Suggestions for a sociological-based Regional Cluster Research[1]

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Abstract

Leading political, business and academic actors, but also actors in intermediary institutions, in many European regions have joined forces to introduce and develop branches of high technology. These actors often refer to the so-called “cluster concept” (Porter 1990) as a theoretical basis for initiatives or development processes. Naturally, the cluster concept has also provoked a good deal of criticism. On the one hand, cluster research has been characterised as mere scientific embellishment, as a ‘fig leaf’ for activities serving quite different motives, as a scientific ‘fly weight’. On the other hand, one misses the critical appraisal of contributions to cluster research in the current sociological discourse. There is a lack of research into possible reciprocal stimulation between sociological approaches and the cluster concept. The paper intends to contribute to filling the existing gap. In order to test the cluster concept’s viability, a look is taken at its possible sociological connection, which could serve as a basis for subsequent empirical research. The paper starts by exploring the cluster concept’s constituent elements. This is followed by an analysis of the explanatory power of sociologically based cluster research and the discussion of the question whether the criticism can be eliminated with the help of sociological concepts. This short summary already hints at the final conclusion: the cluster concept is not rejected; rather, further comparative, social science based cluster research is called for.[1]

Keywords: *regional clusters, networks, spatial proximity, competition, co-operation, trust, emergence*

1 Introduction

Many European states and the European Union are devoting considerable effort to the promotion of high-technology. Information and communication technology, bioengineering, microsystems and nanotechnology – these and related fields, collectively also called ‘future technologies’, are being studied, developed and applied to generate marketable products and processes, thereby also creating employment and enhancing the potential for innovation in national economies. In this context, regional promotion schemes and initiatives have become more prominent in recent years. Leading political, academic and business actors, but also actors in intermediary institutions, in many European regions have joined forces to introduce and develop further specific high-tech branches and to stimulate the growth of economic clusters.

Apart from the much-quoted example of successful regional development, i.e. Silicon Valley in the United States (Saxenian 1985), similar regional high-technology development in Europe has been recorded in Cambridgeshire (UK) (Cooke/Huggins 2003), around Munich (Sternberg/Tamásy 1999), and in old industrial zones like the

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ones near Göteborg (Lindholm Dahlstrand 1999) and around Dortmund (Jonas et al 2002, Jonas/Berner 2004). As one would expect, these European region-specific processes are by no means uniform; rather, they are the result of specific conditions and have taken individual development paths (cf Clarysse/Muldur 2001).

Actors from various fields often refer to the so-called “cluster concept” (Porter 1990) as a theoretical basis for initiatives or regional development processes. Discourses in regional science usually associate it with terms such as “territorial innovation concept” (Moulaert/Sekia 2003) or, more comprehensively, “agglomeration-theoretic concepts” (Parr 2002, Malmberg/Maskell 2002). One could also mention “industrial districts” (Becattini 1978), “innovative milieus” (Maillat 1996), “learning regions” (Lawson/Lorenz 1998) or “flexible specialisation” (Piore/Sabel 1985) – terms pointing to the connection between regional development and regional stimulation of innovation.

With respect to the explanatory power of cluster research, the claim is made that it helps to elucidate the functioning and thus the advantages of region-specific development processes. Researchers assume that there is empirical evidence for a close connection between local growth and a limited number of innovative industrial clusters (Baptista/Swann 1998; Padmore/Gibson 1998: 627; Porter 2000).

Naturally, the cluster concept, being increasingly employed by political and business actors, has also provoked a good deal of criticism. Cluster research has been characterised as mere scientific embellishment, as a “fig leaf” for activities serving quite different motives, as a scientific “fly weight” (cf. Moulaert/Sekia 2003: 292). Current sociological discourse, on the other hand, has been found to lack thorough research on regional and local development processes which are considered to be exemplary for successful economic growth. Research into possible reciprocal stimulation between sociological approaches and the cluster concept is not sufficient.

This comes as a surprise since sociologists, especially from the field of social network research, too, have developed concepts and conducted empirical studies which could be used to analyse the development of new fields of technology at a regional level. Sociological discourses on innovation and business networks or regional networks may quite often refer to the “territorial innovation concept”, especially the concept of “industrial districts”, (cf. Fischer/Gensior 2002, Reindl 2000, Weyer 2000a, Windeler 2001, Hirsch-Kreinsen 2002, Smith-Doerr/Powell 2005), but debates about the cluster concept are highly unusual (cf. Braczyk et al 1998, Heidenreich 2000 and 2004, Rehfeld 1999, Dybe/Kujath 2000 and Hellmer et al 1999).

The following discussion intends to contribute to filling the existing gap. In order to test the cluster concept’s explanatory power, a look is taken at its possible sociological linkage, which could serve as a basis for subsequent empirical research. First, the cluster concept’s constituent elements are scrutinised and any critical points so far raised within regional cluster research are noted (section II). Next, the explanatory power of sociologically based cluster research is discussed. With reference to research on social networks but also to other sociological approaches, this paper tries to fathom the insights gained through mutual inspiration in order to show that a sociological reflection offers the possibility to tap into regional cluster research in a constructive way.

By doing so, it is also possible to expound on central aspects of regional clusters in a theoretically elaborated manner. Thus, a workable conceptual frame is developed, which is open for further theoretical reinforcement and – as a consequence – usable for an empirically orientated sociological research on regional clusters (section III). This short summary already hints at the final conclusions: the cluster concept is not rejected; rather, further comparative, social science-based cluster research is called for (section IV).

2 Basic Aspects of the Regional Cluster Concept

So far, the most authoritative sources on the evolution of the cluster concept are the writings of two authors: Michael Porter (1990, 2000), who advocated a new theory of competition and trade, and Alfred Marshall, whose agglomeration theory goes back to the beginning of the 20th century (Marshall 1920). According to Porter, a cluster is a geographic concentration "of interconnected companies, specialized suppliers, service providers, firms in related industries, and associated institutions (e.g., universities, standard agencies, trade associations) in a particular field that compete but also cooperate" (Porter 2000: 15). In contrast to, for example, ‚industrial districts', which are primarily entailing small and medium sized firms in a more or less homogeneous constellation of actors, regional clusters have a multitude of heterogeneous actor constellations, in which big companies as well as small and medium sized enterprises can be influential.[2]

Economic clusters are viewed as alternatives to both highly integrated large-scale industrial plants and geographically isolated individual firms. The cluster concept usually proceeds from the assumption that innovative clusters will lead to the founding of spin-off companies and to intensified exchange of knowledge and information between different firms, thus helping companies to control their markets and, at the same time, to strengthen innovation within individual enterprises. Not surprisingly, the cluster concept has been called the "territorial innovation concept" that is most practice-oriented and most firmly rooted in market logic (Moulaert/Sekia 2003: 293).

From Porter's writings, however, one may infer that clusters need by no means be restricted to certain regions or locations, but that they can (also) span several regions of individual states. Padmore and Gibson express this succinctly and plainly: "A cluster can be very localized ... or very dispersed" (Padmore/Gibson 1998: 627, cf. also Oosterhaven et al 2001: 811). Regional economists have consequently come up with suggestions for how to distinguish between regional or local clusters on the one side and other types of clusters on the other. Baptista and Swann, for instance, define a regional cluster as "a strong collection of related companies located in a small geographical area, sometimes centred on a strong part of a country's science base" (Baptista/Swann 1998: 525). Steinle and Schiele describe regional clusters as "localized sectoral agglomerations of symbiotic organizations that can achieve superior business performance because of their club-like interactions" (Steinle/Schiele 2002:

[2] An often quoted definition of 'industrial districts' reads as follows: "A socio-economic entity which is characterised by the active presence of both a community of people and a population of firms in one naturally and historically bounded area" (Becattini 1990: 39). However, clusters do not have a 'community' (see above).

