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Cooperation between *vocational education and training* and enterprises - The role of *learning networks* as elements of regional innovation systems

Abstract

In this article some key elements of *regional learning networks* are discussed. Based on this, a development agenda for a learning region is outlined. Some insights into the initial development of networks via dialogue setting under regional actors are provided. As a characteristic example the Bremen regional programme Work and Technology and cases of successful networks are analysed. Finally and in the light of these cases, some lessons for an integrative management of regional networks will be presented.

Key words: Regional networks, learning in networks, evaluation of networks, management of networks, Bremen regional programme for Work and Technology

Introduction

Work-based learning processes can be strongly enhanced and promoted when regional VET institutions (e.g. vocational schools, industrial training centres, continuing training providers) cooperate closely with enterprises. This requires more than just taking notice of each other. It is essential to work together on the basis of targeted actions and joint initiatives to create shared dialogue between parallel projects.

The concept of ‘learning regions’ was launched to promote awareness of the fact that regions have specific endogenous potential that is often not deployed sufficiently. In order to overcome this, universities and educational establishments should develop closer cooperation with regional stakeholders, e.g. labour market parties and regional authorities (Nyhan, 2007, p. 20).

The point of interest is, how such networks can be initiated, implemented and developed further as an ‘incubator’ for regional development and growth. Still so far, the European regional landscape on product and process innovations is highly differentiated. Some regions are recognised as genuinely “Learning Regions” with strong cooperation patterns involving local stakeholders. Other regions remain underdeveloped – partly because regional policies are exploiting too little the endogenous and incremental potentials of local partners from public and private entities or in other cases some of the key stakeholders have conflicting interest (Morgan, 1997; Morgan & Nauwelaers, 1999). Therefore the questions remains open if regional government initiatives can promote a climate of cooperation and networking amongst local stakeholders.

The network paradigm as coordinated market activity

In the age of globalisation the competitiveness of European industry depends to a great extent on its ability to maintain technological advantages so that new or improved product innovations can be brought to the market rapidly and at decreasing costs (e.g. CEC, 1993). Over the past few years a new paradigm has been identified, variously referred to as the

network or the partnership paradigm. Inherent to this is a strong belief that markets, global hierarchies and state control do not serve alone in mobilising the necessary resources for innovation and economic development in different regions. Interactive innovation capacity between partners and a rich social capital are fundamental resources for future economic development and the generation of new employment (Camagni, 1991; Lundvall & Johnson, 1994; Morgan & Nauwelaers, 1999; Nyhan et al., 2000; Porter, 1990; Rauner et al., 1995; Ruth, 2001; Storper, 1995). All this can be studied on many examples like regions in Denmark, Singapore, Wales, Baden Württemberg or Bremen (see Braczyk, Cooke & Heidenreich, 1998 which analyse regions based on Regional Innovation System's).

Learning to innovate is in this respect an important prerequisite to respond to these challenges. This is true not only for academic educated workforces, as for exp. engineers, natural scientists or MBAs but also for technical skilled workers, technicians and/or 'Meisters (the Meister model is much present in some European states like Germany, Switzerland, Austria). For Germany we can say that it has great importance for professional development like manufacturing, building & construction.

Learning processes in a regional context

The idea is to relate the learning situations in vocational training schools to work activities is not at all new! But in some occupations there is little relation pre hand and the rest is coming up in the practise activity without any accompaniment and support. For this reason work process orientation is a significant and consequent driver for such regional development processes; not only in the Austrian, German and Suisse apprenticeship's (to a much smaller extend also in Britain and France) but also in other European countries like Hungary, Italy, Netherlands, and/or the Scandinavian countries there is rising interest for improved linkages between public school and private industry, craft trade. Common in such countries is that they follow work based learning principles and even when they face different institutional context and tradition. These considerations on mesa and macro level are supported on the micro level by a close cooperation between VET teachers and representatives from companies (e.g. trainers or those one responsible for the personal). While weak cooperations can lead to weak work situations in companies with a low transformation of work experiences into work process knowledge and this is a hindrance for innovative change. For such kind of reason the implementation of network based evaluation tools are important (Deitmer & Attwell, 2000).

