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The Role of ICT in Interfirm Networks and Regional Clusters

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ICT and trust in clusters: the case of the clothing industry in France and US

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Abstract. The aim of this paper is to evaluate the influence of cluster sociological factors (like inter-personal trust) on the implementation of ICT. Some recent literature argues that ICT in its most advanced usages is able to replace in any case human relationship for economical transactions which represent the main drivers of business-to-business exchanges.
Our position is that this optimistic approach should be temporized: when traditional industries are based on strong personal relationship, information technologies can not always replace with the same profit relation based on mutual confidence and interpersonal contacts.
We will address these questions firstly in a theoretical perspective and secondly by referring to an empirical research led in the clothing industry. The discussion will highlight the facts emerging from the field by mobilizing the concepts outlined in the first part of the paper.

1 Theoretical background

The issues of information technology and the transformation of industries have been studied for decades trough an economical perspective.

This broad perception of the economic environment of the firms is now showing some limits that tend to be studied in more detailed ways. First, it appears that the industry level favour a better understanding of the relationship between firms embedded in the same economical network. Moreover, some industries have developed specific structures, the industrial districts (or clusters), which show a surprisingly long life cycle despite their apparent very traditional organization. Our first section will present some research work related to that dimension.

Another possibility to enlarge the comprehension of the movements that are affecting the industry structures and the role of information technologies is to enrich the economical vision by adopting a socio-cultural perspective. Instead of postulating that relations between firms are just abstractions, sociologists are considering that despite its economical aspects, any relation within the business field is also guided by humans which act non only in purely rational ways but that concepts like trust are strongly influencing relationship between entities. Our second section will focus on some research that has addressed this question.

1.1 Economic literature on networks and clusters

Literature on networking is abundant. It is relatively easy to superpose works based upon the classical economic community as well as those provided by its IS component. In both ways this trend emphasizes positive externalities "naturally" emerging from this organization. In no case possible negative externalities appear, as if any situation linking partners within a network should lead to mutual benefit. This idealistic view is confronted to reality: why in this case should some industries be confronted to high difficulties to survive? Because of the lack of networks? In some cases it should be true, in others it appears clearly that the absence of networks is not the main reason for failures.

These observations arise the need to improve the understanding of the mechanisms that are underlying this particular form of inter firms relationships. One question is to establish the perimeter of such networks. Which criteria will help determine the inclusion or exclusion of a firm from a given network? The frequency of the transactions, the nature of the business, its location ? There is no clear answer to these questions. Most of the authors rely in some very large – vague- acceptation of this term of network. Others, sometimes by default consider

that the inclusion within a given industry is one pertinent and easy way to define boundaries. For others this is not sufficient. Networks should have a "node" which regroups the most active firms, whatever could be their size. This view progressively leads to focus on some specific form of networks –the clusters- which main characteristic is their geographical co location.

Following these thinking, emblematic authors of the economy of networks are orienting their works in this direction. Porter (1998) defines clusters as "geographically proximate groups of interconnected companies and associated institutions in a particular field, linked by commonalities and complementarities". Antonelli (2000), instead of considering a district as a whole, underlines the differences of roles between small and large firms. He concentrates his attention on the importance of districts in the diffusion of collective knowledge communication and innovation. In that way, he establishes a distinction between technological districts and industrial districts: "the latter are characterized in terms of high level of Marshallian externalities among small firms localized in regions with small populations and small cities. By contrast the former are characterized by the coexistence of large and small firms, a large multisectoral range of economic activities, a strong metropolitan character and an important scientific and communication infrastructure".

Benghozi and alii (2000) analyse the role of information and communication technology from an organizational perspective. They have pointed out that ICT are in the same time structuring for firms but also very flexible and adaptable to particular environments. Moreover, the place of ICT in organization not only concerns interfaces and coordination mechanisms. It raises some questions about the nature of interactions and social games. ICT generate, inside organization and beyond, constant changes in terms of fusions, boundaries between departments or functions. They conclude "ICT do not contribute to build global organizations or at a macro-economic level, perfect markets. On the contrary, they organize segmented sub-parts, very much differentiated and an aggregation of mini organizations."

Considering the diffusion of internet in SME, Gadille and D'Iribarne (2000) have highlighted two forms of restructuration for SME using ICT. One group is composed with firms which are committed by their networks of customers, or suppliers or by competitors to adopt these technologies. Then they are highly computerised and aim to rationalize their production processes and to reinforce their integration with the information systems of their partners. The other group is formed with firms which are much more autonomous in their decision process to adopt internet. They are more creative in their uses, they interact much more with customers, suppliers and consultants to adapt the technologies but in the same time they are less efficient in terms of frequency of use.

As these different authors have pointed out, it is remarkable to notice the complexity of ICT implementation. Ways of diffusion are multiple and levels to

any implementation can be studied at the level of the organization or at the level of the individuals. By consequence, the theoretical frameworks are changing. Despite that, one should avoid the temptation of considering each situation as idiosyncratic.

1.2 Sociological research literature on ICT and trust

The concept of trust has been largely explored by sociologists within different fields. Our purpose is to focus on authors which have developed it within the context of business-to-business relationship. The question of embeddedness is then raised.

Criticising the transaction cost theory, Granovetter (1985) points out that choices between market and hierarchy are made not only to reduce transaction costs, but are also linked with the quality of social relationships among partners. The tendency for someone to resort to either one of the coordination modes varies according to the quality of relations that he has with his partners, inside or outside the firm. Thinking about business groups, and no longer about individuals, he then shows that inter-firm networks are built according to similar types of logic (Granovetter, 1995). They are not only driven by an economic interest - lowering transaction costs for instance - but they also integrate other factors, such as trust. As for economic relationships among persons, embedded in social ties, he shows that relationships among firms are also embedded in informal ties.

The ‘moral economy’ of these groups is an important feature: mutual trust is characteristic of business groups and distinguishes them from any other type of association. Trust, in the case of business groups, exists mostly because there is a reputation effect. The different actors within these business groups know that they will work together again in the future, so they should have no opportunistic behaviour that would rule them out of the system.

If trust is a key driver for building embedded relationship among firms then the question is to understand how technical networks interfere in the development of such ties. In that perspective, Hart and Saunders (1997) have built a model of adoption and use of some specific information technology – EDI - based on power and trust. It can be summarised as follows: “EDI adoption reflects existing power arrangements. Firms that are internally motivated to initiate EDI exchanges and have leverage over their trading partners influence those partners to adopt EDI. […] However, we have argued that a critical condition of successful EDI use over time is trust. […] And, the expectation of continuity is a significant factor in building trust”.

“More powerful firms, that is firms controlling resources that relatively more dependent firms rely upon, influence their trading partners to adopt EDI. However, once EDI is adopted, expanded use is determined by the extent of trust between firms. Greater use of EDI, as we have described it, means that operations

between trading partners will be more integrated and partners will have more direct access to previously inaccessible information. Our model implies that power and trust are not antithetical attributes of interorganizational relationships. Rather, they are two dimensions of the relationships that determine whether and how EDI is used".

Trust plays an important role in EDI use for two reasons. First, it encourages firms to make investments necessary for electronic information exchange. Second, it discourages opportunistic behaviour which would clearly reduce the opportunity for greater information sharing over time.

Gottardi's (2005) is analysing the difference in ICT implementation and impact between industrial districts and other economic backgrounds.

His research question is: "could the diffusion of ICT within industrial districts, which are a quite homogeneous environment (economic and social) and are bound together by a dense glue of relations and exchanges, be accomplished more easily and generate more clear advantages in comparison with what is occurring in more heterogeneous environments.

His conclusion is that on the contrary, ICT find it hard to spread into Industrial Districts. The reasons analysed are: existence of tacit knowledge, difficulty in codifying and interpreting the knowledge, cost and time of implementation, and the fact that ICT are not significantly better than pre-existing modes of communication (interpersonal).

Tacit and explicit knowledge as defined by Nonaka (1994) are different in the way that they can be communicated. Two aspects assume relevance in knowledge transfer: the type of knowledge transferred and the applicative context where transfer occurs (Nonaka, 1991, 1994). This distinction emphasizes the issue of transferability of knowledge and the modalities employed. Explicit knowledge can be codified, and is therefore relatively easy to obtain, transfer and store. On the contrary, tacit knowledge is directly connected with ideas, perception and experience, and therefore is quite difficult or even impossible to codify and transfer.

1.3 Embeddedness and trust in clothing clusters

Piore and Sabel (1984) made a detailed analysis about solidarity surrounding geographical axes in their works on industrial districts. Industrial districts are groups of small firms, such as one can observe in the textile or garment industry.

To illustrate the notion of an industrial district, Piore and Sabel quote the example of the textile district of Prato (in central Italy). According to them, the industrial district has the following characteristics: Job certainty is controlled through work sharing, rather than seniority, firms' entries and exits are easy and constant, employees and management are both concerned with informal resolution of disputes, work is collaborative, and the community is an essential entity. Many

people go back and forth between the role of employee and manager, a great part of the production is done by subcontractors and as fashion changes very often, it implies a great flexibility of the different actors.

Le Sentier in Paris has all these characteristics and the main French garment companies deal with Le Sentier, especially for replenishment, because they know that they can order and receive the products very quickly, and that conditions will be respected. The Garment Centre of New York is similar to the Parisian Sentier, as Uzzi (1997) shows.

Refining the concept of "embeddedness" from Granovetter, Uzzi (1997) makes it operational by applying it to the clothing industry in New York. He shows that three axes characterise the embeddedness of economic action in social relations: Trust is a governance structure for socially integrated relationships, as it allows one to face uncertainty in better position because it strengthens the efficiency of professional relationships. The second axis, fine-grained information transfer, is more than a matter of asset-specificity, know-how or reducing information asymetry between parties, because the social relationship imbues information with veracity and meaning beyond its face value. The third axis is joint problem-solving arrangements: this step induces a more rapid and efficient result than an automatic reply from actors dealing in a purely formal framework, threatened with contractual rupture when incidents arise.

This view can help in identifying informal ties (other than region) in the apparel supply chain. In the Parisian Sentier for example, religious and ethnic bonds are particularly powerful (cf. Lazzaratto et al., 1993). These bonds establish trust and mutual adjustments, which are essential to the rapidity and the diversity of transactions.

The current importance of EDI

Croom (2005) has studied the impact of e-business systems on supply chain organisation on a sample of 98 large European organisations (across industries). He has analysed the top supply chain initiatives and their relative importance for the different actors in the value chain. For retailers, it is supply chain integration that is the top priority. For manufacturers, price and cost pressures are the top supply chain initiative. Out of his sample, Croom has shown that 73.5% are using EDI. He found that e-business strategies were most heavily influenced by their major customer, in other words, the requirements of an organisation's 3 or 4 major customers dictated strategic prioritisation. It confirms that EDI technology is used in the value chain to facilitate coordination as requested or demanded by retailers.

2 Empirical study: the case of the clothing industry in France and US

2.1 Methodology

This paper is the result of a research that took place in the clothing industry in France and the United States, between 1997 and 2000 (Abecassis, 1999). It is based on an inductive methodology. It used the techniques of interviews to collect rich data (each interview lasting 1.5 to 2 hours). The interviews dealt with a precise definition of the characteristics and the changes of the company, the characteristics of relationships with its different partners and a description of the IT use within the production process as well as with its partners. The sample included textile companies, manufacturers, retailers (specialised or generalist), technology suppliers, standardisation institutions, and so on. These firms were located in France and the USA, and the distribution per activity and location is detailed in Table 1 shown below. The sample of business actors was built from different sources: commercial industry databases, suggestions from professional federations and contacts made during business conventions and is aimed to be representative of the industry as a whole. Also, over fifteen 'observers' (technology suppliers, standardisation institutions, and so on) have been interviewed, to validate the results along the project.

The analysis of the data has been facilitated by the use of the matrixes proposed by Miles and Huberman (1994). Several tactics have been developed to improve the validity of the research. First, concerning the internal aspect of the validity, we used other sources of data (business and industry newspapers, professional bodies publications, consultancy studies…) according to the principle of triangulation. These large and rich qualitative materials have helped us to develop a rival hypothesis and to analyse data up to a point where no additional explanation could be found (Saturation Principle).

Secondly, the interviews took place from 1997 to 2000 and this period of 4 years allowed us to replicate our results through time which is a means to improve external validity. External validity is also ensured through the variety of the informants (industries and professional organisations) as well as the variety of locations (France and USA). Finally, we have interviewed business actors who were both users and non-users of IT, which allowed for a comparison.

The research is exploratory in nature. It aims at detecting trends.

Table 1: Distribution of interviews per location and per activity

Location Activity	France	US	Total
Textile	2	3	5
Clothing manufacturing	13	8	21
Retail	6	4	10
Total	21	15	36

2.2 Data analysis: EDI implementation in the clothing industry

The aim of this part is to describe the situation of EDI implementation in the clothing industry, based on the author's observations. To do so, we first present the history of EDI implementation and the observation framework.

2.2.1 History of EDI implementation in France and the US

In France, supermarkets were the first to order their grocery products by EDI. They then decided to generalise the system to all their products, especially to clothing. They first implemented proprietary systems, putting pressure on their clothing suppliers to be connected. But the manufacturers refused to choose these technologies. They only did it if the retailers threatened to de-register reluctant suppliers.

