Interfirm co-operation and learning within SME Networks - two cases from the Styrian Automotive Cluster

Regional Science Association 38th European Congress, Vienna, Aug. 28th - Sept. 1st, 1998

Michael STEINER, Christian HARTMANN, Dept. of Economics, University of Graz and Institute of Technology and Regional Policy, JOANNEUM RESEARCH, Graz, Austria.
E-Mail: christian.hartmann@Joanneum.ac.at

Recent publications in the cluster-related literature have shown that interfirm links imply the potential to foster specific forms of higher co-operation and especially of learning (double loop learning) within clusters. Especially networks deserve in this context a particular focus of attention. The purpose of this paper is to show essential conditions that should be present at cluster level in order to enable double loop learning between the firms. This will be done in order to give a first advice for public and semi-public cluster institutions for the facilitating of interfirm collaborations and cluster related activities.

Two case-studies of SME-networks selected from Styrian clusters will give the opportunity to get deeper insights into the conditions that enable clusters to bring forth double loop learning activities. In a first step particular criteria for the presence of double-loop learning will be established. In a second step the conditions for this specific type of learning will be dealt with. Among the categories of conditions that will be examined in detail are the relations and interactions in the network, the types of joint projects carried out between the firms and the specific organisational culture that prevails at the individual firm level.

Key words: Learning, SME-networks, Conditions and criteria.

1 Introduction

Clusters as units of analysis presume a high density of interaction, co-operation, creation and diffusion of knowledge. In this paper the cluster concept will be interpreted from the perspective of „learning organisations“ to give a description of joint knowledge creation and technology-spill-overs that may take place within clusters. A special focus is put on the different forms and organisational aspects of joint learning. The recent literature (see e.g. Coombs et al. 1996, Dodgson 1996, Senge et al. 1995, Senker/Sharp 1997) suggests that this new approach may offer new findings about clusters and SME networks that go beyond the well known ideas of learning by doing and knowledge spill-overs.

2 Clusters as learning organisations

As a starting point for a definition of cluster it is still useful to refer to Marshal (1920) and his threefold dimensions of cluster-forming effects: Clusters, accordingly, are sets of complementary firms (in production *and* service sectors), public, private and semi-public research and development institutions, which are interconnected by labour market and/or input-output and/or technological links. They are highly competitive because of these links, since they generate a situation which combines the advantages of both the market mechanism and the direct control-structures of a single organisation: 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 the existence of these threefold effects 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 co-ordinated attempt of the members of the cluster to improve their relations and links. Clusters, hence, can be regarded as learning organisations, and concepts of learning can be applied to cluster analysis.

In the following we will point to some elements of learning models to be used for such an analysis.

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

While learning by doing and agglomeration economies focus mainly on the issue of productivity gains, organisational learning rather deals with the question of the firm’s innovation activities. Learning in this context is regarded as an effort that is pursued actively and strategically. Learning by doing may be considered as something that is carried out passively parallel to the acquisition of new technologies while organisational learning follows clear decisive objectives and may even lead through innovations to the development of new technologies.

„Learning organisations are organisations where people continually expand their capacity to create the results they truly desire, where new and expensive patterns of thinking are nurtured, where collective aspirations are set free, and where people are continuously improving their personal capabilities“ (Senge 1990, p.15). Of particular importance seems to be the interplay

of the individual, the team and the organisation as a whole. 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 How do Organisations learn?

Learning is a conscious attempt on the part of the organisation to retain and improve competitiveness, productivity, and innovativeness in uncertain technological and market circumstances. The greater the uncertainties, the greater the need for learning. Organisations learn in order to improve their adaptability and efficiency during times of change (Dodgson, 1993).

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

Single-loop learning (SLL): SLL occurs when errors are detected and corrected and organisations carry on with their present policies and goals. According to Dodgson (1993), SLL 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. SLL has been referred to as lower level learning by Fiol and Lyles (1985) and adaptive learning or coping by Senge (1990).

Double-loop learning (DLL): DLL 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. DLL involves changing the organisation's knowledge-base or firm-specific competencies or routines (Dodgson, 1993). DLL is also called higher level learning by Fiol and Lyles (1985) and generative learning (or learning to expand an organisations capabilities) by Senge (1990).

Deutero-learning (DL): DL occurs when organisations learn how to carry out single-loop and double-loop learning. The first two forms of learning will not occur if the organisation is not aware of the fact that learning should take place. The awareness of ignorance motivates learning (Nevis et al., 1995).

