Material and Immaterial Dimensions of Clusters. Cooperation and Learning as infrastructure for innovation

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Abstract:
The aim of the paper is to give empirically based insights into forms and mechanisms of knowledge management and learning within clusters. Taking the case of five specific clusters from the Austrian province of Styria we look at differences in their learning behaviour. Based on theories of (organisational) learning we investigate into learning systems and their particular forms at the cluster level. By means of a survey and in depth-interviews with firms of the clusters different patterns of learning according to the specific technology and product orientation of the clusters and their different needs for specific forms of knowledge can be found. Each of the clusters shows distinct patterns of learning and uses different sources of knowledge. Also patterns of substitution between these sources can be revealed.

Keywords: organizational learning, knowledge networks, clusters, learning region, geography of innovation, knowledge management

JEL: D 83, L 14, 0 32, R 12, R 15

1. Introduction

Clusters and networks have received renewed attention in recent years not only as a tool for regional development in general but as an institution of knowledge creation and diffusion between the knowledge infrastructure of a region and the firms within the clusters. They are therefore often regarded as geographically condensed forms of economic co-operation and knowledge exchange and as a tool for regionally oriented knowledge management and interfirm learning.

Empirical attempts to show the existence and to find such geographically condensed forms of economic activities were mainly centered on a combination of top-down and bottom-up approaches mostly in search of material links between firms and/or sectors within given geographical limits. They were often based – on different levels of economic activity (macro, meso, micro) – on value chains or supply links of economic activity. Empirically they were originally centered on the measurement of agglomerative tendencies and spatial complexes by a combination of functional linkage and spatial proximity as started by Florence (1944) and later continued by Streit (1969), Richter (1969), Czamanski and Czamanski (1977), Harrigan (1982), and Kubin and Steiner (1987), testing the assumption that industrial agglomerations are not the result of or not only the result of a common attraction to urban centres but are also the result of interaction among the various industries. In the 1970s a series of studies using a production function approach tried to measure regional productivity differences via different indicators for agglomeration economies (Aberg 1973; Sveikauskas 1975); Segal 1976; Carlino 1978, 1979, 1980; Moomaw 1981). More recent attempts of empirically based cluster identification rely on regional input-output tables and their change over time and especially their changing expansion(see e.g. Hewings et al. 1998), case studies of special forms of clusters (originally centered on the industrial districts in Italy, Pyke et al. 1990) and factors in support of the competitiveness of clusters (Porter 1990, 1998).

The theoretical base for cluster and network formation relies on different lines of reasoning. The earliest reasoning (albeit not yet understood as a support of cluster formation) goes back to the advantages of specialisation and the division of labour and starts with, of course, Adam Smith. Without using the term globalization yet he nevertheless gave a first hint that specialisation depends on globalization and that the enlargement of markets is also a precondition for regional specialisation calling for cooperation. Another early apologist for cluster formation was Friedrich List: in his “Das nationale System der politischen Ökonomie” of 1841 he argued in support of networks to diffuse knowledge and to train workers to encourage the underdeveloped German industry. And Marshall

argued in 1890 that there are at least three reasons for cluster formation: material linkages, technological spill-over and labour market effects; he thus emphasized the dynamics of external economies associated with learning, innovation and increased specialisation. This emphasis on the necessary preconditions of conscious and inconscious aspects of interaction and learning was emphasized by the more recent literature of network formation. This focus was taken up by GREMI (Groupe de Recherche Europeen sur les Milieux Innovateurs), analysing territorial innovative processes and the production-reproduction modalities of the complex socio-economic fabric (Aydalot 1986, Ratti et al. 1997). This was continued by notions and concepts such as embeddedness (Grabher 1993), social networks (Scott 1991), untraded interdependencies (Storper 1995), the so-called domain of the geography of innovation stressing the role played by space in the process of innovation and its diffusion (Feldman 1994).

The recent renaissance of interest has therefore more focussed on clusters and networks as an institution for knowledge management and organisational learning. A still gowing literature has focussed on the regional dimension of learning and the learning region (Florida 1995) and its organisational base (Morgan 1997, Cullen 1998), on the necessity and forms of proximity for knowledge exchange (Rallet and Torre 1998), Torre 2002), on the specific character of knowledge and its aspects of regional governance (Gertler 1997, 2001, Martell and Malmberg 1999) to name but a few milestones in the debate of regionalized forms of knowledge management. To this adds a long list of studies trying to calculate the externalities of knowledge and the geographical dimensions of spill-over (for an overview and classification see Autant-Bernard and Massard 1999 and Gallaud and Torre 2002).

In this paper we will focus on a specific aspect of clusters as institutions for knowledge management and organisational learning – we will analyze the channels of transmission of knowledge within a given set of clusters of a specific region. To guide our search we take theories of learning as a basis for the selection and interpretation of data. We first derive from a regional input-output-model for Styria (STYR-I-O 2000) "cores" of interlinked economic activity of Styria resulting in five clusters having also a certain threshold level of employment. Focussing on specific forms of learning and knowledge management we make use of the information of a general questionnaire sent to firms within Styria and in-depth-interviews with the leading firms within the five identified clusters to investigate specific of collaboration, the inter-firm learning behaviour, the diffusion of tacit knowledge, and prevailing learning systems. In doing so we supplement the material dimension of input-output-relations of these

clusters by the immaterial dimension of knowledge exchange. Looking at both dimensions and focussing on the second we regard networks as a special form of clusters with intense, conscious forms of cooperation and a similar stock of knowledge. To retain and improve this knowledge firms within a network have to learn – both as a single firm and as a group of firms. Clusters and their networks can be regarded from our perspective as learning organisations, and concepts of learning can be applied to their analysis (Steiner and Hartmann 1998, 1999).

This means that we start from an existing set of clusters (derived from regional input-output-linkages) in a predefined spatial context and look inside this "cluster boxes" to explore its different ways of formal and informal learning and to shed light into forms of knowledge exchange. In the next chapter we will describe certain aspects of theories of organisational learning and of learning systems (2), try to operationalize them for the analysis of patterns of learning within clusters after having given a short description for the identification of these clusters and outline of the empirical basis to describe the learning patterns (3), present the results of our empirical inquiry of the specific patterns of learning and knowledge management (4) and give a summary and conclusions of our findings (5).

2 Clusters as learning organizations

Clusters – having both material and immaterial links – generate a situation which combines the advantages of both the market mechanism and the direct control-structures of a single organization: Firstly, because one has many different firms within a cluster serving many different markets within and out of the cluster, which keeps the forces of competition alive and guarantees a flexible and efficient handling of activities. Secondly, because the interconnections of the agents within a cluster allow for a close co-ordination of activities, the development of strong long term complementarities and the avoidance of external effects (external to the cluster).

This of course raises the question to what extent this competitiveness is automatically created by these links or if conscious efforts are needed to maintain and develop the competitiveness of clusters. These efforts may be pursued from the outside of the cluster, e.g. from policy institutions with their goal orientation and consequent instrument use , but they can also be generated from inside the cluster as a coordinated attempt of the members of the cluster to improve their relations and links. Clusters, hence, can be regarded as learning organizations, and concepts of learning can be applied to cluster analysis (Steiner / Hartmann 1998, 1999).

2.1 The nature of learning

The concept of learning has changed considerably in recent years: For a long time learning was primarily considered as an adaptive response by an organism to a change in the environment. According to an essentially behaviorist-reductionist perspective this included the idea of learning as a linear process and as something that has to start from the level of the individual so that learning in a social context can be understood as the aggregate of individual behaviours. As Cullen (1998, p.4) argues conventional models of organisational learning still retain elements of these positions taking as a starting point an "information processing" model or "black box" conceptualisation of learning, where information is converted into knowledge and then action. Applied to the concept of organisational learning, it can be understood as a collective and purposive strategy to achieve the goals of the firm; it can furthermore be extended to the notion of clusters as learning organisations with common goals and shared agendas. Yet learning cannot only be regarded as a process leading to changes in capabilities and competencies; it has also to be considered as a social process of ongoing development embedded in a socio-cultural (regional) context. Learning then becomes essentially a communicative process rather than a cognitive performance requiring new thinking about the nature

and forms of the transmission and dissemination of knowledge within a social and organisational context, such as the firm or a cluster (Cullen 1998, p. 5).