In the United States, retailers (like discounters and department stores) have had the same role, with more impact on the supply chain as they have a larger market share and are more concentrated. The American specificity is that textile firms also joined in, because it was a way to better respond to declining demand, to relocate the manufacturing by supporting the *Quick Response* strategy, and thus to protect themselves from Asian competition. American clothing manufacturers have therefore been pushed to use EDI both by the textile industry and by retailers.

It does illustrate that where EDI has been implemented, it has been under retailer's pressure.

2.3 Observation framework

Previous research in the clothing industry has built a typology of three value-chain organisation structures (Abecassis, 1999).

Garment Centre is an industry organisation that is rather localised, in urban centres (like New York, Los Angeles or Paris). The firms are usually small and involved in all activities in the supply chain. They are flexible enough to easily and quickly change the products and the activities. A lot of informal communication is used and supported by interpersonal and ethnic relationships. Le Sentier in Paris represents more than 10% of the French clothing industry revenues (almost 40% of the French womenswear revenues) and 45,000 people (nearly 25% of the workforce in the industry). The *Garment Centre* in New York represents about 17% of the American clothing industry - with almost 100,000 people out of 540,000 and $13bn revenues out of $68bn (Abecassis, 1999). The *Garment Centres* are where retailers replenish for short runs and for highly fashionable (seasonal) products.

Delocalisation is a structure where there is a centre (in developed countries) and a periphery (in cheap labour countries). The periphery manufactures for the centre. This organisation supports large quantities of permanent products at low added value. The centre is usually made of large firms.

Quick Response is a strategy sponsored by large textile firms in the US to encourage firms to relocate their manufacturing in the US or at least to the region (Mexico, Caribbean) by using IT. In this organisation, the retailers transmit sales data to manufacturers through EDI so that they can replenish stocks. It is usually made of one central retailer that works with dedicated and locked-in suppliers. It also exists in France with suppliers in Eastern Europe or North Africa.

Those three typical value chain organisations are presented in the order in which companies grow. New clothing firms are usually created in *Garment Centres*. As they expand, they tend to manufacture more and more overseas (*Delocalisation*). Finally, the more fashionable products they have, the more they need flexibility. This is when they relocate some manufacturing to closer locations. They are then part of a *Quick Response* structure.

The balance between these three organisation structures is quite difficult to work out as most companies often belong to those three structures at the same time. For example, the same firm can manufacture some of its products abroad (*Delocalisation*), keep some of the manufacturing in France to be more reactive on fashionable products (*Quick Response*), and might get some seasonal replenishment from the Le Sentier if needs be (*Garment Centre*).

EDI implementation is obviously quite variable depending on the industry structure, but also on the stage in the value chain. That is why to evaluate the penetration of EDI in the clothing industry, we will analyse the level of EDI use

in each of the industry structures presented above and we will assess the level of EDI use in the steps of the value chain.

2.4 EDI use in the clothing industry

2.4.1 In the industry structures

In France, we have observed (Abecassis, 1999) that EDI-users have mostly suppliers in Europe, or in North Africa, Turkey or Eastern Europe. EDI is mostly used for permanent products (as opposed to fashionable ones). In the US, EDI-users are mostly large retailers (discounters and department stores), who deal with permanent products and manufacture in Mexico or in the Caribbean.

The result of our observations and interviews is that in the three typical industry structures described above, EDI is used in only one of them. EDI is used in the *Quick Response* model. EDI has not been implemented in two out of the three typical organisation structures, and it has been implemented only in the most sophisticated of these three structures (the one that is historically achieved after the other two).

2.4.2 In the supply chain

Communication between retailers and manufacturers is definitely the stage in the supply chain where EDI is the most implemented. But EDI systems between retailers and manufacturers are then far less widespread in the clothing than in other supply chains such as publishing or pharmaceutical products (Steinfield *et al.*, 1998).

Most of the electronic communication between retailers and manufacturers is either internal (when manufacturing and retail are integrated) or between large retailers and few main suppliers. These large retailers have implemented EDI proprietary networks. A few inter-firm networks do exist between some quasi integrated partners, starting from retailers or from manufacturers. There are very few open networks shared by the whole clothing community, where suppliers to one retailer could communicate with another one.

What happens when the manufacturer receives the electronic order from the retailer? Does electronic communication continue in the supply chain? Previous research in the industry (Steinfield *et al.*, 1998) has shown that transactions like ordering fabric and trim are usually external and not electronic, and transactions like communication of new designs or cutting orders are internal and electronic. If the manufacturer is using automated manufacturing tools, it is likely that the data

regarding the products to manufacture will be transmitted electronically, but only if it is internal to the manufacturing firm. Anything that is subcontracted is usually transmitted in the old-fashioned way (fax, post or phone). Finally, very few of the fabric orders are supported by electronic tools. There is not such a strong pressure, time-wise, as fabric manufacturing is a long process anyway.

To summarise, EDI penetration is quite low in the clothing industry (see Table 2). EDI has been implemented in one out of three industry structures (*Quick Response*), and only in retailers to manufacturers communication (and not in the rest of the supply chain).

Table 2: Degree of EDI equipment per location and per activity

Location Activity	France	US	Total
Textile	50%	100%	80%
Clothing manufacturing	30%	50%	38%
Retail	83%	100%	90%
Total	48%	73%	58%

Source: Author's interviews.

Table 3: Summary of observations on EDI-use per organisation structure

Industry structure Transactions	Garment Centres	Delocalisation	Quick Response
Textile-Clothing	Low	Low	Medium
Clothing-Clothing	Low	Low	Medium
Clothing-Retails	Low	Medium	High

Source: Author's interviews.

The categories of EDI-use are defined as:

- High: majority of the transactions are supported by EDI.
- Medium: Significant part of the transactions is electronic.
- Low: none or very few transactions are electronic; the rest is manual.

The difference per country comes from a different balance of the organisation structures per country. For example, the US has more QR than France.

3 Discussion

From our observations, ICT implementation in the garment industry, and particularly in clusters is still a challenge, due to the role of embeddedness of economic action in social relationships and the high level of trust between economic actors within the cluster.

3.1 Coordination in the clothing industry and the limited support of ICT within clusters

For the NIE, coordination is how the economic agents will make compatible decisions, especially about their transactions. Three coordination modes are generally distinguished: market, hierarchy and partnership, to which are associated three control mechanisms: price, authority and trust.

The clothing supply chain presents itself as a set of activities where the three coordination modes are used, and if they move between operations, this move doesn't automatically involve the obvious domination of one of those modes. In this segmented supply chain, firms of very different sizes operate with numerous and different kinds of links, going from pure competition to quasi-integration, through more or less formal subcontracting. This happens in the "middle" of the supply chain (ready-to-wear clothing), as well as in the upstream (textile industries) and in the downstream (retailing): the Benetton corporation uses all the types of organisational links (cf. Lazzaratto et al, 1993). The issue is then that upstream, middle and downstream have no defined borders: their respective borderlines are mobile. Since the transactions during the different stages of the production process require faster and more reliable coordination, several ways are used to manage them:

• When transactions of high volumes of goods are frequent, then standardisation may occur and electronic networks such as proprietary EDI networks may be used among regular partners: pressures to integrate or quasi-integrate exist. This trend concerns only long-standing product lines and basic garments, produced in great volumes.

• When transactions concern short life lines, then the partnership relationship increases, building trust with mutual commitments and affecting reputation (see Lorenz, 1994).Formal contracting is not excluded, but specificity from one order to the other makes it difficult to standardise the transactions: pressures to integrate are weak, specialisation of producers warrants their flexibility.

• Finally, a large part of the transactions involves informal arrangements, where a credible threat of turning to competitors in case of default on delivery schedules or quality takes place. Those informal arrangements play a key role in the control of the coordination modes.

Thus, we have the paradoxical following situation: in this segmented supply chain, coordination problems are complex and hard to manage, transaction costs for a lot of transactions could be reduced if electronic networks were used in inter-firm relationships. Electronic networks, however, only develop inside hierarchies: if a few inter-firm networks do exist between some quasi integrated partners and more often, inside integrated companies, starting from retailers or from manufacturers, there are no open networks which could rationalise transactions and reduce coordination costs for the entire business, despite the necessity of tight and fast coordination among segments.

Three types of reasons may explain this situation:

-Difficulties in coding the products. Here we follow Pascal Petit (1996). He explains that "using IT is easier when information is easy to code and customer networks are stable". Obviously these conditions are not fulfilled here most of the time, especially, for fashion garments, produced in short lines and with very short life cycles. The big challenge for fashion garments is that information is too diversified and short lived.

-Difficulties in standardising transactions: standardisation in the garment supply chain encounters at least three obstacles: competition between national and international standards, competition between producers and retailers standards and rigidity of product nomenclatures unsuitable for diversified and short-lived products

- Uncertainty of demand. From Malone's point of view (1987), the diffusion of computer networks depends on the frequency, volume and simplicity of transactions. However, transactions on fashion garments have none of these attributes. Finally, it is the ambiguous rationality of buying a fashion garment that could be at the root of the complex structure in this industrial system. Buying patterns introduce extreme uncertainty in the business and the players have to reorganise in order to be more flexible and reactive. To reach this flexibility, partners relentlessly search for compromises between economic constraints and future changes in consumer's tastes. Opposing this shifting demand, the reactivity of the offer can be built by establishing in its midst new ties for which economy is no longer the only measure.

3.2 ICT, trust and type of information communicated.

It results from our observations that the role of trust is contrary to what was previously presented in the literature. This phenomenon is strongly linked to the type of information communicated throughout the chain.

All things being equal, Hart and Saunders's model shows that more trust is favourable to higher levels of EDI use. Our observations show the limits of this statement. In fact, a pre-existing high level of trust is limiting the implementation

of ICT, because trust supports embeddedness, in which interpersonal communication is superior or alternative to electronic one.

We have observed in the Garment Centres in Paris and New York, that over a certain level of trust, “demonstrations of trust decrease the probability of greater EDI-use”, because embeddedness and interpersonal communication are efficient pre-existing (superior, more adapted to tacit knowledge) modes of communication.

Through an inductive and historical perspective, we have shown the importance of trust in ICT relationship with organisation, and more specifically the unpredicted, ambiguous, and non-linear role of trust.

Our arguments are the following: Not only tacit knowledge cannot be communicated through ICT, but also interpersonal communication is a superior way of communicating in the Garment Centre context. Also, the arguments related to the difficulty of coding, the multiplicity of partners, and the importance of the investment, are also valid in this context. Can we conclude from our research in clusters that interpersonal relationships and electronic communication are substitutes to one another? Our observations in the industry lead us to believe that very significant and effective informal relationships between partners can compete with the expected advantages of ICT, especially when powerful and effective social networks pre-exist electronic networks.

Tacit and explicit knowledge as defined by Nonaka (1994) are different in the way that they can be communicated. Two aspects assume relevance in knowledge transfer: the type of knowledge transferred and the applicative context where transfer occurs (Nonaka, 1991, 1994). The meaning of that distinction is that explicit knowledge represents knowing about (objective knowledge), while tacit knowledge represents knowing how (or subjective knowledge). This distinction emphasizes the issue of transferability of knowledge and the modalities employed. Explicit knowledge can be codified, and is therefore relatively easy to obtain, transfer and store. On the contrary, tacit knowledge is directly connected with ideas, perception and experience, and therefore is quite difficult or even impossible to codify and transfer.

Especially in clothing cluster, in between firms that are each specialised in a step of the value chain, the knowledge exchanged is mostly tacit. Interpersonal communication based on trust pre-exists and is more efficient than electronic communication in many situations.

The issue would then not be to transform tacit knowledge in explicit knowledge but rather to improve the flexibility of electronic networks to allow the transfer of less structured information. New forms of electronic exchanges like electronic messaging seem more appropriate to these needs.

Further research should highlight theses developing trends.

4 References

Abecassis C, Caby L, Jaeger C, (2000), IT and Coordination Modes : The case of the Garment industry in France and US, Journal of Marketing Management, 16, 425-447.

Antonelli C., Petit P., Tahar G. (1990), “The diffusion of interdependent innovations in the textile industry”, Structural Change and Economic Dynamics. vol.1 No.2, pp.207-221.

Antonelli, C. (1988), New Information Technology and Industrial Change, Dordrecht and Boston Kluwer Academic Publishers.

Brousseau, E. (1996), “Intermédiation par les réseaux: quelles institutions ?”, In Mutations des Télécommunisations, des Industries et des Marchés. (Ed.) E. Brousseau, P. Petit, D. Phan, Economica. pp. 125-147.

Granovetter, M.,(1985), “Economic Action and Social Structure: The Problem of

Embeddedness”, American Journal of Sociology, Vol 91, No. 3, Nov, p 481/510. Granovetter, M. (1995), “Coase revisited: Business Groups in the Modern Economy” Oxford University Press, pp. 93-127

Malone T., Yates, J. and Benjamin R. (1987), “ Electronic Markets and Electronic Hierarchies”, Communications of the ACM, Juin, vol. 30, No.6, pp. 484-497.

Petit, P. (1996), “Organisation des marchés: le rôle des services et l’impact des nouveaux moyens de télécommunications.”, In Mutations des Télécommunisations, des Industries et des Marchés, (Ed.) E. Brousseau, P. Petit, D. Phan, Economica.pp.137-170.

Orlikowski, W. J. (1995) "Shaping electronic communication: the metastructuring of technology in the context of use." *Organization Science* 6(4): 423-444.