850) – and many other examples could be quoted (Oakey et al 2001; Hendry et al 2000: 132; Cooke/Huggins 2003: 52).

Besides taking note of the geographical boundaries introduced by the regional scientists, two observations can be made when comparing Porter's definition with those proposed by regional scientists: On the one hand, regional science cluster research retains certain basic features of Porter's definition. This mainly concerns the relevance of reciprocal connections between actors within a cluster. On the other hand, various regional scientists have introduced additional qualitative features. Baptista and Swann, for example, stress the linkage to a specific science base, while Steinle and Schiele emphasise the role of "club-like interactions". There is general agreement that no random regional or local "agglomeration" or "accumulation" of actors does, by itself, constitute a cluster. The term cluster can only be reasonably applied if an accumulation of empirically observable interactions, that have surpassed a "critical amount" in terms of quantity as well as quality, arises (Oosterhaven et al 2001: 811). Since no definitions for the terms interaction or "critical amount" are given, one is led to conclude that a "cluster" has to be more than a random conglomeration of actors. Before analysing these features more closely, the specific way in which relations between actors in a cluster are conceived is looked at, thus focusing on the sociologically relevant aspects observable in the co-ordination of actions and communication.

Scientific discourse has revolved around the following four major points, which are used in the analysis of interactions and which should provide an explanation of regional cluster processes: *First*, actors in regional and local clusters profit from spatial proximity (Oakey et al 2001). It is asserted that spatial proximity is instrumental in stimulating communication among relevant actors and therefore facilitates co-operation and competition. *Second*, the cluster concept rests on the basic assumption that the respective interactions are controlled by differing co-ordinating mechanisms, ranging from "competition" – sometimes also called "rivalry" – to "co-operation" (Cooke et al 1997; Porter 1990, 2000; Simmie et al 2002). *Third*, researchers stress that newly arising or traditionally present patterns of action within a particular cluster are characterised by very specific features (e.g. co-operation based on trust, specific outputs etc.) typically emerging in networks profiting from spatial proximity. One can therefore distinguish between cluster-internal patterns of action and actions by external actors. Cluster-internal actions have a special quality which emerges at a collective level – namely at cluster level. *Fourth*, as emphasised by scientific discourse, the focal point of analysis are actions taken by a multitude of heterogeneous actors that would not come into view if one proceeded from a company-, industry- or sector-specific explanatory framework. These four points are discussed in greater detail below [(2.1) to (2.4)].

2.1 Spatial proximity

Without doubt, "spatial proximity", whether at a regional or local level, is both a necessary prerequisite for cluster formation and a precondition for the success of existing clusters. Proximity, a "powerful variable" (Porter 2000: 25), facilitates interaction and enhances its positive effects. According to Porter, spatial proximity is relevant to cluster-specific competitive advantages. "Location affects competitive advantage

through its influence on *productivity* and especially on *productivity growth*." (Porter 2000: 19) Proximity has a beneficial effect on the local concentration of significant information and thus its visibility. It accelerates information flow within the cluster, while at the same time reducing the exchange of information with external actors "because communication takes forms (such as face-to-face contact) which leak out only slowly" (Porter 1990: 157). Apart from these more obvious assumptions about spatial proximity, the latter is, for example, also said to enhance the perception of which moves are likely to be made by competitors.

All these assumptions and observations, however, are not unproblematic, since they do not explain how "spatial proximity" is able to produce these co-ordination effects. Cluster research therefore differentiates between social and geographical proximity, i.e. a social and a spatial dimension: "People are more likely to communicate with those who have close ties to them than with those who are geographically close." (Steiner 1998: 9) In principle, this means that spatial proximity can only enhance co-operation if it has a positive influence on the social dimension. As a result, "spatial proximity" is the key factor in enabling interaction among actors in the same social category. In this context, reference is usually made to Alfred Marshall (1920). According to Marshall, the development of industrial conglomerates is based on positive externalities arising from the accumulation of related industries their and corresponding companies. He presents three possibilities: First, firms mutually benefit from their respective knowledge spillovers; second, they utilise the specific inputs and services of industries further up and down supply chains; third, such agglomerations give rise to a geographically defined labour market whose actors have specific skills and qualifications.

Meanwhile, there is an almost general agreement in cluster research that the advantages of a nearby supply of primary products and other inputs or proximity to regional markets can not always be realised. Catherine Beaudry and Stefano Breschi (2000) have developed this idea further. They distinguish between supply-side and demand-side aspects and believe that advantages are clearly present in supply-side aspects, particularly those related to the local application and utilisation of knowledge. In contrast to the innovation resource "information", knowledge is something characteristically vague, making complete codification (i.e. turning knowledge into information) very difficult, if not impossible. Therefore, both transfer and transformation of knowledge usually rely on face-to-face interaction or are significantly enhanced by it. Physical presence is generally easier to organise locally or regionally than over long distances. In addition to the advantages of positive externalities (knowledge spillovers, specific inputs of supporting industries, local labour markets) mentioned by Marshall, Beaudry and Breschi identify the following aspects: The establishment of specific communication codes and social norms, better utilisation of various learning strategies facilitated by spatial proximity (learning by doing, by using, interacting, imitating, etc.), and the establishment of future-oriented collective knowledge bases (cf. Beaudry/Breschi 2000).

Some possible advantages of regional clusters due to spatial proximity have thus been named. The question of how proximity actually brings about co-ordination is answered by pointing to the central role played by the utilisation of knowledge, which in turn is based on (co-present) interactions. Yet, since it continues to be unclear how spatial

proximity helps to initiate these interactions and how it endows them with a special quality, the original question remains unanswered. The criticism made by the group around McKelvey therefore continues to be valid: “Co-location or not is an important question, because much of the empirical literature on systems of innovation simply assumes that linkages and interactions are (or ought to be) close geographically.” (McKelvey et al 2003: 486)

2.2 Competition and Co-operation

Whenever the emergence of cluster advantages is explained by action co-ordinating mechanisms, reference is made to the effects of “competition” and “co-operation”. Porter (1990, 2000: 18ff.) sees competition as a dynamic process dependent on five aspects: The threat of new entrants, the threat of substitute products or services, the bargaining power of suppliers, the bargaining power of buyers, and the rivalry among existing competitors. He compares competition to a continuously changing landscape where new products, marketing strategies, production processes, and market segments arise (cf. Porter 1990: 20). Higher or lower competitiveness is due to changes in productivity and innovative power: “Productivity and innovation – not low wages, low taxes, or a devalued currency – are the definition of competitiveness.” (Porter 2000: 30) One can therefore only speak of successful competition among actors within a cluster, and between actors inside and outside of clusters, if there is growth in productivity and innovation. Still, Porter notes that it is typical of clusters to have actors who are not in direct competition with each other; instead, they are active in different industrial fields or at different levels and stages of production chains.

According to Porter, highly developed industrial societies in particular display a “rivalry” – other than market competition – that influences relationships between direct competitors as well as, generally speaking, all enterprises. In discussing the effects of competition, Porter mentions “domestic rivalry” as a specific geographical form of rivalry (Porter 1990: 117 ff.). “Domestic rivalry, like any rivalry, creates pressure on firms to improve and innovate. Local rivals push each other to lower costs, improve quality and service, and create new products and processes. While firms may not preserve advantages for long periods, active pressure from rivals stimulates innovation as much from fear of falling behind as from the inducement of getting ahead.” (Porter 1990: 118). Although Porter often uses competition and rivalry synonymously, they are by no means identical. This is clear from the fact that Porter calls rivalry one of the five driving forces behind competition (ibid.). In the form of “domestic rivalry”, however, it leaves its subordinate position and turns into a kind of competition, where purely economic competitive relationships expand to different domains: “Rivalry among domestic firms often goes beyond the purely economic and can become emotional and even personal. Active feuds between domestic rivals are common, and are often associated with an internationally successful national industry ... Domestic rivals fight not only for market share but for people, technical breakthroughs, and, more general, ‘bragging rights’.”(Porter 1990: 119)

Moreover, companies that are not direct economic competitors may also develop relationships characterised by rivalry. It is precisely this kind of “internal rivalry” that often increases competitiveness within clusters and results in better starting positions

for the respective firms compared with those that could not or would not enter into rivalry. Therefore, from Porter's point of view, neither competition nor spatial proximity are sufficient to increase competitiveness; what is also needed are the effects of vivid internal rivalry to actually realise the potential benefits of proximity.