The nature of learning in a regional setting

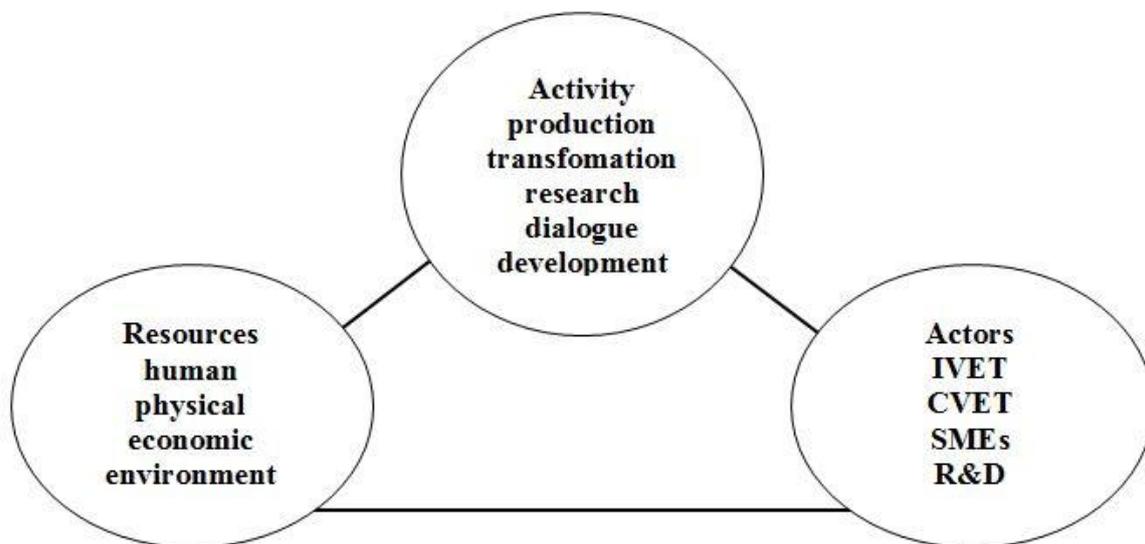
The first aspect to be discussed is the nature of learning processes in a regional context. Much of the previous research on Human Resource Development and work-based education and training, is driven by a rationalist perspective. This is derived from human capital theory (Becker, 1964; cited in Ellström, 1996), it does not readily lend itself to the study of learning processes within firms and their role in the promotion of social innovation. Ellström points out that "such kind of innovations are viewed primarily as the result of exogenous technological progress and investments in research and development (R&D), rather than as the result of learning processes and pro-active behaviour by individual or collective actors at all levels of the firm, including production".

Researchers from both human resource development and from innovation theory have both failed to make the critical link between situated learning and social innovation. By treating innovation as a technologically determined process and by treating learning as a largely technical and individual matter, learning is rarely seen as integral to the process of innovation, and new forms of knowledge production become abstracted from social forms of interaction and practice within the workplace and broader community. As Guile and Young (1996) have cogently argued: "the problem with individualist conceptualisations of learning is that they neglect the extent to which learning is first and foremost a human activity and therefore, about

social relationships and people participating in different types of community”. I hope that this makes clear that the subjective dimension within Learning and Innovation is a key understanding. The radical innovations paradigm (e.g. the touch screen) is a quite seldom key driver for a region but much more the incremental steps to improve given services, product and processes. By improving the product and service quality of such things continuously the involvement of actors on all levels of an organisation is needed.

Regions provide a spatial context for networks and partnerships to develop new learning strategies for knowledge production and innovation. Within a region, partnerships and networks are dependent on the interaction between the different actors who form communities of practice. Whilst these networks are based on the direct relationships between participants they are also dependent on part on the influence and mediation of facilitators and intermediaries. The facilitation of learning and the generation of new knowledge leading to innovation in networks is based on the availability of both human and physical resources.

Figure 1: The network model



The description of a network or partnership is therefore more than a description of the flow of information and the re-distribution and usage of this information. It is an expression of the knowledge that influences the capability and competence of individual actors, like the skilled workers, as information leads to new social relations and activity. A basic assumption in this context is that knowledge consists not only of information but also of many other aspects like know how, know why and know that. Information consists of identifying who will co-operate and who has what kind of capabilities or expertise within this relation. Know-how is the knowledge of how the capabilities of individual institutions within a region might be harnessed through co-operation. Innovation is therefore shaped by a variety of institutional routines and social conventions (Morgan, 1997) but also disrupted by new radical innovations, e.g. mobile technologies. The key argument is that contemporary capitalism has arrived at the point “where practical and theoretical knowledge is the most strategic resource and learning is the most important process” (Lundvall & Johnson, 1994; Morgan & Nauwelaers, 1999).