Orlikowski W. J. (1992) The duality of technology: rethinking the concept of technology in organisations; *Organization Science* 3(3): 398-427.

Petit, P. (1996) Organisation des marchés: le rôle des services et l’impact des nouveaux moyens de télécommunications, In E. Brousseau, P. Petit, D. Phan (eds), *Mutations des Télécommunisations, des Industries et des Marchés*, 137-170, Paris: Economica.

Piore, M. and Sabel C. (1984), The Second Industrial Divide - Basic Books.

Porter, M.E. and Millar, V.E. (1985) How Information gives you Competitive Advantage, *Harvard Business Review* 63(4): 149-60.

Steinfield, C., Caby, L., Jaeger, C. and Kraut, R. (1998), “ Electronic Network Use and Coordination Between Producers and Suppliers: a French and U.S. Comparative Analysis”, In Telecommunications Transformation, (Ed.) E. Bohlin and S.L. Levin, IOS Press, Omsha. pp. 135-150.

Uzzi, B. (1997), “Social structure and competition in interfirm networks: the paradox of embeddedness”, Administrative Science Quarterly, 42, p. 35-67.

Uzzi B. (1996), “The sources and consequences of embeddedness for the economic performance of organisations: the network effect”, American Sociological Review, vol. 61, pp.674-698.

Williamson, O. (1994), Les institutions de l’économie interéditions, 1994 - trad de The economic Institutions of capitalism, Free press, 1985.

Regional Learning in the Software Industry: A University Facilitating Regional Networks of Practice

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Abstract. The paper presents a longitudinal empirical study of a regional networking process among software companies. The process took place in the German region of Siegen-Wittgenstein and was carried out by an IS research group at the University of Siegen in an action research manner. Based on Bourdieu's theory of practice and socio-cultural theories of learning, different measures for the support of regional networks were conducted over several years. Within this networking process, the concept of social capital was applied to facilitate Regional Networks of Practice (RNoP). This paper describes the action research approach taken and presents results of ethnographic and qualitative studies which evaluated the networking approach. In particular, the following measures are described and discussed: (i) initializing informal talks and meeting to learn about the region and to build up social capital, (ii) a series of networking events involving academics, local authorities and regional software companies, (iii) the didactical concept of Courses in Practice (CiP) to bridge between university and IT industry, (iv) an EU funded networking project with software and media companies, (v) establishment of a joint research center. The achievements and obstacles of this approach are discussed with respect to the specific historical situation of the region. Furthermore, the outcomes are reflected with regard to the underlying theoretical concepts.

1 Introduction

Flourishing regional networks and clusters are interesting phenomena in the knowledge society. Their existence is an indicator that locality still seems to play an important role in a globalizing economy. So, research into the nature of regional clusters and networks deserves scientific attention. Additionally, regional clusters and networks have become an arena to implement economic policies. While globalization and multilateral agreements seemingly restrict opportunities for policy making on the level of national states, interventions to foster regional industrial sectors appear to be promising. In this paper, we have a double goal: to investigate into interventions to stimulate the process of regional learning, and by evaluating these interventions, to better understand the reproduction of socio-territorial entities, such as clusters or networks. We will conduct this investigation from the point of a research university and look into its opportunities to stimulate regional learning in specific industrial sectors.

Regional clusters attracted considerable scientific attention recently. However, the discussion has not yet let to a coherent definition of the concept and a sufficient understanding of the mechanisms of a cluster's emergence and reproduction (cf. Lundvall 1992, Guiliani 2005, Bahlmann and Huysman, in this issue). For the purpose of this paper, we draw on Porter's (2000) definition. Clusters are seen here as "geographical concentration of interconnected companies, specialized suppliers, firms in related industries, and associated institutions (…) in particular fields that compete but also cooperate" (p. 15). We define regional networks as those socio-territorial entities which consist of regional firms working in a similar industry but do not qualify as clusters due to a lower level of concentration or lacking vertical integration. The focus of this paper will be on regional networks.

From the very beginning of the discussion, scholars have been aware of the importance of knowledge "spillovers" for the flourishing of regional clusters. Marshall (1890) saw the main reason for regional clusters to emerge in the physical domain. However, he was already aware of the fact that expertise sharing within a specific industry can be enabled by physical proximity of the actors (cf. Bahlmann and Huysman, in this volume). Right now economies in the industrialized world are moving from mass production towards flexible specialization as well as from material products towards knowledge-intense services. Under these conditions regional learning in the sense of information passing and expertise sharing becomes an increasingly more important economic factor (cf. Florida 1995). This fact is also reflected in the cluster related literature (cf. Porter 1990, Saxenian 1994). Other studies have supplemented this view by pointing to the importance of cultural factors such as shared values systems and a feeling of reciprocity among regional actors (cf. Becattini 1990, Lazerson 1990). Guiliani (2005) explains the development paths of regional clusters primarily

from a knowledge perspective. She argues that the ability of the individual firms to absorb information or expertise from external sources is central to the growth potential of regional clusters. Universities are often seen as important institutional factors in technology transfer and the development of regional clusters (cf. Saxenian 1994, Lockemann 2004). Our investigation is based on the hypothesis that research universities can also take the role of a facilitator to foster learning in regional networks. While information passing and expertise sharing nowadays plays an important role in the development of regional clusters, we assumed that it becomes an even more central focus for the development of regional networks. Such a focus is required for the development of these socio-territorial entities since firms cooperate in networks much less intense with each other than in clusters.

To ground our investigation theoretically, we draw on the theoretical concept of practice and social capital. Social capital in the sense of sustained mutual relationships is a precondition to enable expertise sharing among human actors (cf. Ackerman et al. 2003; Huysman and Wulf 2004;Huysman and Wulf 2005; Cohen and Prusak 2001). Socio-cultural theories of learning hold common practice and mutually defined identities to be central enabling conditions for expertise sharing (Wenger 1998; Brown and Duguid 1991; Lave and Wenger 1991). While these conceptions have not yet been widely applied to the analysis of socio-territorial entities, they provide us with a suitable foundation to conduct interventions and empirical analysis.

The paper is structured as follows: In the next section, we will provide an introduction to the discussion on social capital and present results from socio-cultural theories of learning, such as the concepts of network and community of practice. The third section describes the research field and methods. Section four presents the set of different activities which we conducted in fostering regional learning. Section five evaluates empirically the outcome of these activities. Finally, we discuss the findings of the study.

2 Theoretical Framework

To ground our interventions and to evaluate their outcomes, we have chosen theories of practice as a conceptual framework. Going back to the American pragmatists, theories of practice provide a framework to understand the particularities of specific social aggregates. Theories of practice conceptualize society to be divided into entities which have distinct histories shaping their members' action. The particularities among these entities can be explained by their members' rational practical reasoning only when traced back to their socio-cultural and even material and bodily constituencies.

With regard to regional learning, theories of practice allow us to understand the particularities of social entities and human actors and can help us finding appropriate means to bridge among these practices. Pierre Bourdieu (1977 and 1990) is interested in social distinctions when investigating into the reproduction of classes. His analysis of the different forms of capital and their transformation provided us with insides on how to bridge among different social aggregates.

Distinct from Bourdieu's approach, the concept of social capital has also been tackled from a communitarian perspective (cf. Huysman and Wulf 2004a). Neglecting its segregating effects, social capital is understood in this discourse as a property of social entities, which enables their well-functioning (e.g,. Putnam 1993, 2000). In this sense many scholars have argued that social capital is essential to information passing and expertise-sharing activities (Nahapiet and Ghoshal, 1998; Cohen and Prusak 2001; Huysman and Wulf 2004). So, social capital seems to play a crucial role when fostering regional learning.

Finally, we will look into socio-cultural theories of learning. Networks and community of practice are conceptualized as distinct social aggregates. However, they are conceptualized along one communality, which is defined by their specific practices. This homogeneity of practices is seen as the base for their expertise generating capacity (cf. Brown and Duguid 2000b; Wenger 1998; Brown and Duguid 1991; Lave and Wenger 1991). In this sense, socio-cultural theories of learning seem to provide a well elaborated theoretical basis for analyzing regional learning.

2.1 Bourdieu's Theory of Practice

Bourdieu's work (1977 and 1990) is characterized by an attempt to bridge between subjectivism and objectivism in sociological theory. He argues that a social analysis needs to start with an understanding of the subjective reasoning of the human actors involved. Such an analysis allows understanding the complexity and situational embedment of human action in social fields. In a second step, sociologists, however, have to uncover the underlying social structures which guide human action.

Bourdieu develops the concept of practice to frame the subjective dimension of individual and social activities. In his earlier work he uses the term in three rather distinct ways: (1) "Practical reasoning" is the dominant form of human thinking and decision making. It is grounded in human actors' everyday's life experiences. Bourdieu assumes that it is distinctively different from theoretical reasoning which is found in scientific discourses or formal logics. (2) The term "practice" is what makes social setting out of a set of activities, such as playing golf. A specific practice has always a history and is related to reputation; it shapes the identity of the actors involved. (3) The term "practice" is occasionally used by Bourdieu to

just denote the performance of a specific action by a human actor (cf. Wade 2004, p. 5). While the concept of practice, diverse as it is, plays a rather prominent role in his earlier work, it fades away in his later ones. It is partly replaced by the concept of social field.

"Habitus" is a central concept to Bourdieu's attempt to integrate subjectivist and objectivist approaches. It can be understood as a pattern of perception, thinking and action. Habitus, while being the attribute of an individual actor, is socially constructed. It has a dual nature in the sense that it is structuring actions as well as it is structured by action over a human actor's lifetime. Habitus influences human action in a particular situation but does not determine it. So, habitus is reproduced within the different practices, or social fields, in which a human actor is involved. From an empirical research perspective, habitus needs to be observed by analyzing actors' different practices. Similar to the concept of practice in social-cultural theories of learning (see below), habitus describes historically grown differences among social entities, such as classes, which separates human actors from each other.

Bourdieu sees human actors being struggling for resources in specific social fields. The individual actors' forms of capital determine their opportunities to act.

> "And the structure of the distribution of the different types and subtypes of capital at a given moment in time represents the immanent structure of the social world, i.e. the set of constraints, inscribed in the very reality of that world, which govern its functioning in a durable way, determining the chances of success for practices" (Bourdieu 1985, p. 241).

Bourdieu (1985) distinguishes between economic, cultural, and social forms of capital. Economic capital is immediately and directly convertible into money. It may be institutionalized in the forms of property rights. Social capital defines the advantage created by a person's location in a structure of social relationships. It explains how certain actors gain more success in a particular social field through their superior connections to other people. Cultural capital defines a person's forms of knowledge, skill, education, and the resulting habitus, which gives her a higher status in society. It can exist in three different forms: (1) in the embodied state as part of an actor's habitus, in the form of long-lasting dispositions of the mind and body; (2) in the objectified state, in the form of cultural goods (e.g. pictures, books, dictionaries, machines), and (3) in the institutionalized state, in the form of generally accepted educational qualifications and certificates.

In his book *Distinctions*, Bourdieu (1984) introduces the additionally concept of symbolic capital. Symbolic capital can be understood as the amount of honour and prestige possessed by a person, which allows her to influence or manipulate the value system and acting of others in a social field. Symbolic capital is a species of capital that is perceived through socially inculcated classificatory schemes. Symbolic capital is strongly related to cultural and social forms of capital. However, we will treat it in our analysis as a specific form of capital.

The different forms of capital are interrelated and can be converted into each other. As a result of a historical process, actors of different social entities are equipped with rather different amounts of these forms of capital.

2.2 The Communitarian Concept of Social Capital

The term social capital (SC) has been conceptualized heterogeneously with regard to its definition as well as to its epistemological grounding (cf. Huysman and Wulf 2004a). In line with Bourdieu's conception, a line of thoughts applies the concept of SC to reintegrate social structure and practices into economic thinking. The basic assumption is that economic interactions are embedded in social relations. Through social exchanges, people build webs of trust, obligation, reputation, expectations, and norms which influence their economic behaviour [Granovetter, 1985; Coleman 1988).

In American communitarism SC has been defined as an attribute of a social entity, i.e. community, rather than of individual actors. Communities are seen as voluntaristic social units which promote harmonic development of organizations or society as a whole. Advocates of this point of view protest against the decline of social trust, the loss of civic engagement, and seek to foster the moral, social, and political foundations of society (Etzioni, 1995; Putnam 2000). Putnam (1993 and 2000) equals SC with the level of civil engagement and applies the concept of SC to cities, regions and whole nations. He understands SC as a set of properties, e.g. norms, level of trust, or social networks, which enables joint activities and cooperation for mutual benefit. Rising SC would be seen as a major ends in regional development.

Next to civic engagement, SC is perceived to be an important enabling factor for knowledge and expertise intense processes in and between organizations (e.g. Lesser et al. 2000). Focusing on the relational aspects, SC theories have been applied as a conceptual base to knowledge and expertise sharing strategies (Huysman and Wulf, 2004; Cohen and Prusak, 2001; Nahapiet and Ghoshal, 1998). Cohen and Prusak state in this respect:

> "Social capital consists of the stock of active connections among people: the trust, mutual understanding, and shared values and behavior that bind the members of human networks and communities and make cooperative action possible. (...) Its characteristic elements and indicators include high levels of trust, robust personal networks and vibrant communities, shared understandings, and a sense of equitable participation in a joint enterprise - all things that draw individuals together into a group" (Cohen and Prusak 2001, p. 4).