2.4 How to recognise DLL in and between organisations?

DLL at an organisational level may be observed through continuous monitoring (Argyris/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 this to be somehow impractical - it would be difficult to persuade representatives of clusters firms to participate in 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 DLL. These indicators may be categorised into *structural indicators* like prevailing learning systems and *processual indicators* such as assumption sharing within teams or the enlargement of the shared knowledge base.

Learning systems: According to Staehle (1991, p. 843) organisational learning may be recognised by the existence of learning systems that are independent of the individual. 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)
- *The organisational information culture* (informal info-channels as vehicles of learning)
- *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)

Assumption sharing (Argyris/Schon, 1978): The members of a participative learning system act on the basis of their "theories in use"[1]. Organisational learning in general takes place when the outcomes of actions of the team are compared with the planned results. DLL is present if a deviation of the outcomes form the expected results leads to a change in the "theories in use" of the team or the whole organisation.

Development of a knowledge base (Duncan; Weiss, 1979): While individual learning generates merely private knowledge, organisational learning produces knowledge that is shared by the whole organisation - for example the actual prevailing "theories in use". Thus new organisational knowledge needs to be:

- communicated (among the members of the organisation),
- shared in consensus (by the members of the organisation),
- integrated (into the existing structures and processes of the organisation).

Learning systems may support the development and continuous enlargement of organisational or interorganisational knowledge bases.

2.5 Which conditions may support DLL?

There is a growing interest for the particular conditions that may be able to foster joint learning activities between firms (Rößl, 1993; Dodgson, 1996). Of particular interest in the context of this paper are of course supporting conditions for DLL - for those activities show the responsibility of networks of firms in face of new technological- or market-trends. The following conditions are likely to support DLL in and between organisations:

Mutual trust: Trust between firms, according to Sako (1991) is "... a state of mind, an expectation held by one trading partner about another, that the other will behave in a predictable and mutually acceptable manner" (p. 377). In her point of view there are different reasons for predictability in behaviour, and this allows three types of trust to be distinguished. *"Contractual trust"* exists such that each partner adheres to agreements, and keeps promises. *"Competence trust"* concerns the expectations of a trading partner performing his role competently. *"Goodwill trust"* refers to mutual expectations of open commitment to each other: "... someone who is worthy of "goodwill trust" is dependable and can be credited with high discretion, as he can be expected to take initiative while refraining from unfair advantage

[1] "Theories in use" may be describes as the set of assumptions about the relation bewteen actions and outcomes that is shared by the members of an organization.

taking ... trading partners are committed to take initiatives (or exercise discretion) to exploit new opportunities over and above what was explicitly promised" (Sako, 1991, p. 379).

Trust may support joint learning activities for the following reason. The knowledge that is transferred is often tacit, uncodified, firm-specific and commercially sensitive. It is therefore not readily transferable, requiring dense, reliable and continuing communication paths (Dodgson, 1996, p. 68). Knowledge is furthermore in many cases proprietarial. The knowledge and information that is being exchanged cannot be easily replicated or purchased by competitors. It can thus provide important elements of a firm's defining competence and competitiveness. Partners are expected to share trust in each other's ability to provide helpful responses to uncertainty (Dodgson, 1996).

Technology: There are some hints that technology may support DLL in and between organisations. In particular Information technology is regarded as a vehicle for organisational learning processes (Dodgson, 1996; Wilmes, 1997). Especially the management of organisational and interorganisational knowledge bases through intra- and extranets offers in this respect particular opportunities as is shown for example the "virtual teams" at British Petroleum (Davenport; Prusack, 1997, p. 22). But also technological changes in production may lead to DLL activities. The introduction of Computer Integrated Manufacturing (CIM) implied also a new rise of team based work organisation at firm level. Continuous improvement projects have to be established in order to master the challenges of change (Servatius, 1994). The establishment of new systems of production such as "just-in-time" or "just-in-sequence" force the firms either to develop learning activities to cope with the new requirements.

Management systems and style: Particular management systems and/or styles may foster DLL activities as well. Planning as learning (De Geus, 1988) is an example for a management system that enables in particular the top management to bring forth DLL. Through the application of the scenario-method in strategic planning workshops prevailing norms, routines and assumptions are not only questioned but often also fundamentally altered (De Geus, 1988, p. 72). Management systems that support DLL activities at all levels of an organisation may be found in the concepts of the quality improvement approach (Oess, 1991). In particular the Total Quality Management offers a wide range of learning systems and tools with the potential to produce DLL efforts (Lessem, 1991). Senge (1990) stresses in particular the role of the leader of an organisation in the context of DLL activities. To his point of view the

implementation of organisational learning activities is the particular task of the top-management of a corporation.