The dimensions of learning partnerships and how networks are formed

In this section we wish to examine the different dimensions of learning networks and consider how such networks might best be developed (Figure 2, below based on: Rauner et al., 1995).

Figure 2: dimensions, elements and criteria for learning in innovation networks (Deitmer & Attwell, 2000)

dimensions of learning and qualification in innovation networks				
Configuration of network and structure of actors profile in innovation network	forms of innovation	strategies and competencies of actors in the innovation process	process of developing collaboration between actors	External and spatial dimensions
performance criteria within such innovation networks				
<ul style="list-style-type: none"> • joint values • roles • joint goals • size of network 	<ul style="list-style-type: none"> • processes • expertise • work place • technology • quality 	<ul style="list-style-type: none"> • modes of communications & relations; • actors focus & position • motivation • values 	<ul style="list-style-type: none"> • trust & commitment • performance & reward 	<ul style="list-style-type: none"> • environmental conditions: • structures • forms • network structure

A key role for regional learning and knowledge partnerships and networks is that they facilitate the building and transfer of tacit knowledge by direct contact between actors from different organisations based in a spatial neighbourhood. Tacit knowledge is built and shared by direct face-to-face contact, discussion and observation. Spatial elements are also very important in the transfer of implicit knowledge and in facilitating innovation.

As the graph (Figure 3) shows, regional networks for qualifications and learning are based on theme focused partnerships between enterprises and other regional knowledge institutions, including universities, innovation centres, technology centres, and vocational education and training providers. Although such institutions are deeply rooted in the local environment they offer, at the same time, ‘the window to the global world’ because science has neither regional nor national borderlines. Regional networks provide access to the global ‘supply’ of science-based knowledge.

The question is how we start and initiate with such a network. The starting point could be a single problem of a company. This has to address the qualification problems of their staff members (e.g. lack of IT skills in conceptual and practical terms). Such a need could trigger the network development process and that in such a way that other companies come along and say we have the same problem. So gatherings of companies could be important and offer the chance for an innovation dialogue. This needs moderation which could be done by a local partner e.g. a local VET school, presenting new courses on technology. Also other ways are possible, that for an example the local professional academy or university comes into play as moderator and initiator for an innovation technology network. They could find out, for example in an explorative study whether the lack of technical expertise of workers leads to economic disadvantages (What does it cost when we miss that expertise and professionalism at our workers?); but also technical implications (Which technology meets our needs? What are the qualificational, organisational and financial implications for this implementation?). An integrative approach of technical, organisational innovation and learning is formed. This is best when different kind problem solving partners join for a development coalition.

Regional learning strategies for the configuration and development of regional innovation networks: What have we learned so far from European network and partnership activities?

The following section examines the experiences of regional networks in Germany, Sweden, Netherlands and Austria (Deitmer & Attwell, 2000; Docherty & Nyhan, 1997; Hofmaier, 2000;). Despite peculiarities of region, nation and sector the SMEs supported by the different networks are facing similar problems, like for example the following ones: Lack of appropriate technical support for companies seeking to implement new forms of work and production and this by using technology to make production more flexible and of higher quality; Transfer of experience and any innovation oriented dialogue between enterprises is rare; Innovation expert with adequate experience and expertise are hard to find and expensive; Work organisation is often changed in ways that fail to address the underlying workplace culture, leading to frustration and sometimes to disaster; Lack of training and education among management of SMEs, which can lead to difficulties in articulating and formulating the right questions about further development and developing strategic plans how to talk with regional qualification partners; Relatively low degree of low skilled work force; A generally parsimonious attitude towards innovators and entrepreneurs; A lack of risk capital.

The problems mentioned could be addressed by the concept of Learning Region and to what extent this can be transferred into the concept of the innovation and learning networks. The regional dialogue on the provision of Vocational Training could be a starting point to address the above mentioned problems. On this also the VET system in a country could also be improved by such a strategy.