It is assumes that SC is accumulating when it is used (productively), otherwise it is decreasing. In this sense SC tends to be self-reinforcing and cumulative.

People gain connections and trust by successful cooperations, and these achievements of networks and trust support good cooperation in the future.

2.3 Socio-Cultural Theories of Learning

Socio-cultural theories of learning and theorists of SC agree with regard to the importance of social networks for expertise sharing and learning. However, socio-cultural theories of learning focus on the preconditions for learning. It is assumed that mainly people who are engaged in similar practices are able to share or create knowledge concerning these practices (Lave and Wenger 1991; Brown and Duguid 1991; Wenger 1998; Brown and Duguid 2000b). So these theories offer an approach to explain under which conditions social capital can be most efficient for regional learning (cf. Duguid 2003 and 2005).

Practice is basically understood in line with the second of Bourdieu's usages of the term: a recognizable social entity shaped around a set of related activities. Lave and Wenger (1991) and Wenger (1998) define the concept of a community of practice (CoP) as a tightly knit social entity centred on a particular practice. They stress on the intertwinedness of practice, identity and sense making within a CoP.

Brown and Duguid (2000a) and Duguid (2003) distinguish networks of practice (NoP) from communities of practice (CoP). Within communities of practice, members do not only share a common practice but work together, and therefore, need to coordinate their activities with each other. The members also have, at least implicitly, responsibility for the reproduction of their community and their practice. The creation of new knowledge and expertise is happening mainly inside of CoPs.

Members of a Networks of Practice (NoP) share practice but do not work together, and therefore, do not need to coordinate their activities. The members of a NoP can be unknown to each other. They often only interact in an indirect manner, i.e. via newsletter or bulletin boards. Within NoPs common practice offers a reference to members for their interaction. Common practice allows them to make sense of it in a relatively effective and coherent way (cf. Duguid 2003). While new knowledge is mainly created inside CoPs, NoPs are instrumental in passing information among its member. To illustrate the concept, Duguid (2005) takes the example of Knorr-Cetina's (1999) "epistemic culture" of high-energy physicists which constitutes a global NoP which contains multiple local CoPs.

CoPs and NoPs can be seen as ends in a continuum of social entities defined by similarities in their practice, identity and sense-making. While CoPs will typically have a rather narrowly defined practice and a strong feeling of identity, the shared practice of a NoP will span a much wider variety, its identity will be less strongly felt. Therefore, the processes of sense making and learning differ in this

continuum. The mechanism of legitimate peripheral participation describes how outsiders become members of a CoP by enculturation and gradually acquiring its practice (Lave and Wenger 1991). Information passing within NoPs can be seen as a mechanism to explain learning across the boundaries of different CoPs.

For the purpose of our investigating into regional learning, we will define Regional Networks of Practice (RNoP). RNoPs are understood as NoP whose members are living and working in the same region and know each other personally. Well functioning and density of RNoPs are important aspects of a region's SC – in Putnam's sense. Saxenian (1994) showed the importance of RNoP for the development of industrial clusters when investigating into the development of the Silicon Valley and the Route 128 region.

2.4 Conclusion

Bourdieu and the learning theorists mentioned above share an interest in understanding social systems from the perspective of their socio-cultural disposition which they conceptualize as being historically emerging. Both schools believe in the constitution of human action by practical rather than by theoretical reasoning. Deconstructing the social world into distinct social entities as units of analysis is a central element in their theory building. However, the scientific goals and the resulting criteria for deconstruction vary. While Bourdieu is interested in the reproduction of social classes, the socio-cultural theorists investigate into the emergence and circulation of expertise within communities or networks of practice.

SC und socio cultural theories of learning both focus on the importance of social networks for the exchange of knowledge. However, practice theories rather focus on the human actors' capability to share knowledge. Only those actors which engage in similar or shared practices are able to share knowledge about those practices (Duguid 2005). Despite criticisms of the SC approach and the limitations of Putnam's definition of the term (Huysman and Wulf 2004a), social capital perceived as a regional resource seems to be a useful metaphor to guide an action research approach into fostering regional learning. We assume that rising SC represents a precondition for the emergence of RNoPs.

3 Field of Application and Research Methods

In the following, we will describe our action research approach. We will describe the regional setting, looking at the software and media industry as well as

the university. We also introduce the research approach and methods we conducted to foster regional learning.

3.1 The Regional Setting

The region Siegen-Wittgenstein is located in the state of North Rhine Westfalia almost at the geographical centre of the western part of Germany, about 100 km east of Cologne. Siegen, the region's centre, is a city of about 100.000 inhabitants. In one of its suburbs, the University of Siegen is located. The Siegen-Wittgenstein region has a tradition in heavy industries, specifically in steel production. In the end of the 19th and the first part of the 20th century, the region was an important location for mining in iron ore. Since the mines were closed and later on most of the steel mills disappeared, mid-size companies in the business of specialized machine and plant manufacturing as well as foundries play an important role in the regional economy. These companies are typically export-oriented towards the world market. The official figure of unemployment is at about 7%, well below the federal German average.

The University of Siegen has been founded in the beginning of the 1970s as part of the then happening expansion of the German university system. During the last 35 years, a research focus in media sciences has been established at the University of Siegen, which has gained considerable international visibility. In the late 80s an applied computer science program was established, in the late 90s a program in information systems was added.

During the last 30 years software and media companies have been started within the region. Some of the companies were created by former students of the university's media science, computer science, and information systems programs. The regional authorities maintain a database in which about 450 small to mid-size companies are registered at the moment. These companies employ about 4.500 workers. The regional authorities regard the software and media industry to be one out of nine sectors which they consider to have regional importance.

The regional authorities have set up a coordinating unit whose job is to foster the development of the software and media industries. The unit has a head and three part time employees. A particular focus of their activities is fostering the linkage between university and regional industries. Since about five years, the regional authorities were involved in allocating regional development funds of the European Union. These EU funds were intended to be allocated for regional development, especially the qualification of employees and the networking of companies. The regional authorities had set up a council to decide on project applications in which the regional employers' association and trade unions were represented, as well.

The action research program presented here was conducted by a research group at the University of Siegen's Department of Information Systems which is headed by the second author. The research group works in the field of human centred computing, specifically in the subfields such as Computer Supported Cooperative Work, Participatory Design, End User Development, and Communities and Technologies. Supported by research funds from different government sources and industries, the IS group grew during the time of investigation from two to ten staff members (faculty and research associates) and a similar number of students working as research assistants. Research is organized around specific, typically externally funded projects, and research practice develops within these projects or bundles of related projects. The second author also headed a research group at Fraunhofer FIT. The Fraunhofer Society is a well known and highly respected chain of German national research centres dedicated towards applied science and knowledge transfer into industries.

3.2 Research Methods

The research group of the University of Siegen started its regional network activities within the local software and media industries in 2002 when the head of the group got a faculty position in the Department of Information Systems. In the beginning, there were mainly three motivations to become engaged in regional activities:

- Access to regional companies was seen as an important element in information systems' education. The authors had gained earlier experiences in integrating student teams into companies' CoPs when pursuing entrepreneurship education at the Computer Science Department of RWTH Aachen and MIT Sloan School (cf. Rohde et al. 2007).
- Building cooperation between university and local industries was seen by parts of the academic colleagues, especially in the information systems department, and more so even by the president and the chancellor of the university, as an important aspect of the institution's mission. So these activities would probably strengthen the group's standing inside the university.
- A part of the German national and European Union's research funding schemes are dedicated towards joint projects between industries and academia. While these schemes typically do not require local partners, it can be considered to be an advantage to dispose of a rather large network of industrial partnerships.

We have decided to investigate into regional learning from an action research perspective. We adopted three of Lewin's (1946) principles of action research in applying to:

- Researchers are not just external observers but intervene into the field of application. In our case, we tried to increase the level of social capital in the region and link different communities of practice in the software and media industries.
- Research is a mutual process of learning among the researchers and the practitioners. It is based on an emergent process which takes shape as understanding increases. Action research emphasizes direct researcher-probant collaboration and focuses on group dynamics as the appropriate basis for practical problem-solving. Therefore, it usually combines participative and qualitative methods of analysis, planning, intervention and evaluation (Lewin 1946). In our case learning happened in a double sense: we learned together with the practitioners about the effectiveness of our interventions, the different networking activities. Additionally, our interventions intended to initiate an experience sharing and information passing process in the region.
- Researchers and practitioners joint in tackling an issue of mutual interest. When starting the process, we assumed that fostering RNoP would be a desirable goal for the regional software companies, as well.

Traditional action research distinguishes three phases of intervention: a) reflection phase, b) planning phase, and c) action and observation phase (e.g. Kemmis and McTaggart 1988). In contrast, we did not start with on overall phase model or plan for the different interventions. The interventions rather emerged due to a variety of opportunities and context factors. However, they follow the vision of increasing social capital and bridging among different regional CoPs.

We gained an initial understanding into the particularities of the regional industry by informal discussions with senior faculty at the university, the head of the regional authority's support unit, and some company owners. Supported by the regional authorities, we conducted a first networking event which again led to new insights and contacts. From this starting point, a series of events emerged which will be presented later. Courses in practice were an important aspect of the networking process in which students were supposed to learn by enculturating into regional companies' CoPs.

Within our action research team, there was a certain division of labour. While the second author, being faculty member at the University of Siegen, conducted most of the interventions, the first author, and additional colleagues, rather took the more passive position of observers. They gathered data by means of observing networking events and interviewing participants.

We conducted a series of semi-structured interviews and additional observational studies during the last four years. Since the courses in practice were an important research focus, we conducted 25 explorative semi-structured in-depth interviews with students, supervisors from academia and industries, and officers of the regional administration. 14 students, six company practitioners, three academics, and two officers were interviewed. During the interviews, which

lasted between 60 and 180 minutes, students were first asked about their personal background, their background of education and their motivation for participating in the course. After that, students were questioned on personal impressions and assessments of the course, its single components and the technological support by groupware and cooperation platforms. Students were also asked to suggest improvements. Lecturers were asked concerning their personal background and high emphasis was placed on assessments of the lecture-components held by them. The regional officers were asked about their activities to encourage the competitiveness of the regional software and media industry. We were specifically interested in their experience in establishing regional networks and their evaluation of our joint activities in fostering regional networks of practice between local industry and the university.

Furthermore, a second series of thirteen semi-structured interviews have been conducted with managers of regional media and IT companies, regarding the introduction of an expertise finding system. These interviews focused on internal and external cooperation, communication in networks with partner companies and customers, and IT infrastructure. Additionally, the interviewees were asked about their strategies to find new partners and to identify specific interests, expertises and competences of internal collegues, external partners and potential customers.

Each person was interviewed in an individual session. All interviews have been recorded with a DAT recorder and fully transcribed. In the evaluation, the answers were transformed into a table categorizing the role of students, academic, and industrial supervisors.

Furthermore, other measures to foster regional networking have been evaluated by participant observation. The observational data was structured around the different events and documented in form of written notes and minutes. Interviews and observational data have been analyzed descriptively according to our heuristic approach (cf. Kyale 1996). The process was informed by the experiences gained when carrying out the different measures. Additional the second author kept a calendar in which he documented his regional networking activities.

4 Fostering Regional Learning

In the following, we will present the selected instruments applied to foster social capital and bridge among CoP in the software and media industries. In the following, we will analyze the intervention processes by means of Bourdieu’s forms of capital.

4.1 Learning to Know the Region: Informal Talks and Meetings

When starting the process, the faculty member did not know the key players of the region's software and media industry. During the course of the first three years, a considerable amount of time was spent in many informal meetings with a big variety of local actors. Given the general interest of the second author in establishing cooperation with the region's industries, he picked up on opportunities arranged by others. Later on the process gained its own dynamics in the sense that regional actors approached the IS group. In the following, we will present those newly established connections which led to further activities within the regional networking process.

Half a year after taking over the faculty position, the second authors was introduced to the head of the region's coordinating unit for the software and media industry. A senior IS faculty member who had a long standing cooperation with the unit had told him about the existence of the unit and suggested to call the head. In the talks it become quickly clear that both sides had a strong common interest in connecting the IS group with regional industries. For this purpose, the head of the unit offered parts of his network of relationships within the region. He hinted to local company owners who could be of interest for the IS group and contacted them. He also hinted to specific companies which could be interested in cooperating with the university within the framework of Courses in Practice (see below). As a result of the talks the idea for a series of networking event emerged (see below).

In summer 2003, the second author met a consultant whose small company was specialized in setting up EU-funded projects to network small and medium sized enterprises (SMEs). Though the consultant was living in Siegen, his company had not yet been able to get a project in the Siegen region. He hoped to be more successful when involving a faculty member of the local university into his proposal. An acquaintance of both of them had introduced them to each other. As a result, it was agreed to try to write a project proposal to network and consult companies of the local software and media industry (see below).

In fall 2003, a journalist of the major local newspaper met with the second author. He was responsible for covering the page on local economics at that newspaper and got interested in the IS group as a result of their local activities. The journalist was interested in learning about the group's research activities and its engagement with local companies. The local newspaper is still a family run business whose main activities are centred in the Siegen region. Beyond journalists' interest, it is safe to assume that the publishing house has also commercial interest in the flourishing of the local software and media industries. Being by profession well informed about regions industries, the journalist shared his perspective on important regional actors with the second author. The second author offered to keep him well informed about further initiatives. The meeting contributed to a rather broad and positive coverage of the IS group's activities in

the newspaper. The two less important newspapers with a regional coverage followed later on with corresponding reportages.