2.2 Organisational Learning

Organisational learning is the conscious attempt of the part of the organisation to retain and improve competitiveness, productivity, and innovativeness in uncertain technological and market circumstances. Organisational learning is the outcome of three overlapping spheres of activity - individual, team and system learning. All three kinds of learning take place simultaneously. Individual learning takes place each time an individual reads a book, performs an experiment, or gets feedback from workmates or colleagues. Team learning takes place when two or more individuals both learn from the same experience or activity. Team learning may involve new ways to address the team's responsibilities, or it may involve some aspect of the interaction between the members of the team themselves. System learning takes place when the organisation develops systemic processes to acquire, use, and communicate organisational knowledge (Dixon 1995). All those definitions have several characteristics in common. First, learning is conceived as something that is deliberately pursued by the organisations and its members. Organisational learning therefore seems to be something that has actively to be achieved. Second, the learning process is considered as continuous. Thirdly, learning is depersonalised. It is not a person or an elite (the owner or the top management) who is learning (even when he is learning for the organisation), organisational learning is a change in the knowledge of the whole organisation (Staehle 1991, p. 844).

2.3 Basic types

In correspondence to concepts developed by Piaget (1985) Argyris and Schon (1978) have described the following basic types of organisational learning:

- *Single-loop learning* occurs when errors are detected and corrected and organisations carry on with their present policies and goals. According to Dodgson (1993), Single-loop learning can be equated to activities that add to the knowledge-base or firm specific competencies or routines without altering the fundamental nature of the organisations activities. Single-loop learning has been referred to as lower level learning by Fiol and Lyles (1985) and adaptive learning or coping by Senge (1990).

- *Double-loop learning* occurs when, in addition to detection and correction of errors, the organisation is involved in the questioning and modification of existing norms, procedures, policies and objectives. Double-loop learning involves changing the organisation's knowledge-base or firm-specific competencies or routines (Dodgson 1993). Double-loop learning is also called higher level learning by Fiol and Lyles (1985) and generative learning (or learning to expand an organisations capabilities) by Senge (1990).

In particular double loop learning can be associated with innovations at firm and interfirm level (Dodgson 1996). The change of existing norms or policies through double learning can lead to incremental and radical innovations (Pedler et. al. 1997). Therefore double loop learning may be able to enhance the competitiveness of the learning organisation (Nevis et. al. 1995).

2.4 How to recognise double-loop learning in and between organisations?

Double-loop learning at an organisational level may be observed through continuous monitoring (Argyris and Schon 1978). This monitoring should take place within the framework of an action research approach. But this interactive approach with experimental character proves in the context of clusters to be somehow impractical - it would be difficult to persuade representatives of clusters firms to participate in repeated experimental team-meetings. Therefore the focus in this section is put in particular on indirect indicators that may give hints for the presence of such learning activities as double-loop learning. Such indicators should be able to give evidence of organisational learning activities in clusters without having the difficulties as described above. According to Staehle (1991, p. 843) organisational learning may be recognised by the existence of learning systems that are independent of the individual. Therefore the concept of learning systems could be used as a approach to identify double loop learning in clusters without using an action research approach. Shrivastra (1983) offers the following category of learning systems in organisations:

- *One man institutions* (one person is the key to all learning processes e.g. the entrepreneur, the Chief-Executive-Officer (CEO), grey eminence)
- *Mythological learning systems* (organisational myths, corporate stories, the corporate culture as knowledge base)
- *Informal learning systems (*Informal info-channels as vehicles of learning, communities of practice, old boys networks)

- *Participative learning systems* (ad hoc teams, quality circles, teams in order to solve problems like task forces)
- *Formal management systems* (strategic planning, management information systems
- *Bureaucratic learning systems* (rules and procedures that give exact advice for specific situations, i.e. manuals, procedures)

In particular *informal* and *participative learning systems* are very likely to bring fourth double loop learning activities (Brown and Duguid 1991, Senge 1994, Wenger 1996). Both have in common a strong orientation towards group learning and the confrontation of opposing opinions about the validity of existing norms, policies, and objectives. These properties of participative and informal learning systems predestine them as analytical footholds for the analysis of clusters as learning organisations. Thus fingerprints of double loop learning activities in clusters could be localised through the identification of these learning systems at firm and interfim level.

3 The Analysis of Styrian Clusters

3.1 The methodology

The analysis of Styrian clusters comprises the in depth examination of five regional clusters. This analysis is based on a step-wise approach: First the critical sizes of material linkages and corresponding regional clusters are identified. Second the collaborative and learning behaviour of the cluster firms is examined. The major aim of the analysis in this paper is the attempt to examine how learning and knowledge transmissions within clusters takes places, which different forms it assumes. Thus the focus of this paper is lying on the second step and its results.

In the first step 5 regional clusters were identified within the Styrian economy through a regional I-O-Model: machinery and metals, automobile, wood/paper, information technology, chemistry/pharmaceuticals[1].

The second step comprises first a survey with a general questionnaire sent to 1.631 Styrian firms with a return rate of 20% to identify immaterial forms of collaboration within the regional economy (also outside the clusters) consisting thus of a representative sample of Styrian firms. Second in-depth-interviews with leading firms of the five identified clusters are undertaken. Here the mainly human resources managers in 40 firms of the automobile cluster, in 40 firms of the machinery and metals cluster, in 30 firms of wood/paper cluster, in 19 firms of the information technology cluster, and in 20 firms of the chemistry/pharmaceuticals cluster are interviewed (the questionnaire can be found in the annex). In order to examine how learning and knowledge transmission within clusters takes places, the special forms of collaboration and cluster related activities, the inter-firm learning behaviour, the diffusion of tacit knowledge, and prevailing learning systems are especially under scrutiny. This second step is not a rigid statistical analysis (the number of firms and, hence the answers for evident reasons being too small, also too qualitative), rather a qualitative exploration into forms of prevailing learning systems and knowledge exchange.

[1] The first step made use of a regional econometric input-output model for Styria on the basis of 1995 with approximately 60 sectors (2 digit NACE code). The core of the model is based on the Washington Projection and Simulation Model (Conway 1990) and includes – beside the I-O-module – also a demand, income, population and employment module. This model allows the identification of linkages and multipliers between the sectors thus enabling to find „cores“ of economic activity within the region. The size of the cluster is accordingly defined by the main sector plus the linked sectors to the extent defined by the coefficients. Apart from existing linkages a certain threshold level of employment was taken as an additional criterion (see Adametz et. al. 2000).

3.2 The identification of double loop learning in the cluster through learning systems

In order to identify different learning types and especially double loop learning in Styrian clusters the concept of informal and participative learning systems had to be made operable. Specific questions investigating into the existence of these learning systems in the clusters had to be developed. In order to do so, particular concrete forms for each learning system were identified through intensive interviews of experts for organisational learning and the analysis of existing literature. Table 1 shows the particular forms of these learning systems that were first identified in course of this process and then examined through the 149 interviews in cluster firms[2].