Successful regions are those “whose networks incorporate an adequate supply of quality knowledge resources, along with the ability and willingness of local firms to make use of external sources of knowledge with a clear focus on innovation” (Huggins, 1997). Up to now there is a limited understanding of the different regional (and national) innovation systems in Europe¹. But it is argued that a robust networking culture is to support the inter-organisational flow of information and knowledge between actors in different fields, especially between companies and the research and development institutions (Ruth, 2001).

Establishing regional learning networks – experiences on the Bremen programme work and technology

The Bremen Landesprogramm Arbeit und Technik created regional development projects by linking technology innovations with qualification and organisational development activities. This is linked to regional learning and innovation networks formed by partners from regional research & development, vocational educational training institutions together with small and medium enterprises in the region of Bremen.

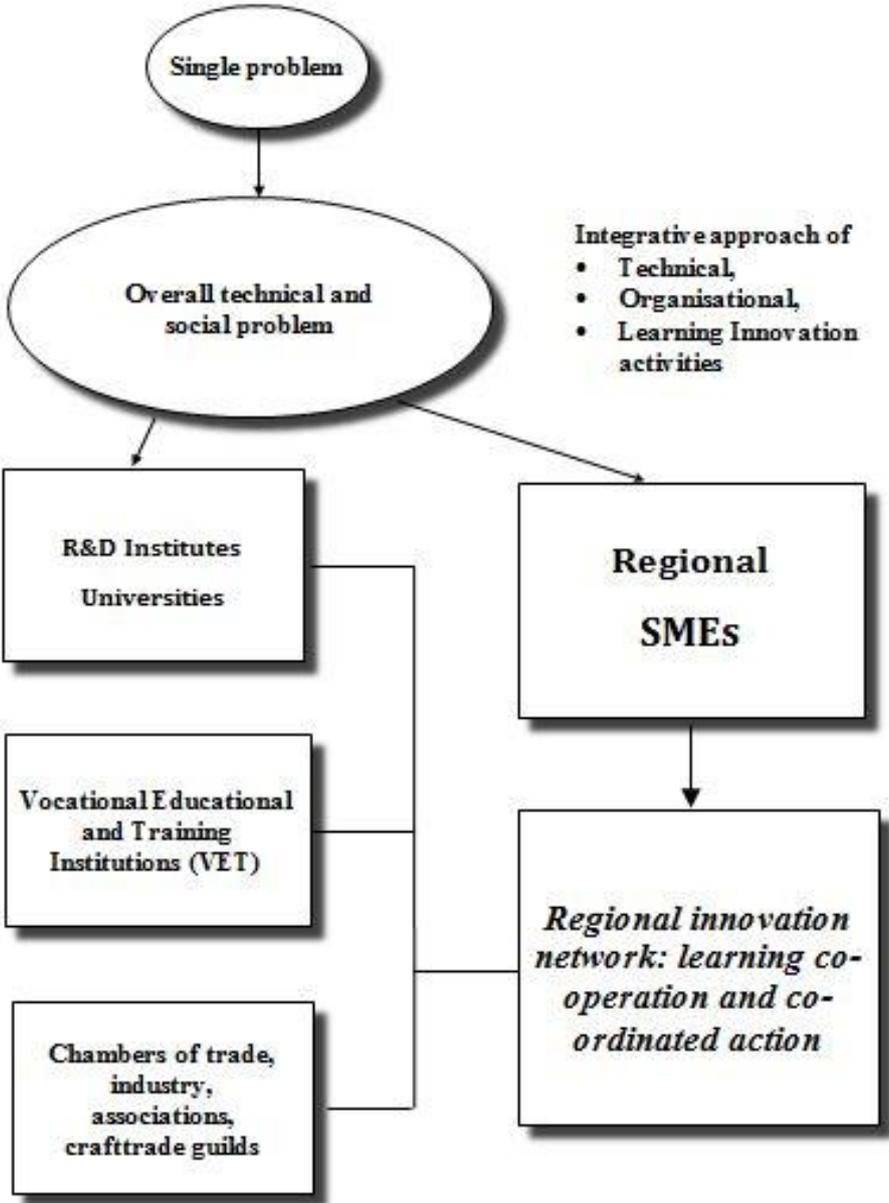
The objectives of the programme² were to overcome regional workplace and business deficiencies by an integrated and holistic modernisation strategy. A lot of SMEs were cut off from innovative new knowledge and skills on innovation implementation, so as in Bremen where massive de-industrialisation in ship building and other related industry sectors has led to a lack of mutual learning and missing innovation transfer. These regionally based companies suffered a short-fall of know-how due to a deep “gap” between innovation and

¹ But the awareness for the debate can be watched at the European level and is put on many of the national technology development agendas. In comparison with Japan, European countries have a *poor record of converting scientific and technology knowledge into commercially successful products and services*. There are barriers in the transfer of knowledge from researchers to industry and between enterprises (CEC, 1993).