This idea is not without its critics. As has been pointed out in the debate on regional clusters (Cooke et al 1997), Porter clearly prefers the regulating mechanism of competition while neglecting the central role played by interaction processes and networks in successful development (Moulaert/Sekia 2003: 293). "Competition" and "rivalry" are only one side of the coin. The other side is "co-operation" – or, in Porter's terminology, exchange and flow of information. "When such interchange occurs *at the same time that active rivalry is maintained in each separate industry*, the conditions for competitive advantage are the most fertile." (Porter 1990: 152) So, following Porter's line of argument, co-operative exchange relationships within a cluster mainly depend on the positive effects of rivalry (Porter 1990: 135 ff). Moreover, these relationships are due to specific "mechanisms" that "help information to flow more easily, or which unblock information as well as facilitate co-ordination by creating trust and mitigating perceived differences in economic interest between vertically or horizontally linked firms" (Porter 1990: 152 f). Examples of this improved flow of information are personal acquaintances, ties with a "scientific community" or with professional or business associations, communal ties owing to geographical proximity, and specific norms of behaviour. Other such mechanisms act as sources of mutual agreement on common aims (strong informal relationships among companies; common property; shared capital; overlapping staff etc. [cf. ibid]).

Elaborating on the approach mentioned above, the advocates of positions stressing the relevance of co-operation distinguish different types of co-operation, for example between outsourced suppliers and their customers, or between producers and consumers (Wever/Stem 1999; Oakey et al 2001; Sternberg/Tamásy 1999); other examples are product development undertaken collectively by several companies (Hendry et al 2000), "sub-contracting" (Rama et al 2002), cluster-internal networks (Steiner/Hartmann 1998), and lastly, frequent co-operation between spin-off companies and their source organisations (Lindholm Dalstrand 1999).

These are the empirical phenomena being considered. At the conceptual level, however, it is still not very clear how co-operation is defined or according to which criteria one should distinguish between different forms of co-operation. Accordingly, scientific discourse on clusters has criticised the lack of analysis of interaction processes between relevant actors or groups of actors; if analysed at all, this has so far been done in a rudimentary way only (cf. Oakey et al 2001: 402).

2.3 Emergent phenomena

"The cluster of competitive industries becomes more than the sum of its parts" (Porter 1990: 151). There seems to be near universal agreement among cluster researchers regarding this claim postulating the emergence of phenomena at cluster level – although for conflicting reasons. According to Porter any specific "surplus" at meso-level is mainly due to actions driven by competition and rivalry among micro-level actors.

One need not agree with this position. Authors who put greater emphasis on co-operation tend to explain phenomena emerging within clusters by means of the quality of co-operative actions. This would seem to tie up with the definitions of “regional clusters” mentioned earlier, e.g. the one suggested by Steinle and Schiele about “club-like interactions” stressing the significance and relevance of special co-operation mechanisms. Cluster research assumes that, above all, “trust” and “reciprocity” (Padmore/Gibson 1998: 628) are of pivotal importance in the evolution of cluster-specific interaction and communication processes. For example, regarding the regulating mode of “trust”, Steinle and Schiele argue that the cost of a bad reputation within a cluster would be so high that actors will generally follow the idea of “trustful co-operation”. One opportunistic action, if it were to become public, would not only harm one relationship in particular, but all of the actor’s relationships within the cluster (Steinle/Schiele 2002). This conceptual elaboration is based on the idea that a cluster is characterised by a special co-operative “climate” – a unique set of rules regarding communication, habitual routines or practices of action – different from the one inherent to its surrounding environment. Access to a cluster can only be obtained by meeting certain requirements.

“Clusters [...] are like clubs where you have to pay a membership fee and/or have to take an active part in the activities to remain a member and enjoy the benefits” (Steiner 1998: 8). A “club” could therefore be described as a social structure independent of individual actors, resulting from the effect of various control measures. Following this idea, it becomes possible to look into the emergence of certain co-operation features at action level and to analyse the respective results, i.e. the output.

According to Roberta Capello (1999), it is not only possible to differentiate between (cluster-) internal and external actors, but also between the output of an individual actor and the output – a result of the co-operative relations established by “club-like interactions” – of a group of actors within the same cluster. While in the first case the output belongs to one particular company, in the second case the output of the club-like interactions is rather more similar to a “public good”. It is impossible to relate this output exclusively to any single actor and thus there can be no privileged access to it (to use or to protect it). Quite the contrary: “No rivalry exists for its use by agents belonging to the club, and external agents are barred from access.” (Capello 1999: 356)

Following these suggestions, it is possible to identify a number of phenomena emerging in clusters at meso-level, e.g. specific features of co-operation and their effects (special ideas or visions, routines of action etc.), but also specific outputs (collective goods). Furthermore, these arguments also show that the concept is based on a more or less implicit assumption: Emerging processes and results are homogenous and accessible for all members of a cluster – membership in this special “club” or community is established almost automatically if certain requirements are met. Linking the meso-level of clusters with emerging cluster phenomena in this way, however, may neither be realistic nor convincing. It is also unclear, how this kind of approach could be combined with that of Porter. A question which will be dealt with later in this article.

2.4 Disadvantages of a limited scope of observation

Which individual actors or groups of actors, respectively, are to be considered crucial in the conceptual approaches and definitions discussed so far? It is easy to see from Porter's definition that cluster research reaches beyond sector-specific or industry-specific explanations. It is also obvious that the immediate objects of investigation are private companies, which are seen as collective actors. These actors are small, medium and large enterprises in different economic sectors and industries, which are interconnected at different levels and stages of economic processes and value chains – including a great diversity of suppliers, production companies, service providers and customers of any kind or shape. Also, almost like an afterthought, further collective actors, called "associated institutions" (ibid.), are mentioned. These are intermediary institutions including professional associations, industrial associations and transfer institutions, institutions belonging to the political sphere, public administrative bodies such as institutions promoting economic development, further education and training institutions, but also academic research and development bodies like specialised research centres or institutions of higher learning of any kind. This list might give an idea of what is involved.

Still this approach, with its strong focus on private companies, has been criticised for being too narrow in scope and its disregard for the analysis of other kinds of actors. According to the critics, Porter has consistently failed to mention the importance of regional-policy strategies and public infrastructure (cf. Cooke et al 1997), which are particularly important for knowledge-based economies and may even be able to partly substitute for other economic resources (Padmore/Gibson 1998: 633). Philip Cooke and Robert Huggins (2003) suggest concentrating on the dynamic aspects of development, e.g. negotiation of cluster-specific visions of the future, encouragement of turbulent spin-off processes, changes in horizontal and vertical co-operation relations, development of regional associations and intermediary organisations, and lastly, implementation of a supportive regional development policy. The collective goods provided by intermediary institutions, such as personal contacts, information and manpower, happen to be essential components in supporting nascent clusters. Thus, the idea that intermediary institutions could also play a more active role in this regard seems not at all improbable.[3] The criticism of the bias towards actors in the private sector is taken into account by many of the empirical studies mentioned above (cf. 2.2). For this reason, other organisations and institutions, for instance from science or politics, are included, though it should be noted that the assessment of highly qualified experts and managers is prominent.