Learning system	Particular forms at cluster level
Informal Learning system	- informal meetings in bars or at conferences etc. - communities of practice - „old boys networks“ - social networks (clubs etc.)
Participative Learning system	- interfirm R&D teams - interfirm project teams - benchmarking clubs - participation in consortia

Table 1: Particular forms of learning systems

- Informal learning systems may be present at cluster level through informal meetings at conferences or in bars, through communities of practice, through networks with fellow graduates (old boys networks), or through social networks:
- Informal meetings (Saxenian 1996) take place in bars or in the lobby of conferences. Such meetings are mainly focused on the transfer of knowledge on a personal face-to-face basis.
- Communities of practice (Wenger 1996) are spontaneously emerging informal teams for problem solving comprising employees of different firms. Learning takes places in the discussion and fixing of technological problems.
- ”Old boys networks” (Saxenian 1996) are formed by graduates of particular universities. In such networks technological or organisational problems can be discussed freely on an informal basis. Learning arises through the exchange of alternative perspectives.

[2] In Annex B the corresponding questions in the questionnaire can be found

- - Social networks (Hendry et. al. 1995) have nodes in local sporting clubs and charity organizations (i.e. Rotary club etc.). In such networks information and knowledge can be exchanged informally and learning takes place in the exchange of alternative perspectives.

Participative learning systems may be present at cluster level through formal R&D-teams at interfirm level, through interfirm teams working on a joint project, through the participation in benchmarking clubs, or through the joint preparation of tenders in consortia:

- Interfirm R&D-Teams (Dodgson 1996) are formed by researchers of Universities, R&D-Institutions and firms. Within such teams a strong transmission of knowledge from the regional knowledge infrastructure to the participating firms takes place.
- Interfirm project teams (Pedler et. al. 1997) are formed by members of several firms. Within such teams new production programs are launched or new software systems are implemented. Learning arises through the continuous problem solving in course of the project.
- Benchmarking clubs (Pedler et. al. 1997) are formed by several firms in order to identify good-practices for routines at firm level. Learning occurs through the active transfer of good practice between the club members.
- Consortia (Balling 1997) collaborate on preparing bids for public or private tenders. Knowledge about particular markets and/or technological problems is exchanged among the firms in course of the preparation process.

These eight particular forms of learning systems were used as a basis for the determination of the learning orientation of each cluster and the clusters in comparison. Thus information about the general learning orientation and the importance of particular forms of the learning systems could be made comparable among the five examined Styrian clusters.

4. Empirical results: Linkages and learning in Styrian Clusters

4.1 Styrian Clusters and their development

The five clusters show together a picture of highly differentiated patterns (see figure 1). Some clusters are very dynamic in their development while others tend to stagnate or even to shrink. Some clusters show on the one hand close collaborative relations to the regional knowledge infrastructure, but are on the other hand scarcely regional embedded via material linkages. Other clusters have on the contrary strong regional linkages but do not collaborate very intense with regional universities and R&D-institutions.

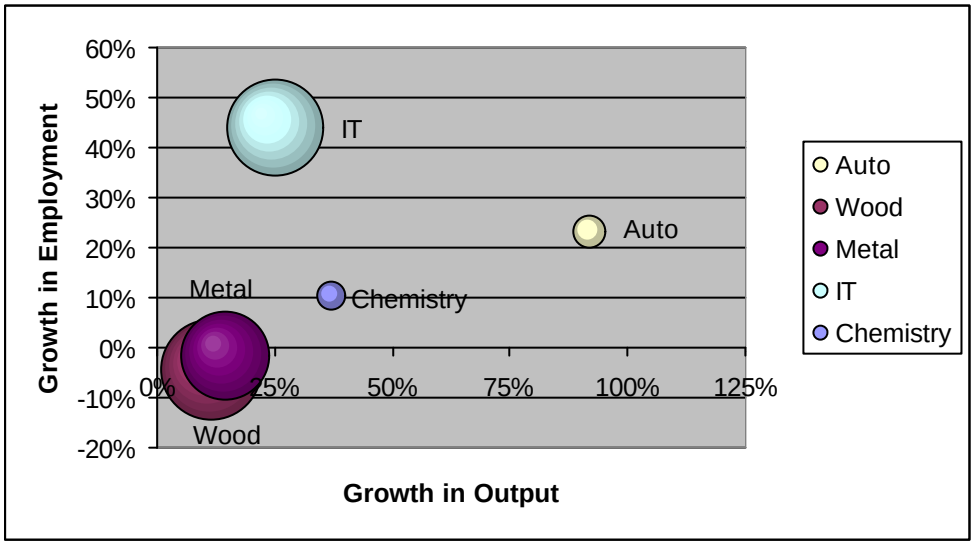

Figure 1: Development of the Styrian Clusters 1995 - 1998

The development of the clusters (in terms of employment and real output) as derived from the I-O-model show in particular for the automobile cluster an extraordinary dynamic in the past years: From 1995 to 1998 the number of employees in this cluster has grown about +23% (Ø Austria +6%), real output has even grown about 92% (Ø Austria +25,6%). And in 1998 the core industry of this cluster comprised about 60 firms with 7.900 employees, producing an annual output of Austrian Shillings ATS[3] 35 billions. The output per employee was in 1998 ATS 4,4 billions and has been growing from 1995 to 1998 by about 50%.

But also the chemistry/pharmacology cluster shows with a growth of the real output of about +37% (Ø Austria +9,5%) a positive dynamic for the past years. Employment has grown in the past years

[3] 1 € = 13,7603 Austrian Shillings

by 10,3% (Ø Austria -2,8%). This cluster comprised in 1998 about 50 firms with 1670 employees, producing an annual output in the worth of ATS 4,2 billions. The output per employee was in 1998 ATS 2,5 millions and has been growing from 1995 to 1998 about 19,3%.

The machinery and metal cluster on the contrary has with -1,6% experienced a loss of employment in the past years and tends to shrink slightly faster than the national average (-0,8%). The growth of the real output of the metal cluster (+14,5%) has been also below the national average (+20,2%). This cluster comprised in 1998 about 450 firms with 20.500 employees producing an output of ATS 44,8 billions. The output per employee was in 1998 ATS 2,2 millions and has been growing from 1995 to 1998 about 13,9%.

The wood/paper cluster on the one hand has also shrunk in terms of employees in the past years with -4,2% more than the national average (-1,2%). But on the other hand the growth of the real output (+11%) has been larger than the national average (+8%). This cluster comprises about 560 firms with 9.400 employees producing in 1998 an output of ATS 12,8 billions. The output per employee was in 1998 ATS 1,4 millions and has been growing from 1995 to 1998 about 17,4%.

In terms of employment the information technology cluster has grown very fast (+43,9%), but not as fast as the national average (+50,6%). This cluster comprised in 1998 about 500 firms with 1600 employees producing an output of ATS 1,5 billions.

4.2 Material versus immaterial linkages

As a step to gain first additional insights into cluster behaviour as expressed in the collaboration with the regional knowledge infrastructure the combination of material and immaterial linkages as "hard" data (trade linkages provided by the IO-table) with "soft" data showing the collaborative behaviour of the firms (gained through the survey and the interviews) is analysed. The graphic below shows the analysed clusters (size of the circles = number of employees), giving information in one dimension about the regional embeddedness of the clusters in terms of regional trade linkages. The other dimension shows the presence of knowledge intensive collaborations in the examined clusters, that is expressed in the percentage of cluster firms that are permanently and frequently collaborating with the regional knowledge infrastructure (regional universities, „Fachhochschulen" and other R&D institutions.