² The piloting phase (1990-1995) for this programmes was managed by the ITB and evaluated afterwards (1995-1997). Until 2003 it was managed by Bremen Innovation Agency (BIA).

successful implementation. Fostering and supporting ongoing change processes through the creation, management, monitoring and evaluation of regional networks around special topics was as that time a central goal. Existing regional networks, both horizontal and vertically structured, (e.g.: city-guilds for specific sectors like heating & plumbing handicraft enterprises) were enriched by external partnerships with bodies from the local university, polytechnics, VET institutions and professional associations (Rauner, Ruth & Deitmer, 1995; Deitmer & Ruth, 1999; Deitmer, 2005).

Figure 3: Implementation of regional actors cooperation

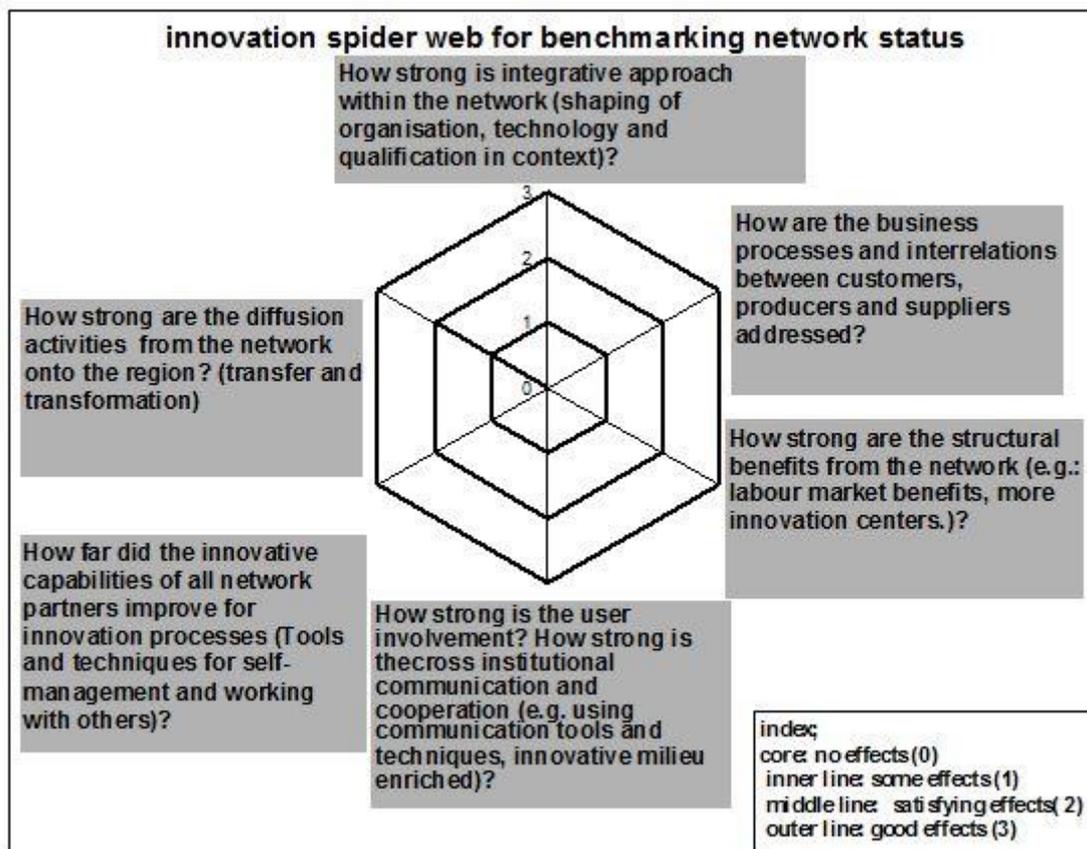


The project networks³ were developed in programme areas like: *Enriching the planning competencies* through the development and introduction of new technology tools in local

³ More than twenty project networks have been established so far which aim for collaborative research and development activities. The networks involve over 70 enterprises and 32 R&D institutions including institutions from the vocational and educational training sector (VET). So far over 6 million € have been spent, based on the EC Social and Regional funds.