At this point the possibilities of and limitations to the cluster concept – at least with regard to its theoretical foundation – are revealed. Geographic proximity, competition and rivalry, but also co-operation, emergent phenomena and the restrictive analysis of actor constellations are pivotal aspects of regional cluster research. On the plus side, regional cluster research is based on a conceptual framework which is undoubtedly

[3] This leads to the question whether clusters simply emanate, or whether their growth is influenced by regional policy and regional-policy actors.

suitable for empirical investigation. Nevertheless, the discussion makes it clear that the reasoning behind these pivotal aspects still has considerable gaps.[4]

3 Towards a sociological reflection

What are the possibilities of combining the cluster concept with a sociological framework of analysis? Different sociological concepts are used to answer this question. These include concepts from research on social networks, from the sociology of space, from the sociology of work, from research on innovation and from the sociology of organisation. Furthermore, an action-oriented perspective, concepts of collective learning and arguments from sociological theory are referred to.

Research on networks conducted in the social sciences plays a pivotal role in this context because many of the aspects mentioned above have already been subject to this field of research. On the one hand, approaches which define networks as relational connections between actors or as "a kind of organizing logic, a way of governing relations among economic actors" (Powell/Smith-Doerr 1994: 368, as well as 2005) – i.e. those using a very general definition of social networks – are to be taken into consideration. On the other hand, concepts of 'social networks' following the idea of trust-based co-operations are of importance. In this scenario, co-operation takes place between autonomous but also interdependent actors who only co-operate for a limited amount of time and who mutually respect each others interests (Weyer 2000a: 11). The less general, but basically similar, definitions of company networks (Sydow 1992: 79) and innovation networks (Kowol/Krohn 2000) are also part of this concept. These concepts analyse long-term, target-oriented co-operative actions, not taking into full account the role of several actors and their exchange processes to be found in regional clusters. Apart from analysing the relationship between actors within networks or heterogeneous co-operations, it is vital to take a closer look at individual actors from different contexts of action who are not involved in direct, more or less long-lasting exchange processes – or who are not yet involved in any exchange processes at all.

But it is not the aim of the following argument to construct a network-theoretical foundation for the cluster concept. Rather – on the basis of the aspects discussed earlier – arguments from different sociological approaches are brought up so as to elaborate on more satisfying and more sophisticated answers to the problems of regional cluster research. The following four aspects are dealt with: *first*, the still inadequately answered question of how to explain the relevance of geographical proximity for action processes (3.1); *second*, suggestions on how the central aspects of competition and rivalry on the one hand and co-operation on the other hand could be turned into sociological topics, including the conceptual options for a better understanding of trust (3.2); *third*, the question of how to analyse emergent phenomena within a sociological framework (3.3); and last but not least, the question whether or not

[4] Most corrections in cluster research are of a pragmatic nature. One example is the incorporation of the concept of value added chains. Other authors, e.g. those from the field of institutional economics, link the cluster concept to that of 'collective learning'.

the selection of the investigated groups of actors undertaken in regional cluster research is sufficient (3.4). The aspects are assessed in varying degrees of detail. Because the sociological discussion on the subject of 'geographical proximity and interaction' as well as action-guiding mechanisms (competition and rivalry versus co-operation and trust) is more detailed, more emphasis is placed on the corresponding chapters.

3.1 Spatial proximity and interaction

The cluster concept could be criticised for not sufficiently explaining the relevance of spatial proximity: Firstly and most importantly, because the (possible) disadvantages of spatial conglomerations have not been properly weighted against their possible advantages. In a conceptually and empirically plausible way, Gernot Grabher (1994) has described the significance and consequences of lock-in effects which could lead to regional sealing-off tendencies and ultimately to one region being cut off from the development of either other regions or the development of the national economy as a whole. Secondly, – as has been pointed out in previous sections – because there does not seem to be an explanation of precisely *how* "spatial proximity" stimulates interaction processes.

Suggestions for useful answers to these questions can be found in many sociological theories. Anthony Giddens' concept of "social integration" explicitly refers to space. He discusses face-to-face encounters in the sense of the "simultaneous physical presence of people in a circumscribed section of space" (cf. Berger 1994: 100) as opposed to "pseudo-interactions" under conditions of spatial absence. Following Berger, the nature of "a circumscribed section of space" can be described in terms of the relevance of "spatial proximity". Georg Simmel, in particular, ([1908] 1992: 722 ff.) has presented a detailed analysis of the associating and dissociating effects of the human senses (hearing, seeing, smelling) on direct interaction; he called mutual eye contact the "purest" and most immediate connection arising in the course of communication. Mutual eye contact is one, perhaps the most essential, advantage deriving from spatial proximity. Spatial proximity enables the actors to perceive each other in a special way and to form an "image" or "impression" of the opposite side within themselves. Encounters under the condition of physical presence are therefore crucial for a great variety of integrative processes (Schultz 2001: 89), which are, naturally, also required in regional clusters.

However, they do not contain any mechanism guaranteeing the creation or emergence of traditions, "communities of practice", collective identities, cluster-specific milieus, or indeed, of trust. In view of the increasing internationalisation of economic exchange processes and considering that communication processes depend on increasingly sophisticated technology, the last argument gains in importance. The rapid spread and adoption of a wide range of information and communication technologies have led to the gradual replacement of physical presence by accessibility as a necessary prerequisite of communication. Peter Berger tentatively concludes from this that verbal communication under conditions of physical presence gradually *seems to become*

irrelevant: By “employing technological media, we successfully manage to transmit with ever increasing completeness the kind of additional information and those additional signals whose mutual perception used to require simultaneous physical presence” (Berger 1994: 107).

Still, concepts of face-to-face communication are questioned because of the rapid spread and enforcement of a whole panoply of information and communication technologies. Physical presence as a prerequisite of communication could thus be in danger of being gradually substituted by accessibility (c.f. Berger 1994, Giddens 1990, Malsch 2005). On the other hand, the sociological concepts and approaches mentioned above are restricted in their applicability because communication between many actors in regional clusters – coming from science, economics or politics – quite often does not require eye-contact. Accordingly, (direct) interaction is not necessarily the most common means of communication.

In both cases, discussing the problem of how geographical proximity can be used to enable interactions seems inevitable (see 2.1). Possible solutions can be found if the problem is dealt with at a structural level as well as at actor level. Then, the question of how local infrastructure could be or should be designed to stimulate mutual exchange processes at the individual level, i.e. between actors from different organisations as well as institutional contexts (private enterprises, science, politics) arises.[5] On the other hand, the question which skills individual actors require to build this infrastructure and to profit from it in the long run has to be answered.[6]

Answers to the first question are given by authors like Martin Heidenreich: Personal contacts between actors of a cluster can be established in many ways. They can simply “run into each other”: meet in places such as restaurants or coffee shops, during events organised by intermediary organisations, e.g. collective breakfasts in technology centres, public lecture series, or special cultural events aimed at specific target groups. Authors like Martin Heidenreich pursue this line of argument by pointing to the chances and opportunities for “low-threshold contacts”, i.e. informal contacts with a low level of commitment, which are more frequent under conditions of spatial proximity (Heidenreich 2000: 95ff.). Informal contacts allow transmission of “*suggestions differing*

[5] The set-up of actors within regional clusters is identical to the one within ‘organisational fields’. These are constellations which “constitute a recognized area of institutional life: key suppliers, resource and product consumers, regulatory agencies, and other organizations that produce similar services or products” (DiMaggio/Powell 1983: 148). The concept of ‘organisational fields’ assumes that, above all, cultural and normative aspects play a central role (DiMaggio 1994). The concept falls into the category of institutional theoretical approaches (Nee 2005), in which the effects of specific institutions and action-guiding norms are worked out. As a consequence, the focus on competition and rivalry as well as co-operative interactions differs from the focus of regional cluster research.