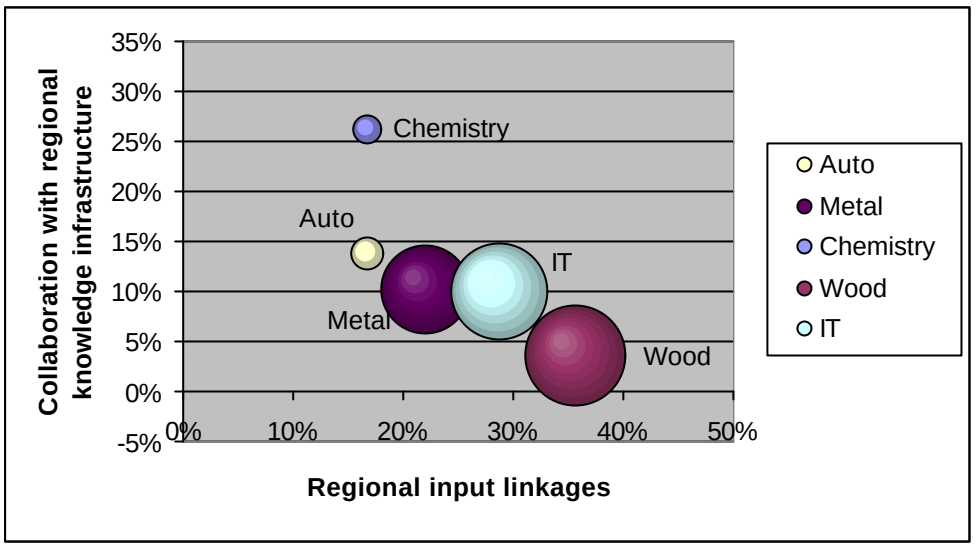

Figure 2: Regional input linkages and collaborations with the regional knowledge infrastructure in the Styrian clusters

The wood/paper cluster is characterised by the strongest regional embeddedness of all analysed clusters. The firms of this cluster receive 35,7% of their input from Styrian suppliers. 24,5% of the output is going to Styrian firms. But at the same time this cluster has a rather poor performance in terms of knowledge intensive collaborations: Only about 11% of the companies have stated to collaborate with universities, "Fachhochschulen" and other R&D- institutions on a regular basis. More than 60% of the firms stated to have never collaborated with such institutions.

The information technology cluster is also characterised by a strong regional embeddedness. Its firms receive 28,7% of their inputs form Styrian enterprises. The cluster is at the same time also strongly tied to the regional knowledge infrastructure: 45% of the enterprises have stated to collaborate with the regional knowledge base on a regular basis. Only 20% of the firms said to have never collaborated with such partners. About 60% of the cluster firms have also intensified collaborations with members of the regional innovation infrastructure within the last five years.

The metal processing and machine building cluster is characterised by a less intense regional embeddedness – its firms receive 22% of their inputs from regional suppliers. Far much stronger are the knowledge intensive collaboration in this cluster. More 70% of the firms have stated to collaborate regularly with universities and other R&D institutions. About 33% of the firms have intensified these collaborative activities within the past five years.

The chemistry/pharmacy cluster has an even stronger participation in knowledge intensive collaborations: More than 73% of the firms have claimed to collaborate regularly with the regional

knowledge infrastructure. Only 21% have said to collaborate never with these institutions. More than 40% of firms have intensified their collaborations the regional innovation infrastructure within the last five years. With regard to the regional embeddedness of this cluster one needs to say that its firms receive only 16,7% of their inputs from regional suppliers.

The automobile cluster is also characterised by a rather weak regional embeddedness: In 1998 only 16,7% of the input to its firms was provided by regional enterprises, and only 2,4% were delivered to downstream firms in Styria. At the same time this cluster is extremely export oriented: About 95% of its output are delivered abroad. This cluster has also a strong orientation towards the regional knowledge infrastructure. More than 58% of its firms have stated to collaborate regularly with universities and other regional R&D institutions. Only about 20% of the firms have never collaborated with members of the regional innovation infrastructure.

4.3 A closer look at learning and collaboration

Delving deeper into the issue of learning and collaboration in Styrian clusters offers additional perspectives. In the following four aspects of learning in clusters will be examined more in detail. First a comparison between collaborations with institutions of the regional knowledge infrastructure and the collaboration intensity between the cluster firms and the importance of participative learning systems in the clusters is examined. Then the dominating learning styles of the five clusters are under scrutiny, and finally two particular important forms of participative and informal learning systems will be analysed in detail.

The figure 3 shows the relations between the overall inclination of the clusters to collaborate with other firms (x-axis), the presence of collaborative links with the regional knowledge infrastructure (y-axis), and the importance of participative learning systems in the clusters (the size of the globes). These three dimensions should give together clues for the adoptability of the cluster firms through their team oriented learning ability and their access to new information and technology in regard to their innovative efforts and knowledge creation. Participate learning systems, be it in the form of interfirm R&D teams or be in the form of interfirm project teams, function as a concrete formal forum for the creation and the exchange of new knowledge.

4.3.1 Interfirm collaboration, collaboration with the regional knowledge infrastructure and participative learning systems

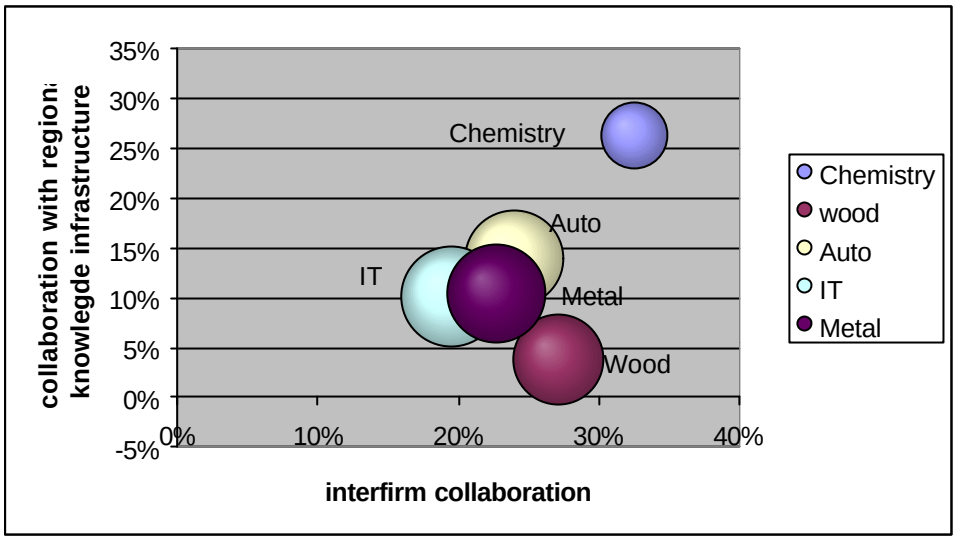

Figure 3: Collaboration and participative learning systems in Styrian clusters

With regard to their patterns of collaborative activity the automobile-, the information technology-, and the metal/machine-building-cluster are forming a group. The wood cluster shows different collaborative patterns: There are more co-operations between firms in this cluster compared to the first group, but at the same time the firms are clearly lagging behind with regard to joint activities with regional knowledge infrastructure. The chemistry cluster is situated clearly apart from all other clusters. Its firms are collaborating much more intense both with other firms and the regional innovation infrastructure than all the other examined clusters.

With regard to the importance of participative learning in the clusters the IT (50% of the firms) and automobile cluster (48%) have the strongest presence of such learning systems, the metal and machinery cluster (40%), the wood cluster (39%) being already slightly less strong oriented towards participative learning, and again the chemistry cluster (23%) with a rather weak presence of participative learning activities.

While the clusters differ (partly) in their collaborative behaviour they share except the chemistry cluster a strong orientation towards participative learning systems and are thus very likely to bring fourth double loop-learning at cluster level. The chemistry cluster has nevertheless a high potential for adoptability – his collaborative orientation towards the regional knowledge infrastructure is almost twice as strong as that of the other four clusters. The wood cluster in comparison is substituting its

weak knowledge intensive links with a stronger participative learning orientation and interfirm collaboration.