At about the same time the second authors was invited to a become member of a workgroup in which a department head of the biggest regional software company and a regional investor discussed future trends in the software industry. A particular focus was seen in discussing new applications with HDTV and iTV. The major software company was on the way to launch new products in the field of iTV. The work group was organized by the head of a regional transfer centred jointly financed by the university and the regional authorities. While the work group did not lead to clear outcomes and was given up a year later, the personal access to the industrial actors remained and let to the inclusion of the software firm into the regional networking activities.

4.2 Increasing Visibility and Connecting Actors: Networking Events

As a result of the talks with the region's coordinating unit, a concept for a series of networking event was worked out, called „Lyz Media Breakfast" (according to the location the meetings took place). It tried to reach out towards heads or upper management of regional software and media companies. Following an invited talk in the early morning (starting at 8:30 a.m.), there is a joint breakfast for the participants to network with each other. So it is designed that participants can leave by 10 a.m. to follow their daily work schedules.

At the first of these events, the first author gave an introduction into the work of his group at the University of Siegen. Moreover, a member of his group at Fraunhofer FIT gave a survey on the Usability Lab's services for industry. The coordinating unit had sent invitation letters to the heads of 350 software and media companies stored in its database. The first event had some 25 participants and let to discussions and talks among the participants. The first instance of the events was considered to be successful which made the coordinating unit decide to continue organizing further events at a frequency of about 4 events per year.

The regional coordination unit had set up a similar series of events already before. But it had been abandoned some time ago. They took the interest of the IS group as a motivation to relaunch their activities. Coverage by the local newspapers helped to announce the initiative within the region.

Beyond the "Lyz Media Breakfast" series of networking event specifically designed for the software and media industries, the second author was invited to give talks about the group's work at a variety of different events in the region. The audience reached from the local trade union association towards the industrial board. These talks helped rising the visibility of his group's work. After the talks there were opportunities to start talking to the different regional actors.

4.3 Bridging between University and Industry: Courses in Practice

Based on earlier experience in entrepreneurial education, we have developed Courses in Practice (CiP) to be a didactical concept which bridges among CoPs of regional software companies and the IS group. Originally, the concept was developed to offer learning opportunities to students by integrating student teams into the CoPs of local IT companies (cf. Rohde et al. 2007).

The CiP approach works as follows: IT companies define projects close to their core business. The student teams work on these projects inside the companies. When working in industries, the students are additionally coached by members of the IS group. Each group is supported by an academic supervisor. CiPs have duration of typically one term (4 months). During this time about five meetings among the students and their academic supervisors take place.

In the end of the term, the students and their company advisors present the results of their projects publicly. The students give a 20 min talk about their results which the company advisors comment on it for about 10 min. Finally, the results are discussed publicly. The event is announced in the region. The participation of the faculty's dean and the engagement of the regional administration guaranteed a certain level of public interest. So, typically some 30 employees of other companies, faculty members, journalists, and students join the presentations which end with a small reception. These events became occasions for further networking among the regional actors as well for acquiring new companies and students.

A groupware tool called Basic Support for Cooperative Work (BSCW) was deployed to all CiP project groups to support their internal cooperation as well as the interaction with the academic supervisors. BSCW was developed by the Fraunhofer FIT (cf. Bentley et al. 1997). The system supported cooperation within and between working groups. Lecture and project materials have been published in the system. In order to find these materials, the system offers various options for retrieval. Furthermore, awareness mechanisms and functionality for annotations and discussions are offered to users.

The first CiP were held in summer term 2003 at the University of Siegen. After presenting the concept to him, the head of the regional coordination unit pointed us towards two small software companies whose CEOs he knew well and thought could be interested. Following his introduction, we had a meeting with each of the CEOs and convinced them to buy into the project. Since 2003, four instances of the CiP have been conducted. Eight student team, two every year, consisting of overall 19 students got encultured into the CoPs of four different software

companies. Two of the four companies participated more than once in the course: one of them four times, the other company two times.

When investigating empirically into the learning processes happening within CiPs (Rohde et al. 2007, Fischer et al. in preparation), we found that the students teams do not just enculturate into the companies' CoPs. Due to the student learning history at the university and the coaching provided by the IS group while running the projects, the students often turn into boundary spanner between the university's and the company's CoPs. This is specifically the case the company define projects related to innovative products or processes, in which they do not have an established practice inside their company.

According to the interviews and the observation, the usage of technological cooperation support with BSCW seemed to be ambiguous: While some of the CiP groups used the system regularily and found the support very helpful for their cooperation, other groups did not use the system very much. The findings showed that the usage of cooperation platforms like BSCW depends on several factors, as the number of members of a CiP group, their spatial collocation/distribution, the frequency of their physical meetings, and the usage of other systems (like CVS) in the participating companies. The application of technological cooperation support was more important, as less frequent physical meetings of distributed groups have been conducted. Furthermore, some of the involved IT companies denied to use the BSCW system at all, due to the priority for their own technological infrastructure.

4.4 Bridging among Regional Industries: Funded Networking Project

The European Structural Fund (ESF) provides funds for the industrial development of specific regions under different program lines. In North Rhine Westphalia, the state government had decentralized the decision-making for allocating considerable parts of these funds into the regions. Siegen-Wittgenstein had creating an advisory board which decided on the different project applications. The advisory board represented enterprise owners, trade unionists, local politicians, and members of the region's administration. A section of the region's business development department was instrumental in preparing the decision making of the advisory board. Since the board did not meet often, the department had a strong influence on the decision process. It provided most of the relevant information towards the members of the board.

Together with the consultant, in September 2003 the second authors set up a meeting with eight CEOs of regional software and media companies. Both sides had attracted have of the participating companies. In the meeting we tried to agree with the companies on joint vision and a work plan for the project which fitted the

criteria of the ESF program. In the meeting and the following negotiations, it turned out to be impossible to agree on a work plan. This was due to different interests among the companies, historically grounded animosities and rivalries among certain CEOs, and the requirements that the companies should pay for about one quarter of the projects total costs. In the end of November, we finally succeed to hand in a proposal with a smaller consortium. It was directed towards consulting the participating companies individually and set up consortia meetings to foster expertise sharing among them. The proposal was rejected by the regional authorities. Though the second author intervened strongly towards the head of the coordinating unit, he did not get a clear feedback on the backgrounds of the decision nor could he revoke it.

Surprisingly, in late November 2004 the regional authorities approached the business consultant and the second author to submit a similar proposal than the one rejected about a year ago. Unfortunately the funding conditions had deteriorated. So the companies were expected to cover about half of the costs for the services the project provided. Therefore, we had to find new partners from the local software and media industries and rearrange the project proposal. The project was surprisingly approved with just four partners – just one remaining from the original proposal. The activities of the network-building process cover joint meetings among the CEOs, meetings with the IT departments of strategic clients in the region (e.g., a brewery, a producer of switchboards), and joint public relations. So these joint activities focus around marketing and management practice within software and media companies.

Furthermore, the IS group is in the process of establishing a joint research center in the field of interactive television (iTV). The center will focus on research and development of innovative technological features and suitable formats of iTV. This activity is jointly pursued by a regional software company, the administrative body of the region, and the university. The software company is member of the ESF project and has already participated four times in CiP. This initiative therefore is grounded in a longer history of cooperation among the different actors.

Finally, the IS research group has developed research proposals together with different member companies of the regional network. Many research programs of the German government and the European Union require participation from industry. Some of them even require explicit SME participation. So, it makes sense for the IS group to include regional companies into their research proposals in case there are matching interests and converging practices. So far two joint research proposals have been written of which one got funding. The participating companies were both involved in CiP before writing the joint proposal and are both members of the ESF project. So the research proposals are grounded on an already rather well established cooperation between university and industry. On

the other hand, the opportunity to receive public funding via the university's activities stabilized the regional networks.

4.5 Supporting Cooperation: Expertise Finding in Regional Networks

For the media and IT industry in the region of Siegen-Wittgenstein, a company database exists with about 600 different firms. This regional company database only contains the main address data and some keywords regarding the companies' core business. The database is rarely used as regional "yellow pages" but quite often less informative than the companies' websites. Therefore, it is planned to introduce a system for expertise finding additionally to this database. The ExpertiFinding Network has been developed at the IS group of Siegen University to foster cooperation between employees in large, distributed organizations.

The system helps to become aware of persons' expertise by making individual knowledge and interests visible. It offers an expertise search engine which generates individual expertise profiles by using self-assessments and automatically created keyword profiles. Since the self-generated profiles present "yellow page"-like data (contact information, organizational status information, formal qualification, main interests asf.), the automatically-created keyword profile is generated by an analysis of documents and folders which are assigned for this analysis by the individual users. Intelligent search mechanisms allow for the generation of an sorted keyword list which is ordered by the frequency of the individuals' keyword usage in their documents. That keyword listing can be edited by the individual user and then be published in the system. Therefore, no documents have to be made accessible to others but only structured data concerning the individual work practice. Furthermore, no information is distributed which is not authorized by the individual user before.

To foster cooperation within the regional media and IT industry in Siegen-Wittgenstein it is planned to introduce this ExpertFinding Network not providing data about individual expertise but about the expertise and competencies of companies. Each regional IT company should be able to create an own "yellow page"-profile and to assign official documents (which might be published already elsewhere or which are not published before) for an automatic keyword analysis. After editing the resulting company's keyword list, the company publishes the data in the system. Users of the ExpertFinding system can search for certain keywords and compare their own profiles (the yellow page-profile as well as the keyword-profile) with that of other companies. Intelligent matching algorithms allow for the finding of companies which are similar to the own company's profile.

According to thirteen interviews with regional IT managers that were conducted during spring and summer 2006, an improvement of the regional marketing of products and services is expected by some interviewees. They consider such an ExpertFinding system an addition to companies' websites, leaflets and call center activities. Some managers stress the importance of the regional market for their business. They attract their regional customers by a good reputation and references communicated mainly in personal networks. Especially very young companies (start-ups) seem to expect improvement by the application of the ExpertFinder. They hope for a quicker and better integration into the regional market.

Other managers stated that their marketing is not focusing on the regional but on national or international markets. These persons expect the main effect of such a system concerning the support for regional cooperation with other IT companies. Furthermore, they see some advantages of regional cooperations in the reduction of costs (e.g., travelling expenses) and more effective cooperative relations.

However, some interviewees are very sceptic with regard to the application of the ExpertFinder network. They state that their knowledge of the regional companies and their competencies is quite good and therefore, they do not need support for the regional expertise awareness. Others are very critical with concern to the regional competition. They are worried about giving away information to competitors.

Despite the presented critical statements, the introduction of the system is planned for the beginning of 2007. According to the action research approach, this introduction process will be evaluated and adaptation of the existing ExpertFinding framework to regional companies' needs and requirements are projected.

5 Obstacles to Regional Learning

While the description of the regional networking process has focused so far on the overall achievements, we also encountered considerable problems and set backs.

In the beginning, it was difficult to identify companies whose practices were related closely enough to the ones of the IS group. Since user orientation does not have a strong tradition in computer science curricula at German universities, the importance of this set of practices was not fully understood by some of the regional software companies. So some of them felt little motivation to engage with the IS group. Others did not have fitting expectations of how to match practices. For instance, in the first instance of the CiP one of the companies

defined the project tasks in a way that pure implementation work had to be conducted by the student team. The company wanted to realize an awareness feature within an on-line community system. Though the IS group's research agenda dealt with the design of a communityware, the company just asked the student team to implement a prespecified feature without conducting a requirements analysis or evaluating design alternatives. They seemed to be more interested in cheap student software developers than in (mutual) learning at all. Thus, it took time to identify fitting practices within the local software companies and adapt mutual expectations.

When trying to establish the funded networking projects, we found that the development practices among different regional companies varied considerable. This was due to the fact that many of these companies worked in rather distinct market segments and based their development on different tools and platforms. To secure shared practices among the CEOs involved, we focussed the joint networking activities around *management* practices in the software industry, which seemed to be more comparable between the different firms.

Even if fitting practices can be identified, the different actors need to accumulate sufficient trust to open up for boundary spanning processes. In the case of CiPs, in two instances companies defined projects which were only peripherally important to their core business. Their engagement in taking care of the students and offering opportunities for enculturation was rather limited in these instances, as well. On the side of the students, such an attitude limited their readiness to engage fully in the project. Moreover, in one of these cases doubts came up whether one of the companies would act fairly towards their students. During a first meetings with the university supervisors, one of the participating students mentioned that the company still owed him money from an earlier student job. Therefore, he clarified in the meeting that he would not participate in the team which was supposed to work in this company. While he participated in the team work with another company, his remarks left traces in the other student team's readiness to enculturate into the company's CoP.

Trust also had to be built during the first meetings of the networking project. In a first meeting, the participating CEOs were rather reserved with regard to talk about their problems and issues to be addresses in the project. This attitude changed in the course of the next meetings, however, to different extents among the actors.