Corporate culture: The prevailing culture of an organisation is very likely to play an important role in organisational learning activities (Saxenian, 1996; Senge, 1990). According to Deal/Kennedy (1982) conventional management is responsible for what things are done in an organisation while the specific culture determines how these things are carried out. Organisational culture may be also perceived as "social glue" that makes the partners "stick together" and thus holds the organisation together (Smircich, 1983). According to Sathe (1985, p. 17) there are four manifestations of organisational culture that can be observed:

- Shared things (Corporate design, corporate outfit, Buildings etc.)
- Shared sayings (Corporate stories, legends, gossip, jokes, sayings etc.)
- Shared doings (Routines, customs, rituals, celebrations, ceremonies etc.)
- Shared feelings (Security, equal treatment, clearness, objectivity, pride etc.)

Complementary co-operating partners: Complementary partners within a network of firms can enable firms to reconsider their existing ways of doing things: be it in the R&D Organisation (Clark et. al., 1985) or in the implementation of a new technology (Chew et. al., 1985). Inter-firm links provide an opportunity to observe novelty through the approaches of the partner, and can stimulate reconsideration of current practices (Dodgson, 1996). They can be an antidote to the "not-invented here-syndrome", and learning vicariously can help prevent the repetition of mistakes. Interfirm links can provide opportunities for higher-level learning (Dodgson 1991b).

3 The AC Styria (Automobile Cluster) - a brief description

3.1 The background

The AC Styria is located in Styria with Graz as a special focus. The activities are concentrated around the sector of automotive industry. The key competence of this economic field lies in production, but also in research and development (R&D) of motor vehicles (Holzschlag, 1997). The cluster comprises up to now about 100 companies and employs more than 10.000 people.

The competence structure of domestic, local companies - some of which have a long tradition in this field has been given essential impetus through specialisation. This structure has formed

a sound basis for attracting globally renowned groups in this line like Chrysler or Magna (Holzschlag, 1997).

The following strengths and weaknesses are characteristic for the AC Styria (according to IV et al., 1995):

Strengths	Weaknesses
+ internationally promising cluster, high Styrian share of cluster Austria (15 %)	- SME's are not globally oriented (too many individual competitors), no suppliers of systems or modules
+ old automotive tradition that can serve as a basis for further developments	- almost no medium-sized companies
+ sound basis of trained personnel	- high costs for tools and wages, relatively low value added
+ pools of know-how (research companies, universities, especially in the field of engineering) as well as strong partners in industry	- small market, just a few clients in the area
+ geographical proximity to low-wage countries: sub-components can be bought from these countries, high-tech remains in Styria (new settlement of firms possible)	- lacking infrastructure and knowledge of foreign languages
+ enough suppliers in the area	- information shortage, SME's don't know enough from each other, too few contacts between research institutions and economy, insufficient telecom-munication networks

The structural changes in the globally active automobile industry brought about by the dynamic development of sellers' markets and by increasing competition and cost pressure has created entirely new requirements for the sourcing markets. Development, manufacture, storage and logistic processes must be cost-optimised with regard to every level of providing services = lean enterprise, and to high quality = total quality management (Holzschlag, 1997). The following trends shape the particular competitive environment of the cluster (ranked according to IV et al., 1995):

- Increasing competition causes internal pressure on costs, productivity, quality and speed of production process.
- Keiretsu[2]: Co-operation of manufacturers in the field of buying components, therefore further concentration among suppliers of systems
- reduction of vertical integration, out-sourcing

[2] The value-chain is controlled by one systems supplier that imposes strong cost pressure on his subordinated suplielrs of single components. The Keiretsu-Concept is related to the idea of "filieres!.