[6] Differences between certain technologies and technological fields have to be considered as well. This can, for example, be seen from the different forms of labour mobility between companies. The level of mobility within the software sector can be very high as opposed to those sectors in which technology-intensive and firm-specific working processes are based on heterogeneous micro- and nanotechnologies and in which labour mobility tends to be low. Homogeneity (e.g. technological standards) at the technological level, too, can have a positive impact on labour mobility as in the case of semi-conductor technology (cf. Powell/Smith-Doerr 1994: 387). These differences are also observable in the various phases of invention and innovation, in technologically defined working procedures and in different technological development trajectories (cf. Sydow et al 2004).

from established patterns of thought and action" (Heidenreich 2000: 96), they increase "the chances of developing trustful relations and common world views" (ibid.) and, above all, they offer "an opportunity for *transmitting implicit, context-embedded, non-tradable knowledge*" (ibid). Low-threshold contacts act as a kind of nutrient, nourishing long-term and temporary co-operation among heterogeneous actors. They are the 'Social Foci' "that brings people together in an activity so as to increase the chance of relations developing among people" (Burt 2004b: 1-4).

In the initial phases of high-technology clusters, regional platforms of communication in form of intermediary organisations and institutions have to be founded. Only then is it possible to aid the emergence and development of individual-based networks, for instance at management level, involving various enterprises or actors from different institutional contexts – or to increase the effectiveness of start-up programmes. Technology-specific foundries and incubators, training associations and further training courses at regional level could be considered to be the centrepieces of this infrastructure. Foundries play an important role in the hoped-for networking of the actors. First, because they offer possibilities of technology transfer. And second, because staffs from different companies are able to take action in such foundries, and by doing so are provided with the opportunity of participating in informal knowledge exchanges. For these reasons, foundries can be very helpful, especially in capital-intensive technology fields. And, as can be seen from the research on industrial districts (Molina-Morales et al 2002), intermediary institutions, but also political actors, can act as brokers for technological or market-relevant knowledge between international networks and local actors.

Nevertheless, it has to be stated that these contacts do not automatically initiate long-term interaction processes. Under ideal circumstances, regional clusters offer something like a 'structure of opportunity' which actors can, at the very least, use for orientation. If such interaction processes are taking place because of the 'embeddedness of actors', and if a corresponding infrastructure ('institutional thickness') is developed, positive effects on achievement and growth processes are viable (Sydow/Staber 2002). Yet generally it is only possible to exhaust the aimed for advantages, like the development of positive externalities, after a high-technology clusters has been established.

From an action-theoretical perspective, the question which skills actors should have their disposal is raised. Contrary to industrial districts, economic activities – at the horizontal and the vertical level – within regional clusters are not automatically interconnected. Furthermore, at the beginning of cluster processes, actors only have a limited chance to fall back on 'communities' or tightly meshed networks because, in many high-technology fields, the latter do not yet exist or only exist in a rudimentary form. Under these conditions, actors are needed who systematically look beyond the boundaries of their social worlds without losing sight of their own goals or the goals of their organisation.

This is not only true for the staffs and managements of established companies in the private sector, but especially for those involved in start-ups. Sociological network literature has incorporated this issue into the discussion on the growing importance of

'frontier commuters', people who move between established networks. The latter, caught in the balancing act of 'split loyalties' (Häusler et al 1994), are trying to draw a line of demarcation between the network and its environment, "to define the boundaries between individual network partners, and to define functional and departmental boundaries within each corresponding company in the network" (Hirsch-Kreinsen 2002: 114). In the case of strong ties, for instance between suppliers and purchasers, involvement in this act of 'boundary spanning' is certainly not reserved to specialised employees, it can encompass the whole company. Hirsch-Kreinsen argues that boundary management requires a variety of qualifications, some of which have not yet been studied. These skills range from a high level of technical and object-orientated flexibility to social and communicative proficiency (ibid.). Because the actors come from different organisations and professions, they have to be qualified to either alleviate the 'cognitive dissonances' between them (Grabher 2004a) or to resolve the situation – as implied by the discussion on 'heterogeneous co-operations' (cf. Strübing et al 2004) – using various methods.[7]

This does not only concern the relationship between actors within particular networks and heterogeneous co-operations, but also the relationship between actors with different frames of reference who are not involved in immediate, more or less long-term exchange processes or who are not involved in any exchange processes at all. Ronald Burts approach to analysing networks (1992) demonstrates how to isolate interaction processes within clusters: Contacts in 'Closed Networks' – called 'ties' – can be found at one end of the spectrum of empirically visible interactions "where a set of people are connected to one another by strong direct or short indirect connections (e.g., through a few leaders)" (Burt 2004a: 1-17). On the other hand, Burt conceptualises missing exchange processes as 'structural holes'. These mark "the empty spaces in social structure" (ibid.: 1-7) to be bridged by the actors. He defines this 'bridge' as "a (strong or weak) relationship for which there is no effective connection through third parties" (ibid.: 1-16). Mark Granovetter (1973: 1361) defines the strength of ties as "a (probably linear) combination of the amount of time, the emotional intensity, the intimacy (mutual confiding), and the reciprocal services which characterize the tie". Long-term relationships within social networks are mainly characterised by strong ties which "create solidarity and trust" (Jansen 2000: 39), high levels of redundancy, and they are connected to processes of social closure which in turn are seen as a vital source for

[7] Salais, Villeneuve and other social scientists (Salais/Villeneuve 2004a) have recently worked out a so-called 'capability approach', which can be used very fruitfully both to analyse regional cluster processes and to develop future-orientated cluster policy strategies. This approach is conceptualised as a counterpart to the neo-liberal approach, in which human capabilities are reduced to human capital. Quite in contrast to the latter position, skills in the 'capability approach' are defined as a part "of a wider concept of a person's potential, a broad capability to achieve her goals. This capability develops (or declines) depending on daily circumstances of life and work, at least as much as on formalised periods of education and training" (Salais/Villeneuve 2004b: 11). Combining the capability approach with the regional cluster concept, Heidenreich argues that the basis for regional capabilities consists primarily of the experience and the implicit knowledge accumulated in regional businesses and by employees. He describes regional capabilities as "one example of a collective investment in people's capabilities [...]. The goal of this approach is not only to increase the number of regional jobs, but also to increase the technical content, the innovativeness and the sustainability of these jobs" (Heidenreich 2004: 59). Following the assumption about the dominant role of implicit and context specific knowledge and competencies in regional clusters, he argues – like Beaudry and Breschi – that both can best be transferred and transformed through direct interaction. But, he also points out that there have to be suitable institutions and networks.

network innovations (Weyer 2000b: 16). Within Burt's concept, they usually appear in connection to the 'ties' mentioned above. Within the context of regional clusters, they play a special role in existing actor-networks. Weak ties – which are also parts of regional clusters – however, mark relationships with low levels of redundancy, i.e. 'fleeting' relationships which are usually not found in innovation or company networks, but play a pivotal role in the network environment. Actors who are able to bridge structural holes have a better chance of picking up and implementing new ideas than those actors who 'merely' have connections to a number of network partners (Burt 2004a).[8]

Geographical proximity – as can be seen from the discourse on the design of cluster-specific infrastructure and the respective skills required to support it – is by itself not enough to initiate interaction. Advantages of proximity can only be realised if cluster-specific infrastructures are developed. Only then can actors benefit from a combination of strong and weak ties and thus co-ordinate their efforts. This is particularly useful when working under pressure or attempting to solve complex problems. Combining proximity and infrastructure enables actors to flexibly co-ordinate problem solving processes and to easily rearrange relationships in order to generate advantageous knowledge exchanges – which have been discussed earlier – within the corresponding cluster.[9] This leads on to the subject of how actions and action-chains create 'social spaces' and of how, in turn, 'social spaces' have an impact on actors.