4.3.2 Participative versus informal learning

Figure 4 shows the relations between the importance of participative learning systems in the clusters (x-axis), the presence of informal learning systems in the clusters (y-axis). Also information about the size of the clusters in terms of member firms is given (the size of the globes) , in order to show wether critical masses of firms are necessary to develop cluster-based learning activities. These three dimensions should provide together evidence for the ability of the clusters to bring fourth double-loop-learning and develop new strategies and patterns of activity and thus being able to cope with exogenous shocks or changes of the environment. These features are again of particular importance for the sustainability of clusters for double-loop-learning enlarges the set of strategic choices of the learners in face of contingency.

The information technology- and the automobile cluster show both the highest potential for double loop learning activities between the firms and/or R&D-institutions. For about 50% of the firms participative learning systems are a very important source for the acquisition of new knowledge, 39% of the IT-Cluster firms and 33% of the firms in automobile cluster have identified informal learning systems as an equal important source. This orientation reflects also the importance of organisational learning as an integrated element of the daily work in both sectors.

The wood- and the metal-cluster form a second group: In both clusters about 40% of the firms have identified participative learning systems as a very important source for the acquisition of new knowledge. Informal learning systems are for the wood cluster (37%) more important than for the firms of the metal-cluster. These findings reflect in particular the big importance of informal networks especially for the wood cluster firms. Because of their lacking linkages to the regional innovation infrastructure they exchange new knowledge through voluntary working groups and informal networks.

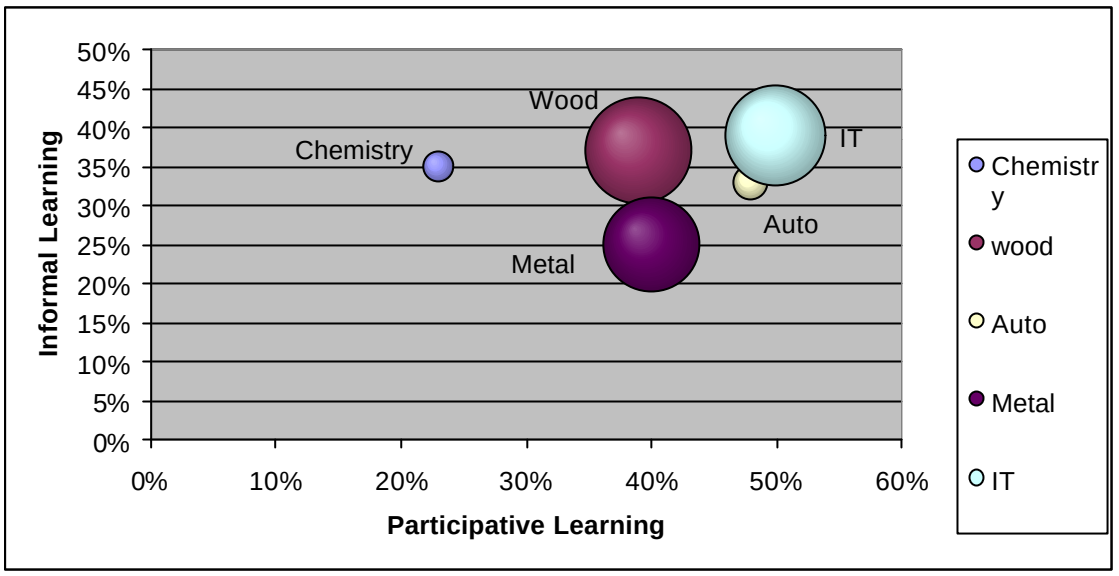

Figure 4: Learning systems in Styrian clusters

The firms of the chemistry cluster acquire new knowledge in the first place through informal learning systems (35%). Participative learning systems play in this cluster a minor role, only 23% of the firms have identified such systems as very important sources for the acquisition of now knowledge. This may be explained through the fact that most firms in this cluster offer mainly R&D-services for their customers – thus most forms of participative learning systems (joint project teams, tender preparation groups, benchmarking clubs etc.) are of minor importance for this cluster.

The ability to bring fourth double-loop-learning in Styrian clusters depends much on the corresponding working cultures that are present in the relevant industries. In the IT- and automobile cluster there is an already existing tradition of joint working and knowledge acquisition through formal and informal teams. In the chemistry cluster such a team oriented working style is except the employment of R&D-teams virtually unknown – collaborative learning in interfirm project teams or benchmarking clubs does not fit into the business style and culture of this cluster. On the other hand informal ways of knowledge acquisition (for example through "old boys networks") are strongly present in this cluster. In the wood and the machinery and metal cluster a team approach towards learning is currently developing both at an organised formal and spontaneous informal level. The size of the clusters in terms of member firms seems to have no influence on this learning ability: The IT and the chemistry cluster being both small in terms of member firms differ strongly in their learning orientation.

4.3.4 Informal knowledge exchange

Figure 6 shows the relations between informal learning systems (x-axis), and the regional embeddedness of the cluster in form of their input-linkages (y-axis). The size of the clusters is shown in terms of member firms (the size of the globes) in order to evaluate wether critical masses of forms are a precondition form the emergence of communities of practice. These three dimensions should provide together detailed evidence for the ability of the clusters to bring fourth double-loop-learning through informal networks among the employees in the clusters. The importance of learning in such informal networks lies in the ability of the clusters to develop new patterns of behaviour or strategies through the spontaneous interaction of their employees (Saxenian 1996). Thus the existence of such informal ways of exchanging an gaining new knowledge in the clusters may be again conceived as very important for their ability to innovate.

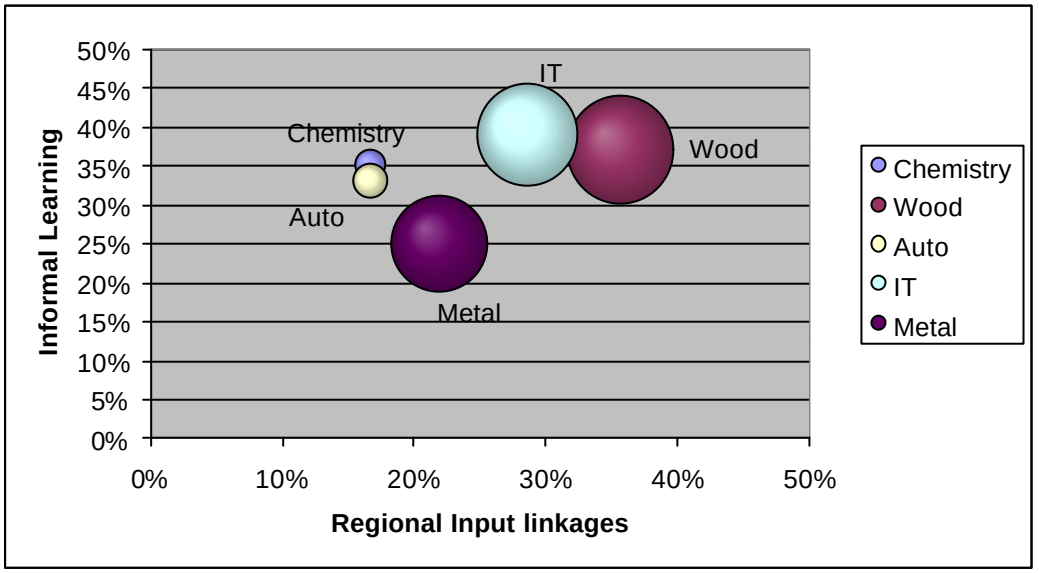

Figure 5: Informal learning systems and regional input linkages

The wood-cluster shows the strongest regional input linkages combined with a good presence of informal learning (37%). Only the IT-cluster – which has also strong regional input linkages – shows a slightly stronger presence of informal learning (39%). The metal-cluster has less strong regional input linkages and shows also a weaker presence of informal learning (25%). The chemistry cluster shows the weakest results concern both the embeddedness and the presence of communities of

practice (35%). The automobile-cluster - also not very much embedded - has a stronger presence of informal learning (33%).