During the networking project, we also found that certain companies, while participating in the networking process, did not want to be seen as regional players. Two of the larger SMEs delivered software and services to client all over Germany. They did not want to be perceived as *regional* players. Therefore, we avoided setting up a website for the regional networking process. Thus, it is important to respect the specific identity and self concept (Tajfel 1982, Tajfel and Turner 1986) of the different actors within regional networking processes.

The networking efforts took place in a social world which was shaped by historical processes predating our activities. At different occasions, it turned out that historically caused animosities prevented us from bringing actors together. For instance, when organizing the first ESF consortium among regional software and media companies, two competing web agencies would not enter the consortium jointly. When investigating into this issue, we learned that the CEOs once worked in the same company and separated in a move which was mutually perceived to be hostile. We perceived similar phenomena when setting up the workgroup on HDTV and iTV: The head of the regional economic board was formally member of the group. However, he never showed up due to the fact that he and the local entrepreneur were competing for influence in the region's parliament where they represented different political parties.

The networking activities in the software and media industries were also competing with activities in other industrial sectors. When the first application of the ESF project failed, it became clear that the regional administration had decided in favour of actors from different industrial sectors. Since he was not made aware by the regional authorities with regard to such a potential competition, the second author was strongly disappointed with regard to the application's outcome. Since he felt betrayed to some extend, it paralyzed the networking activities for several months.

Engaging deeply with companies can lead to the fact that academics become part of the companies' strategies, which can challenge the university's specific role in the networking process. In one of the CiPs, the student team worked with a major producer of cooling equipment. Before the project started, the university did not have direct contact to the cooling equipment producer. The relationship was established by the head of one of the smaller companies which took part in the regional networking project. This company was providing scan services to the cooling equipment producer. The head of the scan service provider had talked to the CEO of the cooling equipment producer and drawn his attention to the CiP approach. He intended this move as a service towards an old client combined with the opportunity to launch the introduction of a document management system (DMS) at the client's side. He was trying to expand his company's portfolio of services towards the domain of DMS. Before, he had already taken some steps to sell these services towards the cooling equipment provider. So far he had not been successful. He hoped that an analysis of the problem-prone and paper-based payment process would finally lead to the introduction of a DMS. So, he hoped to profit from the project by opening a new field of services for his company. The CEO of the cooling equipment producer had rather different plans. He wanted to analyze whether the paper-based processes could be designed in a simpler manner so that scan services would be less required and could be provided internally. Thus, he started the project by not allowing the CEO of the scan service provider to take part in the project meetings. During one of the project's workshops, one of

the middle manager even asked the student team to evaluate the market for scanners and develop a proposal for an internal delivery of the scan services. The second author who took part in the workshop made clear in the meeting that the student team would not take over this task of planning the substitution of the external scan service provider. He stated that such a demand did not fit with the history of the project establishment. The stance was finally accepted by the management of the cooling equipment producer. Still, it looked like the results of the project would seriously damage the scan service provider's long term interests. Its CEO was often asking the second author about the state of the project. Dealing with these questions created a certain loyalty problem for him.

In such a complicated and delicate situation even small events can lead to a break-down in social relationships. In one of the networking events, an IT consultant was introduced to the second author. They had a general small talk in which the IT consultant asked about the regional companies the second author was engaged with. The second author mentioned, among others, the project with the cooling equipment producer. The IT consultant used this information to access the head of cooling company's IT department. Referring to his talk with the second author, he promoted his services. While he was not successful with that, the head of the IT department told this story to the CEO of the scan service provider. Since the CEO could hardly judge how the second author had acted indeed, the story created a certain reservation with regard to the second author's general intentions.

The tension-loaded situation resolved in the end of the CiP when the cooling equipment producer decided to ask the scan service provider to introduce a DMS in one of his other factories. Therefore, at the public presentation of the project results both sides expressed satisfaction with the project's results at last. At that point it was possible to tackle the conflicting situation openly.

The experiences and observations mentioned above show that action research interventions in regional industrial settings have to take into consideration historically evolved structures and relations between different actors. Most of these partly conflicting relations and competitive structures are not known to researchers as new actors in the field nor discussed openly. Speaking in terms of SC, trust-building in regional networks does not starting at point zero but can rely on "bridging" social capital. However, one has to anticipate the negative effects of "bonding" SC as well (Portes 1998; Putnam 2000; Cohen and Prusak 2001)

6 Discussion

The aim of the different interventions mentioned above was to increase the level of social capital between university and regional industries as well as to

establish RNoPs amongst regional software and media companies. Given the historically evolved different forms of capital already owned by the companies and actors, it was necessary to invest a significant amount of symbolic, cultural, and economic capital as well as communicative resources to trigger and foster the establishment of trustful relationships and the building of networks among the different regional actors.

The distribution of the forms of capital among the actors in a social field must be seen as the result of socio-historical processes (Bourdieu 1985). The activities of the Siegen IS group, described in section 4, can be seen as work directed towards the accumulation of capital in the regional setting. Analyzing the action research approach from a Bourdieuan perspective, the IS group was equipped with a rather high level of symbolic and cultural capital while it lacked social capital in the region. In the beginning of the process, none of the members of the research group had lived in the region before or knew any of the important regional actors. Thus, the IS group's activities, especially the ones of the second author, were directed towards rising its social capital in the region. Therefore, other forms of capital needed to be invested to gain and increase social capital.

There were mainly two strategies which were employed. First, the second author aligned with actors who owned already a considerable level of social capital in the regional software and media industry. The cooperation with the head of the regional coordination unit is the best example of this approach. Secondly, the second author applied symbolic and cultural capital to increase the amount of social capital. In the eyes of regional actors his symbolic capital mainly consisted of (a) being a professor of the university and (b) being additionally aligned to a widely known research organization, the Fraunhofer Society. Symbolic capital played an important role in attracting regional actors to engage with his group. Cultural capital, in the sense of the IS group's expertise, played an important role in maintaining once established relationships with regional actors.

Economic capital plays an important role in shaping the reward system for academics. The reward system within the University of Siegen, within the Fraunhofer Society, and within the national and European context of research funding, as it was perceived by the second author, encouraged him to invest efforts in augmenting his social capital within the regional software and media industry. On the other hand, the newly gained social capital could be transferred in other forms of capital as well: While symbolic, cultural and economic capital can be used for investment to increase social capital, the newly accumulated social capital improved the reputation (symbolic capital) of the university IS group. Since the standing of research groups at residential university is dependent on successful networking with regional actors, trustful relationships and good cooperation with regional industries helps to improve this standing. With regard to a potential transformation of social capital into economic capital, a better

regional standing of the university research group was perceived to increase the chances of the IS group to apply for public funding.

Beyond improving his personal social capital, certain activities aimed additionally at increasing the social capital within the regional software and media industry in a Putnamian sense. These activities were partly motivated by his perception of the reward system within his scientific field but also by his personal stance on the role of universities in society (see Fischer at al., in preparation). To this end, the author had a shared interest with the region's coordination unit. Their joint activities can be seen as an effort to mobilize their complementary forms of capital in encouraging regional learning.

.However, this approach to expertise sharing was restricted by the regional structure of practices and partly conflicting interests of major actors. As it was mentioned above, it turned out to be a challenge to identify company practices which were closely enough related to the ones of the IS group. Some of the involved companies worked in domains which did not focus on human computer interface design and therefore were not interested intrinsically in issues of human centred computing. To find common practices, communication and processes of mutual learning between the university and IT companies were necessary. When building RNoP, instead of the companies' core business practices, secondary business practices (such as marketing and managerial activities) were more likely to offer common ground.

In the near future, the expertise sharing within regional networks shall be supported by technical means as well. The introduction of an ExpertFinding Network which allows for the generation and matching of companies' competence profiles was assessed to be helpful for the awareness of regional expertise. Probably such a system can foster the identification of similar practices and the building of new cooperative structures.

Our work has brought up some wider applicable implications for the action research approach into regional networking:

- From an action-research perspective interested in regional learning, it is important to deconstruct social systems to understand boundaries which could act as potential barriers to expertise sharing and the establishment of RNoPs.
- We assume that practice, in the sense of socio-culturally embedded bundles of related activities, is an appropriate concept to base analysis and interventions upon. So, CoPs and RNoP seem to be appropriate as basic units of analysis.

Starting from these conceptualizations, we assume that interventions should aim at linking existing CoPs by establishing or fostering RNoPs. To encourage regional learning within certain NoPs, these interventions need to increase the level of social capital, in a communitarian sense of that term. The interventions

should be aimed at the establishment of social relationships among actors of particular regional CoPs and NoPs.

We believe that the concept of Regional Networks of Practice (RNoPs) bridges a gap between the concepts of CoP which refers to a shared practice and mutual trust and NoP which relies on a broader practice domain but does not require personal relationships. RNoPs can be seen as an intermediate concept, not necessarily requiring shared practice but a broader domain of interrelated practices. In contrast to NoPs, RNoP are grounded in personal relationships and mutual acquaintance in regional settings.

When conceptualizing interventions, one needs a profound understanding of the forces which drive the reproduction of a social field. Bourdieu's forms of capital, originally developed for the analysis of social classes, provide us with a helpful framework to intervene into the reproduction of socio-territorial units.

To gain an appropriate understanding of regional structures of reproduction these socio-territorial units, Bourdieu's concept of SC can be helpful to analyze a broad variety of social processes:

- It helps to analyze why certain regional actors are not accepted by particular CoPs. The concept of habitus (Bourdieu 1985) provides us with an analytical lense to understand the role of bonding SC (Putnam 2000) which leads to the closure of certain communities against certain actors.
- These processes of social closure can lead to an extreme emphasis on the regional identity, which makes it quite unlikely that an "outsider" who is a new player in the region is accepted by the existing regional communities at all (c.f. Portes 1998, Cohen and Prusak 2001).
- The accumulation of social capital of a new actor in regional social structures can be analyzed by the investigation in the investment of other forms of capital (like symbolic, cultural, and economic capital) for trust-building. Although the study presented focuses on social capital mainly, the ownership of other forms of capital seemed to be an important facilitator for the accumulation of social capital in the regional networks and communities.
- In the presented case of the fostering of RNoPs initiated by an academic actor, it was important to refer to SC as an individual resource (like it is conceptualized by Bourdieu) rather than an collective good, as it is looked upon e.g., by Putnam or American communitarists. The more individual-centered perspective of Bourdieu seems to be more appropriate for the initial phase of social capital building and the personal engagement of certain actors (e.g., the academic researcher or a particular local authority). The more inter individual, collective perspective of the communitarians might be more promising for the analysis of a collective practice of an already existing community. In this sense, both theoretical approaches might be seen as complementary to each other, Bourdieu looking from the individualistic/micro-perspectivist "worm's eye view" and the

communitarians looking from the collectivistic/macro-perspectivist “bird’s eye view” at the phenomenon of SC.

However, investigating in processes of learning requires other theoretical approaches since Bourdieu’s theory of practice is not mainly focusing on *learning issues*. Although both theories refer to human actions and the concept of practice, socio-cultural theories of learning (esp. Lave and Wenger’s concept of CoPs) seem to be more appropriate to understand the conditions which foster or hinder processes of social learning.

The CoP approach refers directly to common practices and shared histories of learning to differ between different communities, while Bourdieu focuses on habitus and class differences instead to explain social stratification. Therefore, for the understanding of *collective processes* of expertise sharing and the building of RNoPs, the approach of Lave and Wenger (1991) seems more appropriate.

Since Bourdieu’s concept of (class) habitus is focused on social classes mainly, processes of regional learning should be rather focused on social practice instead. While the *successful* mutual and collaborative learning of regional industries can be explained better with socio-cultural theories on learning and the CoP approach (Lave and Wenger 1991, Wenger 1998), the *failure* and the obstacles of regional learning projects might be better understood relying on the Bourdieuan concept of SC. SC proved to be helpful with the analysis of social closure and processes of social accentuation between communities. Furthermore, the investigation in transformation processes of different forms of capital seems to explain the accumulation of social capital as a central precondition for the establishment of regional NoPs. The two sets of theories (Bourdieu’s concept of CS and the socio-cultural inspired CoP approach) were helpful with gaining insights into (i) the successful/non-successful personal impact on building up social capital in regional networks and (ii) the collaborative learning *of and in* regional NoPs.

7 Conclusion

Based on the theoretical approaches of SC and socio-cultural theories on learning, the IS group of the university of Siegen attempted to facilitate regional learning in IT industries by interventions such as informal meetings and talks, a series of networking events (Lyz Media Breakfast), the didactic approach of courses in practice (CiP), conducting an ESF-funded networking project involving several IT companies, and founding of a joint research center for iTV (Media Design and Experience Lab). Following an action research approach, empirical evaluation of these measures by series of qualitative interviews, minutes analysis and participant observation showed achievements and shortcomings of the attempt:

The close cooperation with local authorities and the collaboration with the highly respectable research center Fraunhofer Society helped to accumulate social capital within the region and to trigger networking of different IT companies successfully. The CiP approach led to trustful relationships and cooperation of the university IS group, IS students, and several software companies. In an ESF-funded project, four software and media companies did not cooperate with each other with regard to their core businesses but with regard to their marketing and management practices. In the Media Design and Experience lab, two companies envision to cooperate with the university to research and develop innovative solutions in the domain of interactive TV.