SMEs and in handicraft companies in the building and construction trade; *Building demonstration centres in thematic fields* e.g. for energy management for the electricity and heating and plumbing handicraft companies and SMEs; *Setting up new links* for co-operation and better co-ordinated action between local suppliers and large manufacturers (e.g. Mercedes-Benz plant Bremen); Using *new materials and construction principles* in special innovation fields.

Figure 4: Innovation Spider to monitor project progress



Following the experiences of the different projects the following key success factors for the establishment and implementation of a regional network have been identified (see Figure 4): the nature of *innovation dialogues* between the different regional actors coming from VET, companies and R&D bodies, the *degree of integration* of the approaches to be undertaken, the increase of own *innovative capabilities* of the different actors, their *business process orientation towards a stronger learning from dialogue and feed back from customers, producers and suppliers*, the *diffusion intensity* of the regional network into the region and finally, the potential for *improving the (infrastructural) innovative capabilities of a region* (Deitmer, 1992; Rauner, Ruth & Deitmer, 1995; Deitmer & Ruth, 1999; Deitmer, 2004)¹.

The need for leadership in the network: the spider in the net

Every network or partnership require a ‘networker’ or a small networker team to get the process of forming the network into go. This person or institution has to build awareness of the need for co-operation and partnership among different actors in the region. It is crucial to find promoters among the potential participants, among the different possible partner institutions from those who are enthusiastic about the vision of a ‘Learning Region’ and

strongly support the idea of establishing a network. The promoter does not need to represent one of the leading companies in a sector but it can be very helpful. He or she should be respected concerning his or her technical and social competence.

An interdisciplinary and cross-organisational approach to innovation

Innovation should transcend the classical boundaries of the scientific disciplines. When a network adopts a strategic orientation at a managerial level it should also address itself to the direct production or worker level. The goal is to shape organisations, technology and qualification including the inter-relations between the management and the different departments of a company. Therefore networks should be developed between different organisations and not only within an organisation and should also take into account the interrelation between customers, users, producers and suppliers. Inter-disciplinarity requires the involvement of different actors with varied specific experience.

Defining common goals for the network or partnership

It is important to define and agree common goals for networks and partnerships. The views of the different partners are often diverse. One central criterion will be to build consensus on the different perspectives and goals the participants have. In this phase of networking constant dialogue through conferences and workshops is very helpful. It can be also helpful to focus on two or three commonly defined and content orientated goals. One of the major tasks is to show the benefit for each network participant. Without pointing out the individual benefits the involvement of its members will decrease, finally leading to the dissolution of the network.

Steering of networks and partnerships: Establishing project management tools and techniques

Network relations are not only an arena where organisations and their members exchange information, but also a context where they constantly interpret and reinterpret what occurs around them. This implies a shift in focus onto the network or partnership through which new interpretations from the participants about the purposefulness of the network come into existence. New forms of evaluation and regular benchmarking are needed to reflect on the course the network has taken so far and what future activities are needed.

Step by step approach: “picking low hanging fruits”

Every project and partnership should combine short-term and long-term goals. Especially at the beginning the realisation of short-term goals is useful since these results show that it is beneficial to participate in a partnership, strengthening the commitment of the members. We have learnt through our case studies that much regional collaboration begins on a small scale through informal collaboration and increases incrementally step by step to develop a more full approach to innovation. We see incremental innovations among the network partners as an approach to develop common experience and knowledge.

Evaluation and benchmarking workshops with all the network partners

Experiences from network projects show that there is a strong need for systematic evaluation research in order to monitor and guide the development process. This makes sense while many partners with different expectations and abilities join and take part in complex innovative task with risk of failure. The risk of failure can be better minimised by systematic involvement of all partner in a reflection about the current development situation and this by systematic evaluation.