Looking at the picture as a whole, there a sings for a – at least weak –positive correlation between the embeddedness of the examined clusters and the presence of informal learning through informal networks. Thus it may be concluded that the regional embeddedness of the cluster has also a possibly even strong influence on the ability of the clusters to learn through their informal networks. Embeddedness leads to informal relations between the firms that are fostered by the spatial proximity of the firms (Hendry et. al. 1995).

5 Clusters and learning - a summary of the results and conclusions

Applying the concept of learning systems empirically to Styrian Clusters, organisational learning could be spotted in all five examined clusters. In particular participative learning systems seems to play an important role in these clusters, but also informal learning may judged as an important source for knowledge creation and knowledge sharing. With regard to particular forms of learning systems interfirm R&D-teams are of importance for Styrian cluster enterprises. In the average the half of the firms in all clusters identified them as very important source for new knowledge.

Learning activities could be identified in clusters that are strongly regionally embedded like the wood cluster but also in clusters with very weak regional input linkages like the chemistry or automobile cluster. The importance of organisational learning as a whole in Styrian clusters seems also to be to a large degree independent of the presence of collaborational linkages to the regional knowledge infrastructure. In the wood cluster - having for example only weak collaborational ties to regional universities and R&D-institutions – both informal and participative learning systems are almost as important as in the metal/machinebuilding cluster. Yet there are differences as to the weight of these respective systems between all the clusters.

In the analysed Styrian clusters learning activities do not need a critical mass of firms or are at least beyond this critical mass. In small clusters such as the IT cluster or the chemistry cluster informal learning systems are as important as in large clusters such as the metal/machinebuilding cluster. In the examined firms the emergence of learning systems therefore seems not to depend on a large amount of potential partnering enterprises.

The Styrian clusters show each different learning styles and orientations, that can be shown by summarising the results of the above analysis while complementing it with qualitative information about the clusters:

- The wood cluster is strongly regional embedded and collaborates to a high degree with regional firms. Products are to a large degree delivered to the regional market and its competitive environment is thus also regionally oriented. The production of goods in this cluster is not very knowledge intensive so far. As a consequence firms in this cluster do rely on interfirm learning activities instead of collaborations with the regional knowledge infrastructure.
- The chemistry cluster reveals a very different learning style. The cluster is focused on very knowledge intensive products for a global market that faces an intense degree of competition. As a consequence the cluster has only weak regional input linkages but collaborates very intense with the regional knowledge infrastructure. In this cluster confidential information plays an very important role, therefore participative learning plays a minor role and is substituted by informal learning systems as a source for new knowledge.
- The IT cluster has a strong regional orientation in terms of input linkages and the market for its products. The products of this cluster are very knowledge intensive and require extensive development activities before delivery. The cluster is on the one hand collaborating with the regional knowledge infrastructure, on the other hand both informal and participative learning systems play an important role for knowledge creation and diffusion.
- The metal/machinebuilding cluster is regionally embedded in terms of input and collaborational linkages and is oriented to a global market. While focussing on large scale production there is nevertheless a growing degree of knowledge intensity in the products of this cluster. There are close collaborations with the regional knowledge infrastructure that reflect this development. In the metal/machinebuilding cluster participative learning systems play a more important role than informal learning activities, which might be a consequence of the strongly diversified production in this cluster.
- The automobile cluster has a strong international orientation and is focussed on global markets with high degree of competition. The cluster shows only weak regional input linkages but rather strong orientation to collaborations with regional firms and the regional knowledge infrastructure. Firms seem to collaborate in this cluster in the development of new products but not in the locally

distributed production of these goods. As a consequence participative learning is in this cluster of higher importance than informal learning activities. Knowledge is created and shared mostly in an organised way that reflects also the highly structured activities in supplier networks within the automobile industry.

5.1 Several conclusions

Several conclusions can be drawn from our analysis and some open questions for further research outlined:

a) Our analysis shows the need of a multi-dimensional approach to get hold of the specific character and network structure of clusters. Besides the supplier linkages we also used the learning behaviour to reveal these structures. Yet further dimensions could be included to get an even more differentiated picture: how does the labour market influence cooperation and learning, how strongly is knowledge passed on by means of labour mobility between firms, how could we measure the effect of these forms of learning.

b) Clusters are not monostructured entities. As institutions promoting change they react quite differently within their given environment. Our analysis reveals that there are certain patterns of communication according to the changing variables of these environments. Further research will be needed to analyse the sustainability of these structures and their change over time – is this behaviour following any specific patterns if these variables change.

c) The analysis was carried out in a specific region – the province of Styria with a given background of knowledge creating institutions. A stronger differentiation of these institutions, the distance up to which they create knowledge spill overs is a further task for research.

d) The basic policy consequence is the necessity of interactive learning for the sustainability of clusters – the more sophisticated these forms of learning the more successful is the cluster. Cluster policy in this sense can be regarded as a fitness programme for sustainability. Yet the policy measures to be used for this kind of support in developed regions need to be carefully evalued – there is no simple tool box to be applied.

e) The basic consequence for less developed regions, especially in the transforming economies of the CEECs, is the necessity for the support in institution building. As our analysis reveals clusters are subtle and differentiated institutions for cooperation and interactive learning. They themselves are in need of an institutional background: a well developed research infrastructure but also a

history of trust building and of informal supporting institutions. The transforming economies – in order to be able to sustain their process of catching up and of convergence – are in an even stronger need of a careful support for the creation of such institutions.

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Annex A:

Table 2: Collaboration and material linkages in Styrian Clusters

	Chemistry	***IT***	***Wood***	***Metal***	***Auto***
Regional input linkages	16,7%	28,7%	35,7%	22,0%	16,7%
Collaboration with firms	32,60%	19,60%	27,20%	22,80%	24,00%
Collaboration with regional knowledge infrastructure	26,3%	10,0%	3,7%	10,3%	13,9%

Table 3: Learning in Styrian Clusters

	Chemistry	***IT***	***Wood***	***Metal***	***Auto***
Participative Learning	23,00%	50,00%	39,00%	40,00%	48,00%
Informal Learning	35,00%	39,00%	37,00%	25,00%	33,00%

Annex B:

Interviewleitfaden: „Cluster und Innovation in der steirischen Wirtschaft“

Unternehmens- Stammblatt

Name des Unternehmens: _____
Adresse: _____
Telefonnummer: _____
Ansprechperson: _____
Position im Unt.: _____
Bezirk: _____
Branche: _____

Interviewer: _____
Interviewtermin: Tag:_____um:_____
Interviewdauer: von:_____bis:_____

Interesse an Studienergebnissen: ① Ja ② Nein

Allgemeine Informationen

Wann wurde ihr Unternehmen gegründet? _____

Ist ihr Unternehmen:

Ein Unternehmen mit mehreren Betriebsstätten	①Ja	② Nein
Ein rechtlich selbständiger Teil einer Unternehmensgruppe	①Ja	② Nein
Wenn JA,		
Muttergesellschaft	①Ja	② Nein
Tochter eines österreichischen Unternehmens	①Ja	② Nein
Tochter eines ausländischen Unternehmens	①Ja	② Nein

Welcher Branche gehört Ihr Betrieb an?