- formation of groups of automotive suppliers and combines production and services
- ecological orientation to diminish emissions, weight of products (synthetic material instead of steel) and to improve recycling quotas

3.2 Participants and actors

The leader of the current project is the Styrian Industrial Promotion Agency (SFG) while the networking activities within the cluster are performed by Agiplan, a European consulting firm. The leading companies within the cluster are AVL, Steyr Fahrzeugtechnik and Eurostar:

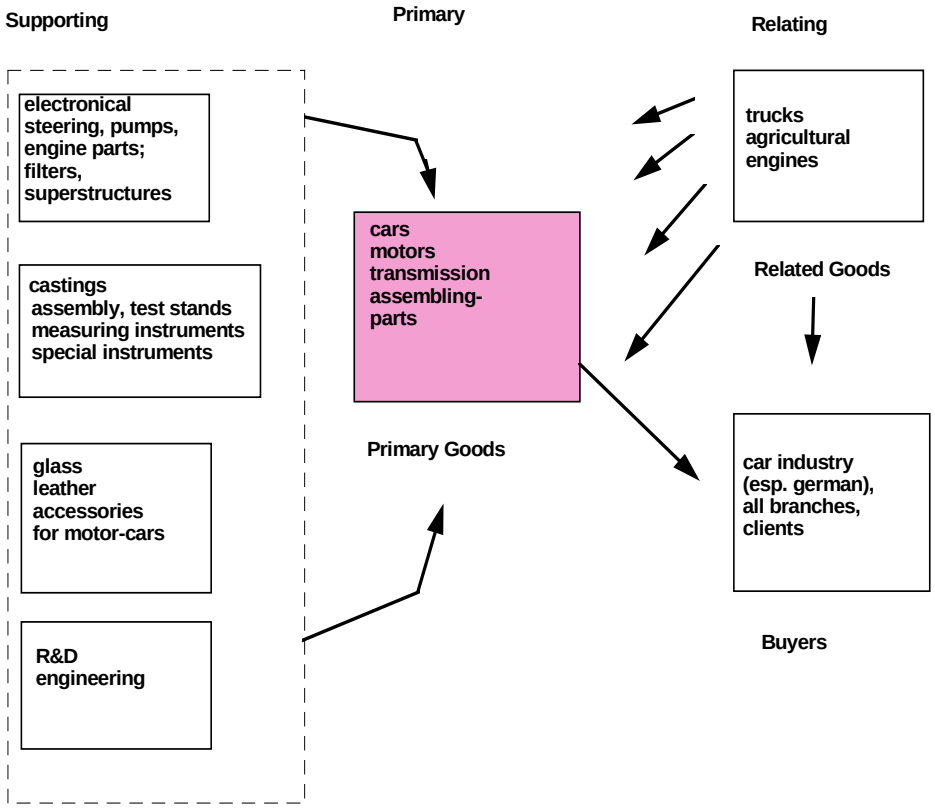
- AVL is specialised in fundamental research and development in the field of combustion engines. It is also a specialist in control engineering and acoustics.

- Steyr Fahrzeugtechnik is Austria's oldest motor vehicle factory. It is currently focused on Development and production of private cars, light utility vehicles, cross-country and four-wheel drive vehicles. Another focus of activities is currently the development and production of car components and systems for European car factories.

- Eurostar is a joint venture of Chrysler and Steyr Fahrzeugtechnik established in order to produce the Chrysler Voyager (while the Grand Cherokee Jeep is produced in the neighbouring works of Steyr Fahrzeugtechnik). The Graz site produces the supply for the markets of Europe, Japan, Australia, New Zealand and Africa.

Beside these leading firms there exist also some 100 SME's from various sectors. They form the basis of the Automobile Cluster in Styria; in the value-added process most of these could be classed as suppliers of subassemblies, parts and basic materials (Holzschlag, 1997). But know how in relation to the automotive industry is not limited to the large companies and the various research and scientific institutions (like the Technical University and the second largest Austrian research institute, Joanneum Research). Small engineering companies have also successfully provided innovative solutions to the car makers (Holzschlag, 1997).

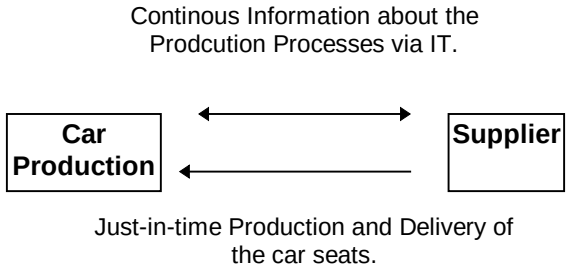
Cluster chart:



4 Case study 1: Learning in a just-in-time-network

4.1 Brief description of the network

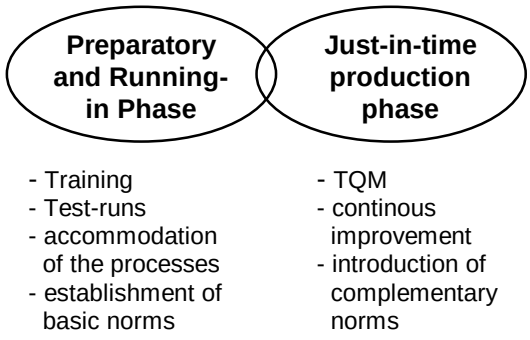
The network in focus of this case study consists of three partners, that are co-operating in a just-in-time network. The network has therefore a hierarchical structure - its members are one automobile manufacturing firm (they are producing Minivans and cross country vehicles) and two suppliers of car seats. In the current production program, the partners co-operate as it follows:



The Network partners are connected through an intranet that is mainly used to exchange continuously information about the production processes. The suppliers start to work (assembling and stuffing the seats) when they receive a particular signal through the intranet. This usually happens about 60 minutes before the seats are actually needed in the production line of the car manufacturer. Essential for the success of this co-operation is therefor the perfect synchronisation of all the different steps of the production in the three firms. Several redundancies exist in each production line in order to make the whole process to a large extent failure tolerant. This particular network prevails just as long as a particular production program exists (about seven years). For the next program new arrangements have to be settled and new learning activities need to be carried out.

4.2 Double-loop-learning activities

Double loop learning activities occur in this network at two different stages of the production program:



- In the *preparatory and running-in phase* all necessary production processes have to be designed and tested. Meanwhile the working staff needs to be trained among the new routines. A major focus is put on the necessary accommodations of these processes in order to optimise all steps of the production. Thus existing norms and routines have to be

changed several times - DLL activities are present. As a result of these activities basic norms for the joint production are established in form of manuals by the partners.

- In the *just-in-time production phase* a strong focus is put on the quality of the products and processes in the plants of all three partners. These activities are not only devoted to a static but also to a dynamic view of quality - all three firms have introduced total quality management (TQM). Within these TQM activities existing routines and norms may be changed - the characteristics of DLL. In close relation to the TQM all firms also practice continuous improvement - all members of the production meet once a week in order to develop incremental changes in the micro-environment of the workers. Nevertheless daily routines may be subject of change.

4.3 Supporting conditions for Double-loop Learning

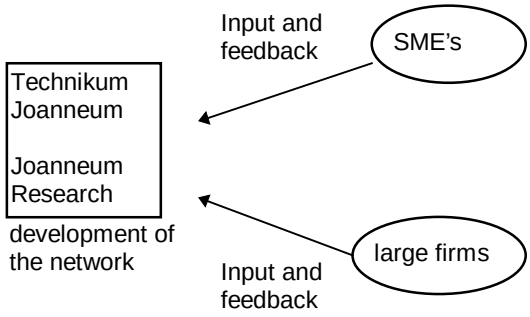
- **Mutual trust:** Between the partners prevails "contractual trust" (Sako 1991). Each supplier is classified as an "A-supplier" - this means that the car producer garantees for the whole duration of one program to buy the components exclusively by the particular supplier. For this reason each of the suppliers is delivering components solely for one car program. Only on this basis of distinct rules of co-operation the management of the supplier firms was willing to join such a close and symbiotic network.
- **Technology:** The post-fordistic organisation of the production in this particular network makes learning activities strongly necessary (Womack; Jones, 1991). Another important role plays information technology in this context - without the existence of a common intranet such a spatially distributed close co-operation would be scarcely possible. In order to co-ordinate the processes in step-synchronisation existing norms and routines have to be questioned and changed.
- **Management systems and style:** The firms prefer lean team-based structures of work-organisation instead of hierarchical tayloristic models. Job rotation and repeated training's on the job help the working staff to be able to "think outside the box" - that means to see existing processes and routines as interdependent parts of the whole value chain. This insights are an essential precondition for the ability to change norms and routines - to develop DDL activities.
- **Organisational culture:** All three firms believe in the potential of their workforce. The employees are regarded and treated as partners of the company. Suggestions for improvements are welcome and the institution of the continuous improvement meetings

helps to infuse the whole organisation with this value. Another important fact in this context is the north American origin of all three partners. This peculiarity may be also responsible for the open mindedness of these firms - they have every day to tackle with intercultural management issues.