Beside hard factors to be reached in innovation networks (e.g. number of potential customers reached, informed or trained) there is clear commitment on soft factors for the successful development of such networks. Therefore soft innovation factors should be also measured. This insofar, that understanding between research actors increasing and the partnership in

terms of trust and commitment develops. All this is of key importance for a successful innovation network. One new tool for measuring the performance of networks is the investigative and evaluative assessment workshops. These workshops involve the core actors in a regional partnership (Deitmer, 2005).

A short structured questionnaire on the success/performance criteria addressed to the participating individuals is utilised to promote discourse. Participants are asked to judge and weight the performance criteria for their network. It is the intention to develop a consensus about the strength and weaknesses of each network through the process of peer group evaluation, and the application of social science research tools (qualitative and quantitative), participant observation and socio-graphic means. Other new methods for the continuous project management and the evaluation of networks include *utility value analysis tools*, *innovation-spider-web* (see picture above) and *strength/weaknesses tools in a three-step evaluation procedure* (Manske et al., 2002).

An integrative example of good innovation practise: Technical and Social Modernisation of the regional Bakery Trade

The Institute for food and bio process technology (BILB), an organisation within the local Bremerhaven polytechnique, worked closely with a network bakery trade companies (guild of the bakery trade under the umbrella of the craft trade chamber) in which they used application oriented training to launch new bakery techniques for the sake of embittering working conditions, product quality and new organisational routes.

The project network initiative departed from company owners complaining over daily hectic and stress during early morning work. The problem of health protection for bakers was infecting sufficient recruitment of bakers for such an unattractive work. In an assembly of bakers at their city guild gathering the head professor of BILB offered a testing out of the answers to these night work problems. By implementing frozen down and getting this implemented in bakery shops within the region through training it was seen as a chance to combat the need for night work. Nevertheless in this project a bakery development centre was created on took its way forward over the last years. The center continuous its success story in which it developed for a European Center of Excellence in dealing with many European projects (e.g. Craft programme). These projects deal with similar problems in other food industries and how appropriate technology and training for more human centred work places can be created.

Lessons to be learned from the Bremen experiences

The development of a regional innovative milieu as well as the regional innovation potential is based on a process of interactive development of „weak“ or “soft” innovation factors as:

regional Innovation dialogues, setting up innovative qualification abilities and socio-technical design concepts between „hard”, *structural relevant innovative, factors and potentials* as represented by the various new forms of institutionalization for the regional co-operative relations (e.g. by specific demonstration and innovation centres; setting up new entrepreneurs).

The experiences of the Bremen programme show however that intensive but isolated diffusion activities has little effect on structural changes in the regions concerned; transfer activities need to be *embedded into organizational and technological learning* processes in their broadest sense; the socio-technical design is only successful if it is supported by an integrative regional innovation policy backed up by professional innovation management covering all the policy fields involved; regional R&D can only be successful when it is based on R&D infrastructures which are oriented towards trans-disciplinary principles and approaches.

From these insights we derive our basic hypothesis that the strengthening of regional networks for product innovation improves the innovation capabilities of SMEs. Developing regional learning networks is a critical task and is dependent on integrating the right partners. Innovation networks which are based on *continuous co-operation, competence and trust*. Such social achievements are based on effective *bi-directional communication* and needs support by a *strong leader* (the so called ‘spider in the net’). Externally initiated project networks that aim only to influence strategy and direction can fail, such networks often show a weak innovation dialogue between academic and the application partners and somehow also a weaker process orientation towards business processes and value chains (Rauner, Ruth & Deitmer, 1995, p. 62).

Beside these statements on how regional innovation potential may be developed it has been another lesson learned that evaluation measures are helpful to give active advice for the perspective development of the innovation network. Often time, and this is my conclusion the direction in which the project should go is not so clear; a self evaluation process between the private and public partners can help to find barriers and difficulties (e.g. communication, unclear goals, lack of common understanding, missing sufficient support, lack of external transfer, strength and weaknesses of the network are not known, lack of review) (Davoine & Bonnet, 2002) in an early stage of the network formation.

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ⁱ The research results presented are based on thematic networks within the regional based Bremen “Landesprogramm Arbeit und Technik,” which were evaluated on a comprehensive and action based evaluation. The programme was set by the regional government (*Laender of Bremen*) to overcome structural deficits with special reference to knowledge for local actors. The thematic networks sponsored by the programme have involved over 150 enterprises (mostly SMEs) as well as ca. 85 R&D and vocational and educational training institutions (VET).