Bitte kreuzen Sie nur eine Branche an (betrieblicher Schwerpunkt nach ÖNACE)

O	10-14	Bergbau, Gewinn.v.Steinen u. Erden	O	36	Sonst. Erz.: Möbel, Schmuck, Sportgeräte ...
O	15,16	Nahrungsmittel, Getränke, Tabakverarb.	O	40,41	Energie- und Wasserversorgung
O	17,18	Textilien, Textilwaren, Bekleidung	O	45	Bauwesen
O	19	Leder, Schuhe	O	51	Großhandel
O	20	Holz (ohne Möbel)	O	55	Beherbergungs- und Gaststättenwesen
O	21	Papier, Pappe	O	60-63	Verkehr
O	22	Verlagswesen, Druckerei	O	64	Nachrichtenübermittlung
O	23	Kokerei, Mineralölverarbeitung	O	65-67	Geld-, Kredit- und Versicherungswesen
O	24	Chemie	O	70,71	Realitätenwesen, Vermietung bewegl. Sachen
O	25	Gummi, Kunststoff	O	72	EDV, Informatik, Telematik
O	26	Glas, Waren aus Steinen und Erden	O	74.2	Architektur- und Ingenieurbüros
O	27	Metallerzeugung und -bearbeitung	O	74	Sonstige unternehmensbez. Dienstleistungen
O	28	Metallwaren	O	75	Öffentl.Verwaltung, Gebietskörperschaften
O	29	Maschinenbau	O	73,80	Unterricht, Forschung & Entwicklung
O	30-33	Elektrotechnik/Elektronik, Feinmechanik	O	85	Gesundheits-, Veterinär- und Sozialwesen
O	34,35	Fahrzeugbau, Kfz-Teile, sonst. FZ-Bau	O	90-93	Sonstige öffentl. u. private Dienstleistungen

Wieviele Beschäftigte/Umsatz hatte Ihr Betrieb 1997 und 1998?

	Jahresende 1997	Jahresende 1998
Anzahl der Beschäftigten	_____ Beschäftigte	_____ Beschäftigte
Umsatzhöhe	_____ öS	_____ öS

Welche Fertigungsstrategie(n) verfolgt Ihr Unternehmen

	Überwiegend	***Teilweise***	***wenig***	***gar nicht***
Einzelanfertigungen nach Kundenwunsch	❍	❍	❍	❍
Kleinserien	❍	❍	❍	❍
Großserien	❍	❍	❍	❍

Kooperation und Cluster

Dieser Abschnitt widmet sich Fragen nach Kooperationen. Diese können helfen, Unternehmen innovativer und wettbewerbsfähiger zu machen, sie sind somit für eine aktive Wirtschaftspolitik von hohem Interesse. Ein besonderer Fokus wird dabei auch auf Ihre Erfahrungen mit Kooperationen gerichtet.
Kooperation ist die auf Dauer angelegte aktive Zusammenarbeit zwischen zwei (oder mehreren) Partnern, wobei gemeinsame Ziele und klare Regeln zwischen allen Beteiligten gegeben sein müssen. Regelmäßige Geschäftsbeziehungen sind hingegen allein noch keine Kooperationen – hier fehlen klare gemeinsame Ziele und oftmals auch „Spielregeln". Auch informelle Kontakte alleine reichen nicht aus, unter Kooperation wird eine also aktive Zusammenarbeit verstanden, welche dem Partner auch Dispositionsfreiheiten einräumt.
Konkrete Beispiele für Kooperationen sind etwa Einkaufsgemeinschaften, gemeinsame Marketing- oder F&E-Aktivitäten, Qualifizierungverbünde, gemeinsame Dachmarken etc.

Wie häufig haben Sie in den letzten 5 Jahren mit den folgenden Unternehmen / Institutionen aktiv zusammengearbeitet?

	laufend	häufig	manchmal	nie
Mit andere Unternehmen Ihrer Unternehmensgruppe	❍	❍	❍	❍
Mit Kunden in Ihrem Bezirk	❍	❍	❍	❍
Mit Kunden in der restlichen Steiermark	❍	❍	❍	❍
Mit Kunden außerhalb der Steiermark	❍	❍	❍	❍
Mit Zulieferunternehmen in Ihrem Bezirk	❍	❍	❍	❍
Mit Zulieferunternehmen in der restlichen Steiermark	❍	❍	❍	❍
Mit Zulieferunternehmen außerhalb der Steiermark	❍	❍	❍	❍
Mit Konkurrenzunternehmen in Ihrem Bezirk	❍	❍	❍	❍
Mit Konkurrenzunternehmen in der restlichen Steiermark	❍	❍	❍	❍
Mit Konkurrenzunternehmen außerhalb der Steiermark	❍	❍	❍	❍
Mit Unternehmen anderer Branchen	❍	❍	❍	❍
Mit Universitäten und Fachhochschulen	❍	❍	❍	❍
Mit außeruniversitären F&E-Einrichtungen	❍	❍	❍	❍
Mit Unternehmensberatern in Ihrem Bezirk	❍	❍	❍	❍
Mit Unternehmensberatern in der restlichen Steiermark	❍	❍	❍	❍
Mit Unternehmensberatern außerhalb der Steiermark	❍	❍	❍	❍
Mit Bildungsinstitutionen	❍	❍	❍	❍

Was war der Inhalt der aktiven Zusammenarbeit mit diesen Unternehmen / Institutionen? (Mehrfachnennungen möglich)

	Mutter/ Tochter Unt.	Kunden	Lieferanten	Konkur- renten	Unt. Anderer Branche	F&E- Einricht- ungen	Unt.- berater	Bildungs- inst.
Informationsaustausch	❍	❍	❍	❍	❍	❍	❍	❍
Erfahrungsaustausch	❍	❍	❍	❍	❍	❍	❍	❍
(Entgeltliche) Beratung, Vermittlung	❍	❍	❍	❍	❍	❍	❍	❍
Gemeinsame Schulung / Training	❍	❍	❍	❍	❍	❍	❍	❍
Gemeinsames Nutzen von Maschinen/Anlagen	❍	❍	❍	❍	❍	❍	❍	❍
Beteiligung an Konsortien im Rahmen von Ausschreibungen	❍	❍	❍	❍	❍	❍	❍	❍
Gemeinsame Projektbearbeitung	❍	❍	❍	❍	❍	❍	❍	❍
Gemeinsamer Einkauf	❍	❍	❍	❍	❍	❍	❍	❍
Gemeinsames Marketing / Acquisition	❍	❍	❍	❍	❍	❍	❍	❍
Erteilung eines gemeinsamen Auftrages an Dritte	❍	❍	❍	❍	❍	❍	❍	❍
Langfristige strategische Zusammenarbeit	❍	❍	❍	❍	❍	❍	❍	❍

Sonstige: ❍ ❍ ❍ ❍ ❍ ❍ ❍ ❍

Wie hat sich diese Zusammenarbeit in den letzten fünf Jahren entwickelt?

	intensiviert	gleichgeblieben	abgenommen
Informationsaustausch	❍	❍	❍
Erfahrungsaustausch	❍	❍	❍
(Entgeltliche) Beratung, Vermittlung	❍	❍	❍
Gemeinsame Schulung / Training	❍	❍	❍
Gemeinsames Nutzen von Maschinen/Anlagen	❍	❍	❍
Beteiligung an Konsortien im Rahmen von Ausschreibungen	❍	❍	❍
Gemeinsame Projektbearbeitung	❍	❍	❍
Gemeinsamer Einkauf	❍	❍	❍
Gemeinsames Marketing / Acquisition	❍	❍	❍
Erteilung eines gemeinsamen Auftrages an Dritte	❍	❍	❍
Langfristige strategische Zusammenarbeit	❍	❍	❍
Sonstige:	❍	❍	❍

Können Sie uns Ihre sieben wichtigsten Kooperationspartner im Bereich Forschung und Entwicklung nennen?

① _____
② _____
③ _____
④ _____
⑤ _____
⑥ _____
⑦ _____

Können Sie uns Ihre sieben wichtigsten Kooperationspartner im Bereich betriebliche Zusammenarbeit nennen?

① _____
② _____
③ _____
④ _____
⑤ _____
⑥ _____
⑦ _____

Auf welchem Weg sind Ihre Kooperationen entstanden?

Aus Kundenbeziehungen ❍
Aus Lieferantenbeziehungen ❍
Durch F&E-Projekte ❍
Durch aktive Suche ❍
Durch Anregung von außen (z.B. Clustermanagement) ❍

Würden Sie sagen, daß Ihr Unternehmen einem Cluster angehört?