5 Case study 2: Learning in a regional knowledge network

5.1 Description of the network

The network in focus consists in its initial phase of five partners: Three large firms (production of automobiles, engineering, car electronics), two SME's (motor parts, lathe work), and two institutions of the regional technology Infrastructure (Technikum Joanneum, Joanneum Research).



The major task of this co-operation is the development a training and knowledge network within the cluster. In the future it is planned to enlarge the group of co-operating partners in order to maintain a broad technological knowledge among the regional enterprises. An important characteristic of this network is the sound interplay between public authorities (funding of the project), institutions of the R&D-infrastructure and member-firms of the cluster.

5.2 Double-loop-learning activities

The partners of the initial phase of the project meet regularly in a steering committee. Several workshops are held in order to assign tasks and to give mutual feedback for the output of the current work. It is this environment in which DLL activities take place. Within these meetings "theories in use" are frequently questioned and also reshaped. Ideas and concepts about learning and qualification within the cluster are subject to intense discussions between the partners. But also assumptions about roles and competencies of the network-members have

been changing frequently as the project development went forth. Thus the development team of the knowledge network may be conceived as a learning organisation in itself.

5.3 Supporting conditions for Double-loop Learning

- **Mutual trust:** "Competence trust" (Sako, 1991) is prevailing at the moment in this network. each partner is expected to bring his expertise, tacit knowledge and experience into the joint project. For Technikum Joanneum it is the competence concerning electronic networks and tele-learning, for Joanneum Research the know how concerning the cluster and the cluster firms and for the partner enterprises the particular experience concerning training's and qualifications in the automotive sector. For the future it is likely that also "contractual trust" will be established for it is planned to sign specific co-operation contracts with each partner.
- **Technology:** Information technology plays in this co-operation a central role. Different training's will be offered through an intranet to the partners. The deployment of applications that require a broad bandwidth leads to several challenges that need to mastered by the partners of the network. In particular a distributed system of HTML[3] databases - the learning network infrastructure - has to be developed and also implemented in the local area networks of the partners. The contents of the databases (English for engineers, quality management) have to be integrated into the specific learning systems of the individual firms. These complex activities require often more than modest alterations of the shared "theories in use".
- **Organisational culture:** New teams and networks need a specific time in order to develop a common culture. From the initial meeting of the steering committee on in last October there has been a development of a growing "common doings". Such "doings" have arisen in the way issues are discussed in the joint meetings and in the way "theories in use" are reflected by each member (e.g. feedback on different products of the joint work such as questionnaires and reports). But also "common feelings" seem to get more and more importance as the project is progressing - in particular the feeling of creating something that might be of use for all members of the cluster is shared by all partners and also often articulated.
- **Complementary co-operating partners:** The network in focus is a fusion of three different kinds of partners. It merges the inputs from a regional R&D-institution, a regional

[3] Hypertext Markup language - major programming language for internet- and intranet applications.

polytechnique, producers of automobiles and SME's as suppliers. Each partner is able to offer alternative points of view to crucial research issues dealt with in the project team. These exchanges of varying perspectives are a basic condition for the development of new theories in use - thus they could lead to double loop learning (Dodgson, 1991b).

6 Acknowledgements

These case studies have been partly carried out within the ADAPT-project „Cluster-Netz". For help at different stages of the project we would like to thank in particular Angela Kremshofer.

7 Literature

Argyris, C.; Schon, D. (1978), Organizational Learning, London.

Bergman, E. et. al. (1991), Regions reconsidered: Economic Networks, Innovation and Local Developement in Industrialized Countries, London.

Biley, S. (1985), The Role of Networks in the Entrepreneurial Process, in: Journal of Business Venturing, Vol. 1 (1), S. 107-117.

Chew, W. (1991), Beating Murphy's Law, Sloan Managment Review, 32 (3).

Ciborra, C. (1991), Alliances as Learning Experiences: Cooperation, Competition and Change in High-Tech Industries, in: Mytelka, L. (1991), Strategic Partnership and the World Economy, London.

Clark, K.; Hayes, R.; Lorenz, C. (1985), The Uneasy Alliance: Managing the Productivity Technology Dilemma, Cambridge, Mass., Harvard Business School Press.

Coombs, R. et. al. (ed.) (1996), Technological Collaboration - The Dynamics of Cooperation in Industrial Innovation, Cheltenham.

Cullen, J. (1998), Developing learning organizations in SME clusters: Modelling and Recommendations, mimeo, Tavistock Institute, London.