3.2 Competition, rivalry, co-operation and (strategies of) trust-building

But first, based on this argument, the relevance of competition and rivalry on the one hand and co-operation on the other is examined. Sociology has produced greatly differing suggestions on how the concepts of competition, rivalry and co-operation could be defined and used analytically. Basically, two definitions have been proposed: The first one understands competition as a form of conflict and thus as something opposed to co-operation; in the second case, competition and co-operation are not necessarily seen as opposing concepts.

With regard to the first definition, one may proceed from Max Weber's differentiation between the social relations of struggle and competition (Weber [1921] 1980: 20), which was, for example, adopted by Veit Michael Bader (1991) in his "Protheorie sozialen Handelns". According to Bader, concepts like conflict, competition, rivalry, confrontation, struggle, quarrel, dispute etc., denote antagonism between two or more parties (Bader 1991: 337). "Conflict" can be conceived as a general, comprehensive

[8] Burt (2004b: 355) lists four types of 'Brokerage': (1) "to make people on both sides of a structural hole aware of interests and difficulties in the other group", (2) "transferring best practice", (3) "to draw analogies between groups ostensibly irrelevant to one another", and (4) "to see new beliefs or behaviors that combine elements from both groups".

[9] It is not possible to fully consider the emphasis put on implicit knowledge (see 2.1) by Beaudry and Breschi in this paper. Apart from the field of innovation economics, the special role of implicit knowledge has been discussed in the sociology of work and industrial relations and the sociology of technology and innovation. Some of the keywords are: tacit and codified knowledge, practical and theoretical knowledge, and finally, implicit and explicit knowledge. At this point, it is important to mention that this concept should not be applied in a one-sided manner – a cluster, for instance, is not simply a hoard of tacit, implicit knowledge.

term opposed to “co-operation”, covering all shapes and dimensions of contradictory collectiveness or societal integration (cf. Bader 1991: 338). The two basic types of conflict are competition and confrontation. Competition – the term to be analysed – can refer to objective situations and to their subjective definition by the respective actors, but also to unilateral actions or reciprocally competitive actions. Competitive relationships are unique in that they do not, in principle, presuppose mutual reciprocal acts of communication or interactions (cf. Bader 1991: 339). Competitive actions by several parties may therefore occur separately with respect to space and time. This seems plausible if one thinks of the indirect, “impersonal” competition taking place in anonymous markets.

The second definition proceeds from the assumption that competition functions without interaction; it can therefore not be conceived as the opposite of co-operation. This approach, too, starts by differentiating between struggle and competition, the latter being described as “indirect struggle” (Simmel [1908] 1992: 323). Thus, according to Simmel, the term competition does not cover activities by which an opponent is directly damaged or eliminated (cf. Simmel [1908] 1992: 323), rather it covers activities by which at least two actors are concurrently trying to offer a “competitive price”. By introducing prices, something independent of the actors, the direction of the argument is changed. While in the case of the first conceptual approach, competition can be described as “struggle by everybody *against* everybody else”, it is conceived as “struggle by everybody *for* everybody else” (Simmel [1908] 1992: 328) in the second approach. From this it can be concluded that, in principle, competition can no longer be subsumed under the concepts of struggle and conflict. Niklas Luhmann argues along this line. According to him, competition works peacefully and avoids conflicts, because it does so without interaction: Competition enables actors to contemplate each others actions with regard to their own personal aims under the assumption of scarce resources. In this situation, personal contact is not necessary at all (cf. Luhmann 1988: 102). Precisely because competition allows social orientation to take place without interaction, it avoids the complications and loss of time typically associated with this kind of communication. Competition has the potential to cause critical confrontations, but inevitably. Consequently, it only has a limited explanatory power in this context.

This could explain why Porter is using the term rivalry. The phenomenon of rivalry leads to the discussion of confrontation mentioned above. In contrast to competitive relationships, rivalry always involves direct communication and interaction (cf. Bader 1991: 339) – and rivalry always requires personal commitment. Porac and Rosa define it as “the goal-directed attentional focus” between two actors within a cluster (1996: 369). Resulting interactions are aimed at bettering one’s own situation or intended to harm rivals (which is obvious in the case of personnel poaching). According to Powell and Smith-Doerr (1994), multiple, rivalry-based types of co-operation in varying combinations of actors are gaining importance because firms are trying to enhance their performance by establishing close, but not exclusive relationships with other firms: “Competition no longer occurs on the basis of firm-to-firm combat, but among rivals shifting alliances competing against one another on a project-by-project basis.” (Powell/Smith-Doerr 1994: 384)

Following this argument, Grabher (2001, 2002) explores the relevance of rivalry in regional project-based contexts of action. Like Porter, he does not limit rivalry between different actors to pure economic competition. “Rather, rivalry comes to the fore in the contested terrain of boundaries between professions, project teams, organizations and, in fact, in the understanding of the sub-sectors of the trade” (Grabher 2002: 255). What is important are those aspects of rivalry that refer to the actors’ plane of action, whereby existing ties in personal networks and between different organisations and institutions are changed (cf. Grabher 2001: 357). “This sort of rivalry generates and reproduces redundancy” (Grabher 2001: 358); and only this redundancy enables flexible adaptation to the changing needs arising in regional development processes. So, in fact, it is the relationships of rivalry among relevant actors within a cluster that ensure the abundance and diversity of organisational forms and customary actions; they provide the “genetic pool”, as it were, in which mutations lead to the evolution of new organisational forms (cf. Grabher 2001: 354).

But rivalry is not the only type of interaction closely connected to competition; Burt’s ‘bridges’ combine interaction and competition in a different way. With special regard to Simmel’s thoughts on the ‘laughing third person’ (Simmel [1908] 1992: 143ff.), bridges are non-redundant relationships which follow market logic and generate competition between networks or subgroups of networks (Burt 2004b: 355, Grabher 2004b: 15ff.).

Calling rivalry the dominant force in regional contexts of action would be taking it too far, but following the ideas proposed in the cluster concept seems to be quite reasonable. Cluster processes are characterised by two opposing forces: rivalry (and, via the concept of ‘bridges’, also competition) on the one hand and co-operation on the other. Viewing clusters in this way, one can draw on a great variety of sociological co-operation concepts (Türk 1995) and explore the reciprocal relationship between rivalry (as well as competition) and co-operation. One could, for example, then ask whether two competing actors could not be at the same time co-operating with each other (cf. Luhmann 1984: 522f.).

Co-operation can thus be conceived as an actual level of concrete societal practice (cf. Türk 1995: 97) where different actors interact with each other, but without automatically engaging in “good co-operation”. Looking for the prerequisites and logic of “good co-operation”, the concept of “collective learning” comes to mind, which also takes place at the level of action. This concept, elaborated by innovation economics, is concerned with areas of core competences in enterprises. These are defined as “what an organization is able to do better than others” (Lawson/Lorenz 1998: 306). If one follows the conception developed by Cliff Lawson and Edward Lorenz, three central aspects of collective learning can be identified: Collective learning depends on members of an organisation sharing their knowledge and making it available to others. Such knowledge is largely implicit and tacit, forming part of organisational routines and practices; the combination of diverse knowledge may potentially generate new kinds of organisational knowledge; these potentials and possibilities, however, are hampered by organisational inertia. According to Lawson and Lorenz, the third aspect, i.e. a company’s ability to analyse and develop its respective core competence, is particularly important, but has so far hardly been studied empirically. Analyses of this third aspect could provide interesting insights into interaction processes between collective actors (i.e., in this

case, enterprises) and their members (i.e., in this case, management and employees), which would in turn reveal something about the quality of collective learning processes and thus also about the quality of action patterns within a cluster. Conflicts within organisations can then – following this approach – be interpreted as successful or unsuccessful dialogues and negotiation processes, possibly leading to modifications and renewal or to stagnation regarding organisational routines and practices.