On the other hand, the program for facilitation of RNoP faced some obstacles: Certain regional actors were rejected by others when building up network structures. Due to historically evolved, personal animosities and structures of competition, some networking attempts failed. Furthermore, egoistic strategic actions and intransparent communication behaviour of single actors led to conflicts and set backs in the trust-building process. Due to the recency of the academic actors in the regional setting, it required a reasonable amount of initial investment just to understand the social dynamics and to be accepted by regional IT companies. Differences in practices between IT companies and the IS group hindered learning through enculturation during the CiP program. Limited resources (in terms of economic capital) led to competition among different industrial sectors with regard to publicly funded networking projects.

Summing up our experiences and the empirical findings, the theoretical approaches of SC and the socio-cultural theories of learning offer potential for the analysis and the understanding of social networking processes. With regard to the facilitation of RNoPs among university and software industries, Bourdieu's conception of SC helps us understand problems and limitations: However, Bourdieu's focus on the *individual* accumulation of SC (and other forms of capital) does not seem to be the best analytical perspective to explain *social/collective* action and practice in communities. According to the "worm's eye view-"/"bird's eye view" perspectives mentioned above (micro-/macro-perspective), both theoretical approaches might be complementary with regard to the *individual* chances and limits for the engagement in social networking processes on the one hand and the *collaborative* learning processes in RNoPs on the other.

The program for the facilitation of regional learning in NoPs of IT companies was motivated by the assumption that expertise sharing between regional software and media companies might lead to advantages in competition with other regions' companies, especially with regard to national and global markets (Porter 2000). Residential universities are regional actors that could play an important role in the process of regional learning and the building of RNoPs. The experiences of the presented case in the German region of Siegen-Wittgenstein show that regional

networking can be an appropriate means to foster regional learning even in regions which are not characterized by local clusters as defined by Porter (2000). Although the Siegen-Wittgenstein region did not offer such an interconnected local IT cluster, the interventions by the university's IS group and the regional authorities led to cooperations in which mutual learning between different software companies took place. The technological support of these cooperation structures by the introduction of an ExpertFinding Network is planned and will be evaluated in further research.

The presented case of establishing RNoPs among IT industries describes an university-driven attempt to foster regional exchange of expertise. Due to their particular forms of capital universities can play an important role in this process. However, processes of networking and enculturation require substantial efforts from regional companies as well as from university actors. Mutual trust between regional companies and academia needs to be built over time through cooperation in various regional activities (cf. Fischer et al., in preparation). From an academic point of view, engaging in the networking of regional industries can help researchers to gain insights into facilitating and hindering conditions for regional learning and forster the development of conceptualizations and theory.

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8 References

Ackerman, M.; Pipek, V.; Wulf, V. (eds): Sharing Expertise: Beyond Knowledge Management, MIT-Press, Cambridge, MA 2003 .

Bahlmann, M. and Huysman, M.: The emergence of a knowledge-based view of regions - A chronological literature review on regional clusters, in this issue.

Becattini, G.: "The Marshallian Industrial District as a socio-economic notion", in Pike, F., Becattini, G., Segenberger, W. (eds) International Districts and Inter-firm Cooperation in Italy, International Institute for Labour Studies, Geneva 1990

Bentley, R. et al. 1997: *Basic Support for Cooperative Work on the World Wide Web.* In: International Journal of Human Computer Studies 46 (6): Special Issue on Novel Applications of the WWW, Academic Press, Cambridge, pp. 827-846

Bourdieu, P.: Outline of a Theory of Practice, Cambridge University Press, Cambridge 1977

Bourdieu, P.: Distinction: A Social Critique of the Judgement of Taste. London: Routledge 1984

Bourdieu, P.: The forms of capital, in: J.G. Richardson (ed.): Handbook for Theory and Research for the Sociology of Education, 1985, pp. 241 – 258

Bourdieu, P.: The Logic of Practice, Stanford University Press 1990

Brown, J. S.; Duguid, P.: Organizational Learning and Communities of Practice: towards a unified view of working, learning and innovation, in Organization Science, Vol. 2, No. 1, 1991, pp. 40 - 57

Brown, J.S.; Duguid, P. 2000a. Mysteries of the Region, in: Millar, W. et al: *The Silicon Valley Edge*, Stanford University Press, pp.16- 39.

Brown, J.S. and Duguid, P. 2000b. *The Social Life of Information*, Boston, Harvard Business School Press.

Cohen, D. and Prusak, L. 2001. *In Good Company: How Social Capital Makes Organizations Work.* 2001, Boston, MA: Harvard Business School Press.

Coleman, J. C. (1988) "Social Capital in the Creation of Human Capital," *American Journal of Sociology* 94: 95-120

Duguid, P. (2003) "Incentivising Practise," Position paper for the Institute for Prospective Technological Studies of the European Commission, Workshop on „ICT and Social Capital in the Knowledge Society," Seville, November 2-3, 2003.

Duguid, P. 2005. "The Art of Knowing": Social and Tacit Dimensions of Knowledge and the Limits of the Community, *The Information Society* 21, pp.109- 118.

Etzioni, A. (1995). *New communitarian thinking. persons, virtues, institutions, and communities.* Charlotteville, University Press of Virginia.

Fischer, G., Rohde, M., Wulf, V.: Community-Based Learning — The Core Competency of Residential, Research-based Universities, International Journal on Computer-Supported Collaborative Learning (iJCSCL), in preparation.

Florida, R. 1995: Toward the Learning Region. in: *Futures*, Vol. 27, No. 5, pp. 527-536.

Granovetter, M.: Economic Action and Social Structure: The Problem of Embeddedness, in: American Journal of Sociology, Vol. 91, No. 3 (November 1985), pp. 481 – 510.

Guiliani, E.: Cluster absorptive Capacities: Why do some clusters forge ahead and others lag behind?, in: European Urban and Regional Studies, 2005, 12, 3, pp 269 – 288

Huysman, M.H. and Wulf, V. (eds) 2004. *Social Capital and Information Society*, MIT-Press, Cambridge MA.

Huysman, M.; and Wulf, V. (2004a) Social Capital and IT – Current Debates and Research. In M. Huysman & V. Wulf (Eds.), *Social Capital and Information Technology*, MIT Press, Cambridge, MA, pp. 1-16

Huysman, M.H. and Wulf, V. 2005. The Role of Information Technology in Building and Sustaining the Relational Base of Communities, in: *The Information Society*, 21, pp. 81-89.

Kemmis, S.; McTaggert, R.: The action research planner. Victoria, Australia: Deakin University Press 1988

Knorr Cetina, K.: *Epistemic Cultures: How the Sciences Make Knowledge.* Cambridge, MA: Harvard University Press 1999.

Kvale, S. (1996). InterViews: An introduction to qualitative research interviewing. Thousand Oaks, CA: Sage.

Lave, J.; Wenger E. 1991. *Situated Learning: Legitimate Peripheral Participation*, Cambridge, UK, Cambridge Unihversity Press.

Lazerson, M. H.: Subcontracting in the Modena knitwear industry, in: Pyke, F., Becattini, G. and Sengenberger, W. (eds), *Industrial Districts and Inter-firm Cooperation in Italy*, Geneva, 1990.

Lesser, E., Fontaine, M.A., Jason, A. (Eds.) 2000: *Knowledge and Communities.* Butterworth Heinemann, Boston.

Lewin, K. 1946: Action research and minority problems. Journal of Social Issues, 2, 34-46

Lockemann, P.C. 2004. Technology Transfer: Political Pressure, Economic Necessity, Social Phenomenon, Financial Reward, or Intellectual Pleasure?, in: Comparative Technology Transfer and Society Vol. 2, No. 2 (2004), pp. 133-173

Lundvall, B.-Å., (ed.), National Systems of Innovation: Towards a Theory of Innovation and Interactive Learning, London: Pinter Publishers, 1992.

Marshall, A.: Principles of Economics, Macmillan: London 1890

Nahapiet, J. and Ghoshal, S. 1998. Social Capital, Intellectual Capital, and the Organizational Advantage. *Academy of Management Review*, 23: 2, pp. 242-266

Porter, M.E. (1990): *The CompetitiveAadvantage of Nations.* New York, The Free Press.

Porter, M.E. 2000. Location, Competition, and Economic Development: Local Clusters in a Global Economy, in: *Economic Development Quarterly*, 14, pp. 15-34.

Portes, A. 1998. Social Capital: Its Origin and Application in Modern Sociology, in: *Annual Review of Sociology*, 24, pp. 1-24.

Putnam, R.D. 1993: *Making Democracy Work. Civil Traditions in Modern Italy*. Princeton University Press.

Putnam, R. 2000. *Bowling alone: The collapse and Revival of American Community*. New York: Simon & Schuster.

Rohde, M.; Klamma, R.; Jarke, M.; Wulf, V. (2007): The Reality is our Lab: Communities of Practice in Applied Computer Science. *Behavior and Information Technology (BIT)*, volume 26 issue 1.

Saxenian, A. 1994. *Regional Advantage: Culture and Competition in Silicon Valley and Route 128*, Boston, MA: Harvard University Press.

Tajfel, H. 1982: Social identity and intergroup relations. Cambridge University Press.

Tajfel, H. and Turner J.C. 1986: The social identity theory of intergroup behavior. In: Worchel, S. and Austin, W.G. (eds.): Psychology of intergroup relations. Chicago: Nelson-Hall Publishers.

Wade, A.: Practice and field: revising Bourdieusian concepts, in: Centre for Research on Innovation & Competition, Discussion Paper No 65, Manchester 2004

Wenger, E.: Communities of Practice: Learning, Meaning, and Identity. *Cambridge University Press*, 1998.

The virtual platform of the Regional Learning Network - an artifact for creating new forms for development cooperation between research and development units and tourism entrepreneurs

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1 Introduction

The aim of the paper is to study the planning process of a virtual learning platform called Tietotori (market of knowledge) as a process of creating an artifact for the Regional Learning Network and as a learning process. This technical artifact Tietotori was born within a project called the *Regional Learning Network for Tourism Business in the Region of Itä-Uusimaa* (Eastern Newland) which aims at organizing and constructing possibilities for learning in a multi-voiced dialogue between different actors.

The Learning Networks represent a new form of project activity financed by the Workplace Development Program of the Finnish Ministry of Labour during the years 2004-09. The purpose of the Learning Networks is to increase the developmental expertise of the participants, to create and experiment with new forms of development cooperation between research and development units and workplaces, and to generate new, innovative solutions for Finnish working life. (Alasoini et al., 2004, 2006)

In the Regional Learning Network for Tourism Business in the Region Itä-Uusimaa the question was about an endeavour to perceive, what the Learning Network would or could be, and, what the object or objects of the Learning Network could be. From the perspective of activity theory and the idea of expansive learning (e.g. Engeström, 1987; Engeström et al., 2004), the challenge for the Learning Network would be to find out essential tensions and contradictions that could form the basis for regional developmental work and a target to strive for. In the activity of the Learning Network there is a question of shaping a new kind of shared object for regional cooperation between entrepreneurs, public organizations and research and developmental units.

When trying to understand the process of constructing the Learning Network we have found the activity theory and especially the concepts of expansive learning and a collective zone of proximal development (ZPD) quite fruitful. Expansive learning can primarily be understood as a process of expanding the object and the motive. The object of expansive learning comprises the whole activity system, in our case the whole learning network. The expansive learning process can be seen as a collective and long-term process, not progressing linearly but rather in a cyclic way. (Ibid.; Engeström, 2000). The idea of a collective zone of proximal development is based on Vygotsky's (1978, p. 86) concept of a zone of proximal development.

The expansive learning cycle represents an ideal type of learning that is a theoretical reduction. In real-life activity, there may be many different kinds of learning and development processes going on, both individual and collective, or processes related to some restricted part of an activity or of a process. It is important to understand how the various learning processes construct each other,

what kind of interaction takes place between them, and how they construct the whole learning cycle. (See e.g. Gherardi, 1999, 2000 and 2006)

According to Gherardi et al. (2003) the knowledge is communicated and institutionalized through an interorganizational network created by a system of practices and within which they circulate by imitation, diffusion of translation.

According to Toiviainen (2003) learning in a network can be perceived as a multilevel process. The levels are understood to be the levels of activity. Such levels of learning could be for example an entire learning network, an entity comprising some of the participants in a network, an individual workplace or an expert organization, a team, or an individual. The levels are special and local, and, they can be recognized by the object of cooperation and by the outcomes, and, by studying activity. (Toiviainen, 2003; see also Alasoini, 2004; Knight, 2002).

Toiviainen (2003) emphasizes that it is relevant to study, what is going on in the network. What will be produced? What are the outcomes to be realized? The target of the cooperation and learning is to direct the future. It is essential to question, how the network should be extended and how the Learning results and knowledge could be transported between the different levels. Is there a need for new intermediate levels that would create connections? Partnership can be seen as a way of making multilevel learning processes possible. (Toiviainen, 2003)

Learning is related to what is attempted to create and generate in cooperation. It is essential that cooperation and learning have some objects in the network. In our Learning Network, the challenge has basically been to shape, what the common object/objects could be.

One of the first aims of the Learning Network project was to build a shared vision among the actors and discuss together what a learning network could be and what could be the forms of its cooperation. The core ideas of the network in this project were flexibility and openness. The network was to be open for new actors and new ideas. According to the basic ideas of learning networks in the financing organisation, dialogue and new modes of cooperation and learning forums could be a way to respond to the innovation challenges in current Finnish working life. (Alasoini et al, 2004, 2006)

In our Learning Network we have taken as an interesting challenge to create, experiment and study new kinds of cooperative forums as learning forums. Learning is not taken as guaranteed, but as an object of research and development for the Learning Network Project.