Davenport, T.H.; Prusack, L. (1998), Working Knowledge: How Organizations Manage What They Know, Boston, Harvard Business Scholl Press.

Deal, T.E.; Kennedy, A. (1982), Corporate Culture, Reading, MA.

De Geus, A. (1988), Planning as Learning, in: Harvard Business Review, 66 (2), S. 70-74.

Dodgson, M. (1991a), Technological learning, Technological Strategy and Competitive Pressures, British Journal of Management, 2.

Dodgson, M. (1991b), The Management of Technological Learning, Berlin, De Gruyter.

Dodgson, M. (1993), Organizational Learning: The Review of Some Literatures, Organizational Studies 14 (3).

Dodgson, M. (1996), Learning, Trust and inter-firm technological linkages: some theoretical associations, in: Coombs, R. et. al. (ed.) (1996), Technological Collaboration - The Dynamics of Cooperation in Industrial Innovation, Cheltenham.

Duncan, R.B.; Weiss, A. (1979), Organizational learning: Implications for organizational design, in: Staw, B.M. (ed.) Research in Organizational behaviour 1/1997, p. 75-123.

Fiol, C.; Lyles, M. (1985), Organizational Learning, Academy of Management Review, 10 (4).

Hedberg, B.L.T. (1981), How organizations learn and unlearn, in: Nystrom, P.C.; Starbuck, W.H., Handbook of organizational design, Vol. I, S. 3-27, New York.

Holzschlag, G. (1997), The Styrian Automoblie Cluster: Present State and future tasks, in: Steiner, M. (ed.) (1997), Competence Clusters: Worksop Report, Graz, Leykam.

Industriellenvereinigung (IV), Steirische Wirtschaftsförderung, Trigon Entwicklungsberatung (1995), Sondierungs-Projekt Automobil-Cluster, Graz.

Lessem, R. (1991), Total Quality Learning: Building a Learning Organization, Oxford.

Marshall, A. (1920), Principles of Economics, Macmillan, London.

Mody, A. (1990), Learning through Alliances, The World Bank, Washington D.C.

Nevis E.; DiBella, A.; Gould, J. (1995), Understanding Organizations as Learning Systems, Sloan Management Review, 37 (4).

Oess, A. (1991), Total Quality Management: Die ganzheitliche Qualitätsstrategie, Wiesbaden, Gabler.

Pedler, M.; Burgoyne, J.; Boydell, T. (1991), The Learning Company, London.

Rößl, D. (1993), Die Gestaltung komplexer Austauschbeziehungen: Analyse zwischenbertieblicher Kooperationen, Wiesbaden, Gabler.

Rothwell, D. (1992), Successful Industrial Innovation: Critical Factors for the 1990s, R&D Management, 22 (3).

Sako, M. (1991), The Role of "Trust" in Japanese Buyer-Supplier Relationships", Ricerche Econoiche, 45 (2-3), 375-399.

Sathe, V. (1985), Culture and related cooperate realities, Homewood, Illinois

Saxenian, A.L. (1996), Regional Advantage - Culture and Competition in Silicon Valley and Route 128, Cambridge, Massachusetts.

Schatz, R. (ed.) (1996), Netzwerke als Basis der lernenden Organisation, Bonn.

Senge, P. (1990), The Leader's new Work. Building Learning Organizations, in: Sloan Management Review 32 (1).

Senge, P. et. al. (ed.) (1995), The Fifth Discipline Fieldbook - Strategies and Tools for Building a Learning Organization, London.

Servatius, G. (1994), Re-engineering-Programme umsetzen, Stuttgart, Schäfer-Poeschel.

Shrivastava, P. (1983), A typology of organizational learning systems, in: Journal of Management Studies, 1/1983, S. 7-28.

Smircich, L. (1983), Concepts of culture and organizational analysis, in: Administrative Science Quarterly 1983, S. 339-358.

Staehle, W. (1991), Management, Eine verhaltenswissenschaftliche Einführung, 6. erweiterte Auflage, München, Vahlen.

Steiner, M. (ed.) (1997), Competence Clusters: Worksop Report, Graz, Leykam.

Wilmes, J. (1997), Wege zum Lernenden Unternehmen: Strategien und Werkzeuge, Remseck, Verlag Management Wissen Zukunft.

Womack, J.; Jones, D.; Roos (1991), Die zweite Revolution in der Automobilindustrie, Frankfurt, Campus.