Just as one should have a clear idea of the importance and functionality of rivalry- or co-operation-based actions, every effort should be made to understand aspects of co-operation like 'trust' (cf. Bachmann 2001, Heidenreich 2000, Beckert 2002) from a sociological point of view. It has often been emphasised that trust should never be based on 'blind loyalty' (cf. e.g. Weyer 2000a: 12). Trust is based on norms of reciprocity and strong personal ties (Powell/Smith-Doerr 1994: 385, Hirsch-Kreinsen 2002: 112). Such tradition-based dense trust is often understood as a specific form of 'governance' in district research, while social network literature tends to treat it as an independent a priori medium (cf. Weyer 2000b). Steinle and Schiele follow this approach in their discussion on the effects of trust within the – according to the line of argument at hand – scarce 'club-like structures' inherent to clusters (cf. 2.3).

But how can trust be established, how can its functionality be characterised? These questions can easily be overlooked, especially, if, because of the lack of co-operation networks or intense mutual co-operations, trust cannot be taken for granted. Jens Beckert (2002) has some answers: He sees trust as a pivotal mechanism in overcoming obstacles in exchange- and co-operation relationships. Still, this mechanism is not an actual solution to the problem of the incalculable uncertainties involved in interactions between the person who has to give trust (ego) and the person who is to be trusted (alter), but instead acts to provide some reassurance. Establishing trustworthiness is a requirement for trust. In the light of incomplete and asymmetrically distributed information, competition- as well as co-operation-based interactions can be seen as an attempt by alter to bond with ego. Alter has to minimise ego's perceived risk of being subjected to exploitation. And considering the ever growing competitive pressure and the resulting urge to act opportunistically (cf. Hirsch-Kreinsen 2002: 112), this requirement does not only become harder to meet, but has to be reproduced ever more frequently. According to Beckert, this succeeds if ego's assessment of alter's profile is validated. In order to do this, alter has to credibly create the impression that ego's assessment corresponds to his or her thoughts and feelings (which are not observable) using one or more of the following four strategies: social bonding, shared anticipation, expertise, or integrity.[10]

This can be applied to plausibly demonstrate how trust is created or destroyed and which role it plays in ongoing interaction processes. Beckert's alter-ego-reasoning

[10] The strategy of social bonding aims at creating the willingness to trust by building cognitive or normative exit barriers. If alter makes an effort, he or she expects reciprocity. In the case of shared anticipation, alter tries to convince ego of the similarities between his/her and ego's characteristics, codes of conduct and norms. The strategy of expertise is especially suitable for use in situations of strong information asymmetry: Here, alter intervenes in what ego perceives as an unsolvable or difficult problem. Something similar is true for integrity, the fourth strategy, except that it is not expertise but veracity which has to be communicated. (Beckert 2002: 39ff.).

basically shows how trust is created if strong personal ties have not been established (for example when bridging structural holes) and how it can act as a stabiliser. Recourse to trust-building actions, which are definitely vital to network like co-operations and to the concept of 'club-like interaction', is not sufficient. When talking about trust, one should take into account the effects of network specific additional information. These effects can derive from informal and personal communications between network actors ('gossip') (cf. Burt 2004a: 3-13) or be of institutional nature (Heidenreich 2000).

This discourse in the field of action theory is far from explaining interactions within regional clusters, but it does enable one to take a closer look at the diversity of interaction processes and to pursue the mutual relationship between rivalry (and competition) and 'good, trust-based co-operation'. This leads to the question of under which circumstances co-operative associations of regional actors are undermined by rivalry-based conflicts. For example, business managers 'bargaining' for graduates of regional apprenticeship projects; or representatives from employee and employer associations joining up in regional political networks (Beese et al 2004) but failing to transfer this co-operative climate to their own businesses, which in turn can lead to rivalry-based conflicts between representatives – if, for example, a union representative was to introduce a works council in one of the co-operating companies.

3.3 Cluster specific processes of emergence, collective learning and monitoring

If the analysis aims at the level of various collective actors, the concept of "collective learning" will allow the investigation of collective learning at regional or local cluster level, which is precisely where the emergence of meso-level phenomena is awaiting clarification. Keeble and other authors state that "[r]egional collective learning can be understood as the emergence of basic common knowledge and procedures across a set of geographically proximate firms which facilitates co-operation and solutions to common problems." (Keeble et al 1999: 320) According to these authors, the emergence of collectively shared knowledge depends on three prerequisites: The first basic precondition is the development of a common language in which actors can effectively communicate about technological and organisational problems; the second, complementary requirement is that more specific knowledge about actual co-operation has to be established among the various enterprises. Thirdly, there has to be common consensus on organisational strategies for problem solution, "how to manage hierarchical relations, how to divide responsibilities among different occupations or services, or what procedures are needed to assure the consistency of collective decision making" (Keeble et al 1999: 320). [11]

Grabher argues, that this position seems to show an inclination to be harmonious usually attributed to collective learning concepts – and that rivalry-based aspects of action, which are constitute elements of the cluster concept, are not integrated (Grabher 2002). Simmel laconically noted that a group of people "which were completely centripetal and harmonious, which were nothing but 'union', would not only

[11] Parallels to other concepts, in which – as opposed to market-driven cluster concepts – the existence of communal formation and specific 'communities' is already presumed, can be easily drawn in this case (cf. Becattini 1990: 39).

be empirically unreal ..., but would also lack any real living process ..." (Simmel [1903] 1983: 173). Therefore, from a sociological point of view, it seems sensible not to predetermine the empirical outcome of whether and when these phenomena will lean towards consensus or conflict.

Charles Sabel's concept of "learning by monitoring" (1994) indicates that collective learning may cause bewilderment and thus undermines mutual agreements and trust-based relationships. Collective learning in heterogeneous actor constellations is, according to this argument, particularly successful if it is combined with monitoring processes. Monitoring can be understood as "simply the determination by the transacting parties that the gains from learning be distributed according to the standards agreed between them, as interpreted by each. The ability to monitor is thus the capacity of each party to assess whether it is getting enough of a fair deal to continue dealing" (Sabel 1994: 137). The risk of becoming a victim of opportunistic acts, confrontations and failing interaction can be reduced if actors manage to assess, aided by suitable institutions, future action plans with regard to already completed action processes, and by doing so, continuously re-evaluate their own and their co-operation partners' position. This means that "learning by monitoring" is a special case of pragmatically oriented actions in which cross-boundary co-operation is considered necessary and in which experience-based and institutionally aided trust can develop and be effective – given time and, especially in this context, the assistance of cluster-specific mediating institutions (cf. Heidenreich 2000: 104ff).

Phenomena of emergence can be analysed, in a conceptually satisfying way, by means of looking into cluster-specific norms of action, regional "boundary objects" (Star 2004) or "knowledge practises" (Jonas 2004), "innovative milieus" (Maillat 1996) and others as phenomena that emerge when complex – i.e. spatially, temporally, thematically and socially differing – action chains and action networks coincide. This is done by Grabher's conception of local heterarchies, its central aspects being rivalry, diversity, goals, projects, and reflexivity. Grabher points out that "local heterarchies" maintain a fragile balance between integrative and disintegrative processes as well as between stabilising and destabilising factors. "In heterarchies, diversity cannot be reduced to the mere coexistence of different organizational forms or philosophies but rather to sustained engagement, overlap, and confrontation" (Grabher 2001: 357). In this sense, heterarchies are driven by rivalry between different organisational forms and philosophies at individual, project and institutional levels. Grabher therefore disagrees with the conception that emergent phenomena mainly result from homogeneous communal formation and that interaction relationships between all actors within a cluster are to be taken into account. As a consequence, his conception implies that emergent phenomena should not be conceived as homogenous results of action processes, but rather as collages made up of different, sometimes conflicting, phenomena. Thus, and corresponding to the club-like interaction concept (see above), it is a promising possibility to discuss emergent phenomena by separating their explanation from their connection with the cluster level.