Ja ❍ Nein ❍
Wenn ja, welchem: _____

Wenn nein, warum: _____

Export und Lieferverflechtungen

Welche Produkt- bzw. Dienstleistungsgruppen umfaßt ihr Angebot?	Anteil am Gesamtumsatz in % (ca.):	davon mit steirischen Kunden in % ca.):	davon mit restl. österr. Kunden in % ca.):	davon mit ausländischen Kunden in % ca.):
	100%			

Wie hoch waren die Aufwendungen Ihres Betriebes für Materialien zur Be- und Verarbeitung im vergangenen Jahr?

Beispiele: Roh- und Grundstoffe, Hilfsstoffe, zugekaufte Halbfabrikate, zum Einbau bestimmte Fertigerzeugnisse

Aufwendungen 1998 in öS (ohne USt.): _____

Bitte geben Sie den Materialaufwand und die Herkunft der sieben wichtigsten diesbezüglichen Güter an. Wird das Gut vom Großhandel bezogen, richtet sich die Herkunft nach dem Sitz des Großhandelsbetriebes; sonst ist die Herkunft des Erzeugerbetriebes anzugeben.

Materialien zur Be- und Verarbeitung (siehe auch Güterliste)	Höhe der Aufwendungen in öS (ca.)	Gütermenge in Tonnen (ca.)	von steirischen Unternehmen geliefert (Anteil in %):	von Unternehmen aus dem restl. Österreich geliefert (Anteil in %):	von ausländischen Unternehmen geliefert (Anteil in %):

Wie hoch waren die Aufwendungen Ihres Betriebes für unternehmensfremde Leistungen im vergangenen Jahr?

Beispiele: vergebene Unteraufträge, Reparaturen, Instandhaltungen und Lohnarbeiten, z.B. Leihpersonal, Werkverträge oder Provisionen für selbständige Vertreter.

Aufwendungen 1998 in öS (ohne USt.): _____

Bitte geben Sie den Anteil der wichtigsten zugekauften Dienstleistungen und die Herkunft der Betriebe an, die diese Leistungen vollbringen:

Unternehmensfremde Leistungen	Anteil an den Aufwendungen in % (ca.)	von steirischen Unternehmen geliefert:	von Unternehmen aus dem restl. Österreich geliefert:	von ausländischen Unternehmen geliefert:
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	100%			

Wie hoch waren die Investitionsaufwendungen Ihres Betriebes im letzten Geschäftsjahr?

Unter Investitionen werden die steuerlich aktivierbaren Anschaffungen (Zugänge) zum Anlagevermögen verstanden. Dazu gehören neben den Bau- und Sachanlagen (Maschinen, Werkzeuge, etc.) auch dafür geleistete Anzahlungen, Umbauten sowie Verbesserungen, welche die Produktivität der bestehenden Anlagen erhöhen.

Investitionsausgaben 1998 (ohne USt.): _____

Bitte geben Sie den Anteil der im folgenden angeführten Investitionsarten an Ihren Gesamtinvestitionen an; nennen Sie anschließend die Herkunft der jeweils erhaltenen Leistung.

Investitionsarten	Anteil an den Gesamtinvestitionen in % (ca.)	von steirischen Unternehmen geliefert in % (ca.):	von Unternehmen aus dem restl. Österreich geliefert in % (ca.):	von ausländischen Unternehmen geliefert in % (ca.):
Errichtung von Gebäude	_____	_____	_____	_____
Transportmittel	_____	_____	_____	_____
Maschinen und Anlagen	_____	_____	_____	_____
Gebrauchte Sachanlagen	_____	_____	_____	_____
Geringwertige Wirtschaftsgüter[4]	_____	_____	_____	_____
Software	_____	_____	_____	_____
Konzessionen und Lizenzen	_____	_____	_____	_____
	100%			

[4] Geringwertige Wirtschaftsgüter sind Güter des Anlagevermögens, deren Anschaffungs- oder Herstellungskosten S 5000,- nicht übersteigen und im selben Jahr zu 100% steuerlich abgesetzt werden können.

Wissensintensität der Kooperationsbeziehungen

Auf welchem Weg erwerben die Mitarbeiter ihres Unternehmen Wissen und Informationen außerhalb des Unternehmens?

	Unbekannt	Sehr wichtig	2	3	4	Unwichtig
Private Gespräche im Rahmen von Informations- und Fachveranstaltungen	❍	①	②	③	④	⑤
Stammtische mit Kollegen anderer Unternehmen	❍	①	②	③	④	⑤
Kontakte zu alten Schul- und Studienkollegen	❍	①	②	③	④	⑤
Kontakte im Rahmen von Sportvereinen, Clubs etc.	❍	①	②	③	④	⑤
Erfahrungsaustausch- (ERFA)Gruppen	❍	①	②	③	④	⑤
Überbetriebliche Teams bzw. Arbeitsgruppen im Bereich Forschung und Entwicklung	❍	①	②	③	④	⑤
Überbetriebliche Projektteams	❍	①	②	③	④	⑤
Beteiligung an Konsortien im Rahmen von Ausschreibungen	❍	①	②	③	④	⑤
Zwischenbetriebliche Vergleichsanalysen / Benchmarking	❍	①	②	③	④	⑤
	❍	①	②	③	④	⑤

Andere: _____

Auf welchem Weg erwerben die Mitarbeiter ihres Unternehmen Wissen und Informationen innerhalb des Unternehmens?

	Unbekannt	Sehr wichtig	2	3	4	Un-wichtig
Interne Weiterbildung (Seminare)	❍	①	②	③	④	⑤
Fachliteratur, Zeitschriften, CD-Rom, Internet	❍	①	②	③	④	⑤
Lerngruppen am Arbeitsplatz (Projektarbeit, Qualitätszirkel, KVP)	❍	①	②	③	④	⑤
Tee- oder Kaffee-Ecken; informelle Arbeitskreise	❍	①	②	③	④	⑤
Interdisziplinäre Task-Forces (z.B. zum Einführen eines neuen EDV-Systems)						
Job-rotation Programme	❍	①	②	③	④	⑤
Mitarbeiterschulung durch Vorgesetzte/Kollegen	❍	①	②	③	④	⑤
Coaching	❍	①	②	③	④	⑤
Learning by doing	❍	①	②	③	④	⑤
Tele-Learning, Multimediales Lernen, Computer Based Training	❍	①	②	③	④	⑤
Selbstlernunterlagen, Fernstudien	❍	①	②	③	④	⑤
Internes Berichtswesen über externe Informationen (Kundenkontakte, Lieferanten, Reklamationen, etc.)	❍	①	②	③	④	⑤
Intranets, Groupware, Informationssysteme	❍	①	②	③	④	⑤
	❍	①	②	③	④	⑤

Andere: _____

Was sind ihrer Meinung nach die wichtigsten Faktoren welche organisationales bzw. überbetriebliches Lernen hemmen bzw. fördern? (Mehrfachnennungen möglich)

Hemmende Faktoren		Fördernde Faktoren
❍	Hierarchische Strukturen	❍
❍	Geringe Betriebsgröße	❍
❍	Kosten	❍
❍	Zeitdruck	❍
❍	Führungskultur	❍
❍	Großes Angebot an steirischen F&E-Einrichtungen	❍
❍	Motivation der Mitarbeiter	❍
❍	Neue Technologien	❍
❍	Einstellung der Mitarbeiter zu Neuerungen	❍
❍	Einstellung der Führungskräfte zu Neuerungen	❍
❍	Einstellung des Unternehmers zu Neuerungen	❍
❍	Andere:_____	❍
❍	Andere:_____	❍
❍	Andere:_____	❍
❍	Andere:_____	❍