Following this suggestion, not all actors of regional clusters, but only those in actor-networks, produce and profit from emergent phenomena and surplus-effects. As Lissoni very convincingly demonstrated in his study about knowledge flows and

innovation processes in a cluster in the region of Brescia, knowledge flows between different companies are influenced by a specific community of actors: “Rather than flowing freely within the cluster boundaries, knowledge circulates within a few smaller ‘epistemic communities’ [...] Those communities are better seen as made of people, linked together by personal ties of trust and reputation, rather than from inter-firm arrangements” (Lissoni 2001: 1498).

According to this explanation, but opposing a preference for social processes based on thick trust and communality, Grabher – in his comparative study of social processes within the software cluster in Munich and the advertising cluster in London – distinguishes between three ideal types of emergent phenomena which also influence relevant individuals at action level (Grabher 2004a). The first type is labelled as ‘communality’ and basically refers to the same form of community mentioned by Lissoni. The other two types are called ‘sociality’ and ‘connectivity’. Contrary to the thick relationships and ties in communality, “the notion of sociality emphasizes ephemeral, yet intense networking” (Grabher 2004a: 115). Relationships are primarily based on pure knowledge exchange. Project organisation dominates work processes with the outcome that only few chances to build up trustful and personal ties between the actors remain. Connectivity on the other hand entails the socially thinnest and culturally most neutral mode of networking (ibid.). Social relationships are almost purely virtual and informational. Their basis is not thick or thin trust, but the interplay of professional norms and ethics.

With the help of this typology, it is possible to analyse processes of emergence and patterns of action in regional clusters much more elaborately than with the concept of ‘club-like interactions’. If trustful and harmony-oriented interactions were to be dominant in regional clusters, it would be conclusive to intertwine the meso-level of a cluster with the emerging processes. It is, however, more realistic to find and observe mixtures of different logics of emergent processes, including a heterogeneity of professions, actor-networks and bilateral relationships. The aim of a sociologically based study of the emergence of action-patterns should then be to analyse these intertwined logics and modes. This would allow to gain a deeper insight into cluster building processes and to work out sophisticated case studies which could provide the basis for an empirically-based comparative sociological cluster research.

3.4 The advantage of a broader focus of observation

The dissatisfaction with Porter’s preference for private enterprises from the perspective of regional cluster research and the two adjustment made respectively have already been mentioned (see chapter 2.4). From a sociological perspective, two arguments in favour of a broader focus can be added. First, it is useful to consider a great variety of organisations and institutions, but also to take into account a wide range of professions and hierarchical levels. Second, it is sensible to include cluster internal as well as cluster external actors, this, too, has already been suggested by cluster researchers.

Concerning the first point: In order to, for instance, explore the chances of and limitations to employees’ direct and indirect participation, the relevance of unions (Kock 2002), the range and quality of discussion forums and training networks covering

different organisations, the development of regional labour markets, the implementation of personnel strategies in different companies etc., it is indispensable to study very heterogeneous actors. In the case of companies, less qualified or unskilled workers and trade union representatives should be included in addition to managers; in the case of intermediary institutions, ordinary staff members should be considered as well as the heads of department; in academic institutions, one should take a look at not only at professors but also at research assistants; and, finally, one should also study the more or less privileged, self-employed individuals who are not part of any organisation. Only in this way can deeper insights into the logic of cluster processes be gained. One could, for instance, analyse the probability for actions taking place between different groups of actors or individual actors. The next step would be to find out whether or not the chances differ, in which way they differ and which consequences this has (cf. Ekynsmith 2002).

Concerning the second point: If one agrees with the conclusion that the development and functioning of regional clusters can only be adequately analysed if the entire field between the two poles of “spatial proximity” and “spatial distance” (Hendry et al 2001) is taken into view, this ultimately means that one must also consider groups of actors or individual actors who, being “quasi-external”, either influence growth or stagnation processes at the meso-level, or have some or even a decisive influence on negotiation processes among individual actors or groups of actors at the micro-level within a geographically circumscribed space. These could be actors involved in private enterprises (customers, suppliers, co-operation partners etc.), in politics (government ministries, EU) or in intermediary institutions. These could, however, also be co-operation networks which have been described as “transregional” or even “transnational communities” (Saxenian 2002) and which can sometimes have significant impact on development processes in regional and local clusters.

4 Conclusion

There is no intention to reject the cluster concept. It offers the opportunity to further elaborate on its basic elements with the help of sociological concepts. Such a theoretical framework can be a good starting point for sociologically based regional cluster research. Geographical proximity and interaction, competition and rivalry as well as trust-based and good co-operation, emergent phenomena as well as the focus on heterogeneous constellations of actors are pivotal elements of a cluster concept with which regional processes of economic change and their effects can be identified and analysed. Here, sociological reflection not only underlines how close the cluster concept’s basic elements are to a social-science framework, but it also helps to redress some of the cluster concept’s weaknesses. It is possible to design a conceptual framework for the analysis of regional (high-)technology development processes, moving analysis beyond the confines of the cluster concept and offering a whole new range of opportunities for action theory-based sociological investigations of regional development processes.

The evolution of regional high-technology fields can thus be conceived as a process of mutual superimposition and merging of the actors’ differing action structures, where the social construction of the actors’ spatial relatedness may be facilitated and furthered by

their spatial or geographical proximity – but not necessarily so. In contrast to social networks, regional clusters provide action choices which combine the advantages of strong as well as weak ties. For now there is no empirical answer to the question of how and to which extent interaction within regional clusters has an impact on a clusters' development. A similarly cautious attitude should be taken with respect to co-ordination mechanisms guiding the actors in their interactions. Here, too, one should not commit oneself exclusively to either competition and rivalry or to "good co-operation". Rather, one should proceed from the tension between the two opposing forces. The shapes taken by rivalry-based and co-operation-based relationships, as well as the likely outcome of their combination, will have to be clarified. This method allows to trace the emergence of phenomena at the meso-level of cluster-specific action structures without distortion by a "one-best-way" approach. And finally, the social science-inspired search for the modes and logic of regional cluster development provides a broad perspective on the actors and groups of actors to be taken into consideration and thus encourages reflection on the course of action recommended by the political and economic powers that be (cf. Lagendijk 2003).

The soundness of the suggested theoretical framework should become apparent at the empirical level. The intricacy and complexity of the actions and development processes to be studied can only be handled adequately if one does not stick blindly to preconceived assumptions. Rather, one ought to conduct empirical investigations in which regional cluster processes and possible emergent phenomena are conceived as resulting from the interaction of spatially close and spatially distant action chains. The analysis of these processes and phenomena should be based on the greatly differing combinations of rivalry-based and co-operation-based actions that involve a large number of very heterogeneous actors and groups of actors.

Empirical studies already conducted in the field of cluster research reveal the gaps in the current conception. These gaps could be filled by social science-based research. Single research projects, however, are not likely to be sufficient for this purpose. Sequenced, joined-up projects provide a better chance of understanding regional cluster processes. In the form of auxiliary research, they may even be able to influence these processes. In order to make a difference, sociological cluster research should impartially follow traditional methods; using the advantages of qualitative and quantitative research methods according to the problem at hand and the integration of methods while carrying out practical research are two additional key factors (Kelle 2004). Re-orientation towards conceptual basics points to the possibility to plausibly compare various cluster processes. Acceptable comparisons (Smelser 2003) can be made by studying and analysing specific emergent phenomena in different regions (cf. Hendry et al 2000, Bresnahan et al 2001, Simmie et al 2002) or different technological areas, which have only rarely been included in the studies on processes of development by cluster research as well as sociological research.

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