The need for a virtual platform was one of the first ideas that rose from the interviews with tourism entrepreneurs conducted by Helia Porvoo – Borgå unit's teachers when asked about the needs for the future in the gathering stage of the Learning Network Project. This paper is inspecting the planning process of the virtual learning platform in the Learning Network Project and one specific discourse at Tietotori related to the regional strategy for tourism business. An interesting question in the long term will be, if Tietotori could form one essential

forum for making visible developmental tensions in the region Itä-Uusimaa related to tourism business.

2 REGIONAL LEARNING NETWORK FOR TOURISM BUSINESS IN THE REGION ITÄ-UUSIMAA

The Learning Network analyzed in the paper is regional, united by the geographic area of Itä-Uusimaa, situated about 50 km east of Helsinki, and by tourism business there.

The history of Itä-Uusimaa as a province is very short. The borders of the province are not based on natural geographical or historical things but instead on the decision of the Finnish Government to organize the local administration in a new way. Even if the province in an administrative sense is new, Porvoo as a central town of the province is the second oldest town in Finland and has rich cultural historical roots. Perhaps therefore, there are different ideas even of how to call the region in the context of tourism business. Often the question has also been expressed, whether it would be a better idea to name and to market the region as for instance “Porvoo District” than “Itä-Uusimaa”.

2.1 The gathering stage of the Learning Network

The aim of the first stage of the project was to collect a learning network, which would enhance research and development activity in tourism industry in the region of Itä-Uusimaa. In the long run the aim was also to study and model new forms of cooperation between enterprises, public organizations and higher education institutions. One of the basic ideas was that all participants in The Learning Network were supposed to be learners and equal partners. The description of the process to create a virtual platform is a minor attempt to model a part of this cooperation. The idea was that the Learning Network would enhance innovations, which would benefit all the participants. (Ritalahti & Lassila, 2006)

The first stage of the project started 1.9.2004 and ended 31.1.2005, and, aimed to create the Learning Network in collaboration with Porvoo - Borgå Unit of the Helsinki Business Polytechnic Helia, Helsinki School of Economics (Unit of Organizations and Management), University of Helsinki (Department of Education) and Helia School of Vocational Teacher Education. Other actors consisted of companies, as well as other regional organizations working with tourism business in the area, the Regional Council of Itä-Uusimaa among them.

Porvoo – Borgå Unit of Helia has coordinated the project. (Kantola, Lassila, Ritalahti & Kalliokoski, 2005)

2.2 The ongoing stage of the Learning Network

Now the project is living its second stage (1.2.2005 - 31.7.2006). The main focus is in making the research and development targets visible in the area, in designing methodologies for analyzing and developing tourism business and work in the area, and in designing and developing a virtual platform in a cooperative way. Planning and creation of the virtual platform began in April 2005 and the platform was opened to public 14th of February 2006. Before the official opening the pages were in test use for those tourism entrepreneurs and regional organizations who participated in the planning process (see list below).

- Aerohot Balloons Hki Oy (aerohot balloons flights)
- Aluekeskusohjelma, kulttuuri (regional culture organization)
- Augur Kalastuspalvelu Oy (fishing services)
- Bertas Bad Oy (meeting and sauna services)
- Ekymi Oy (business development company)
- Handi Boat (tourism services for physically disabled)
- Itä-Uudenmaan liitto (The Regional Council of Itä-Uusimaa)
- Kannonnokka Oy (experience services)
- Museo –kunnan käyntikortti projekti (regional museum project)
- Porvoon kaupungin matkailutoimisto (tourist bureau of Porvoo)
- Saaristolinja Ky (sea and river cruises)
- Seurahovi (hotel)
- Porvoo Tours (tourism services)
- Sipoon kunta, Matkailutoimi (tourist bureau of community of Sipoo)
- TMP-Ohjelmatuotanto OY/Porvoon Teatteri (local theatre in Porvoo)

The planning of the virtual platform is just one of the activities during the second stage of the project. The research topics in the project handle regional learning forums and networking, regional identity, change in lecturers work, and quality improvement in the enterprises. Carrying out research into these themes will also continue during the third stage of the project (1.8.2006 - 31.1.2008) even though the main focus of the development work shifts to innovative activity and winter tourism. The research and development themes are closely related to each other.

3 LEARNING FORUMS

The common/shared interest uniting the participants in our Learning Network has not been taken as given but has been perceived as a common object at the first stage of the project and, as an object of learning as well. Different learning forums mentioned below (Table 1.) were formed in order to enhance and create dialogue between the different actors and to perceive, what a new kind of a learning network could be. One of the main principles in the planning of the forums was that all the actors involved would be equal and that the research and development topics would arise from the dialogues between the different actors. Because of that, naming the different forums (the work team, the expert team) was problematic as each forum presents expertise, not the expert team only. (Kantola, Lassila, Ritalahti & Kalliokoski, 2005)

Stage of the Learning Network Project	**Learning forums**	**Aims of the Learning forums**
The first stage: Gathering stage 1.9.2004 - 31.1.2005	Internal work team Expert team Company interviews Learning network seminars	To enhance and create dialogue To find the common interest for the project
The second stage 1.2.2005 - 31.7.2006	Internal work team Guidance team Learning network seminars Morning coffee meetings Enterprises' own seminars Virtual learning platform	To enhance and create dialogue To enhance multi-voicedness To plan and create the virtual learning platform To enable entrepreneurs to take new roles in the development work To create new methods for learning in the region To make existing practices visible

Table 1. Learning forums of The Learning Network

The project's internal work team that consists mainly of lecturers and a researcher of Helsinki School of Economics, acts as a support organ and it is intended to be creative and dialogic by its nature. The internal work team meets once in every two weeks. The aim is to integrate the Learning Network's functions, as a part of the polytechnic's everyday educational work. In the second

stage of the project, the internal work team has offered an arena for research discussions and worked as a planning and executing organ in the development activities.

The name of the expert team was changed to guidance team in the second stage of the project. This was done in order to underline the principle of equality; there is no learning forum that represents more expertise than the others. The expert team, which comprised representatives of enterprises and, regional tourism organizations as well as researchers, met in every other month. In the second stage of the project two new entrepreneurs joined the team and it started to meet four times per year. The role of the guidance team has been to look at The Learning Network Project as a whole and give guidance in planning and making decisions related to developmental subprojects.

Learning network seminars have combined all the actors involved in the project, including also tourism enterprises that in the region of Itä-Uusimaa are mainly micro, small and medium-size enterprises. During the first stage of the project the seminars were built around the ideas that arose from the entrepreneur interviews. During the second stage of the project the focus has been in planning, testing and further developing the virtual platform, creating regional tourism strategy and planning quality improvement subproject.

In this paper, also the interviews are perceived as learning forums. During autumn 2004, 15 tourism entrepreneurs and representatives of regional organizations were interviewed. The aim of the interviews was to find out, what kind of research and development needs the enterprises or other organizations had. The starting point for the interviews was to listen to the entrepreneurs, in order to get a view of their business, needs and future expectations. This approach proved to be fruitful, as the interviewees felt that they were able to influence the content and the progress of The Learning Network Project. (Kantola, Lassila, Ritalahti & Kalliokoski, 2005)

The first ideas of a virtual learning platform can be tracked to the interviews of 15 tourism enterprises in the very beginning of this project. At the beginning, it was more or less just a question of a channel for information, but during the process the idea became refined towards an emphasis on dialogue and learning. Almost all the interviewees wanted The Learning Network to coordinate and conduct research and development work in the tourism field. This far, consumer behaviour and customer profiles have not been studied thoroughly in the region of Itä-Uusimaa. Learning networks that offer participants a chance of getting to know each other and deepen their cooperation in the future were appreciated especially among the new tourism entrepreneurs in the region of Itä-Uusimaa. There was also a need for forums that enable dialogue between tourism companies and culture organizations. (ibid.)

Also, synergy and dialogue were needed between many different development projects related to tourism business in this region. Helia’s role in tourism research

could focus on processing and gathering existing information and arranging forums where this information would be easily available for tourism companies and organizations in the region. (ibid.)

Monthly morning coffee meetings started in December 2005 on entrepreneurs' initiative. New research findings are first introduced and discussed in these sessions and then published in the virtual platform. Another new forum for learning has been participation in seminars that are organized by other actors. One example of this is a quality programme in which 12 companies in the region of Itä-Uusimaa are participating. The role of the Learning Network is to model the quality development process from the entrepreneur's point of view, to identify phases were support is needed and to consider alternative paths for quality development work.

In the second stage of the project entrepreneurs have had a more active role in many forums. They have taken part in planning and organizing the actual programme as well as in coordinating discussions. Through this approach they have also been deeply involved in the development work. Quite recently a few entrepreneurs have also shown interest to be coordinating parts in development subprojects during the next stage of the Learning Network project.

Different learning forums and interviews of entrepreneurs have been audio taped and written to transcriptions and memos that constitute the main data of the study. Only those seminars, which have not been arranged by the Learning Network have not been audio taped.

Learning forums as tools for shaping common object for regional development cooperation

In the Learning Network, there has been a question about finding out the needs and expectations of tourism companies through the interviews mentioned above and about bringing these findings into a multi-voiced discourse in the other learning forums, as material for a possible object of the Learning Network. Progressing on the way of a regional zone of proximal development (ZPD) and the process of expansive learning there is also a question about making choices, in which process the other learning forums besides the interviews had an essential role. In this learning network, we have found crucial the idea, that each of these learning forums has an important role in perceiving the regional ZPD and the vision of the Learning Network in the future. So, the vision for the Learning Network was constructed in the work team as well as in the expert team and in the seminars.

The activity theory and especially the concept of a zone of a proximal development (ZPD) and the model of expansive learning seem to give a fruitful theoretical and methodological framework for the paper. Based on the preliminary analysis of the data, the hypothesis is that in the different forums mentioned above there is an on-going process of perceiving a ZPD on a regional level. Some very

inspiring questions seem to arise for a closer examination. What is Itä-Uusimaa as a region, and, how is it perceived and presented in the discourses on different forums?

Expansive learning can also be understood as constructing a collective zone of proximal development. This can be seen *"as a grey area between actions embedded in the current activity with its historical roots and contradictions, the foreseeable activity in which the contradictions are expansively resolved, and the foreseeable activity in which the contradictions have led to contraction and destruction of opportunities"* (Engeström, 1997, p. 10). The idea of collective zone of proximal development is based on Vygotsky's (1978, p. 86) concepts work of zone of proximal development.

4 THE VIRTUAL PLATFORM TIETOTORI

4.1 Expectations of the virtual platform

Dialogue is seen as the basic tool in the regional cooperation, but as a challenge as well. Creating possibilities for different voices to make themselves heard in the learning forums has been one of the most essential ideas in the project from the very beginning. (Kantola, Lassila, Ritalahti & Kalliokoski, 2005; Ritalahti & Lassila, 2006)

Based on the interviews, dialogue also seemed a contradictory topic in the region of Itä-Uusimaa. The need for dialogue seems to be different depending on the background of the entrepreneur. Whilst old enterprises regarded it sufficient, new ones were in need of more dialogue. As the companies are small and entrepreneur-driven, dialogue plays an important role. Enhancing dialogue was found to be one of the challenges for the virtual learning platform. (Ibid.)

At the moment, there are many different regional projects going on in Itä-Uusimaa, and many of them compete for the entrepreneurs' time and energy. Synergy and dialogue are needed between these different development projects. Helia's role in tourism research could focus on processing and gathering existing information and arranging forums where this information would be easily available for tourism companies and organizations in the region.

According to Helia's senior lecturer Sirpa Lassila (2005) the idea of a virtual learning platform came up in these interviews. All the information the interviewed enterprises needed could be placed in a virtual platform open for them, not only for information search but also for dialogue and networking.

In the interviews made at the beginning of the project the entrepreneurs emphasized their lack of time; because making business takes all their time they cannot spend much time on information retrieval. There was a need for a platform

that would collect all necessary information “under the same roof”. This platform could also attract those entrepreneurs who are not often seen or heard in other forums. According to the brainstorms in the seminars mentioned above, the participants emphasized their bad experiences of former virtual platforms and forums they have been involved in. These bad experiences were not easy to define, but some of the identified reasons to them were that the platforms neither were very functional, usable nor up-to-date. Also the lack of suitable links and the content and the form of the information were found a problem. (Ritalahti & Lassila, 2006)

The representatives of tourism companies and regional organizations wanted to have a platform that is open and offers an opportunity for everyone to participate as a producer of more general or company focused information. Interaction was one of the keywords but not in the form of a chat forum. A living virtual platform also meant to them information of interesting meetings and seminars, of current topics under discourse, and instructions for using the platform on the first page. (ibid.)

4.2 The idea of the content and the form of the Platform

The aim was to help the local entrepreneurs to develop their business by offering a platform where they could discuss, inform others and search for new ideas and information. Tietotori is based on an idea of interaction and cooperation, which means that visitors can comment all documents saved at Tietotori and create new material for others to read. Tietotori also serves as home pages for the Learning Network.

This virtual solution goes hand in hand with face to face learning forums. Meetings are planned and prepared at Tietotori and after the meetings memos are available there even for those who could not come to the meeting. Discourse can continue virtually and processes can be made visible.

The actors of tourism sector in the region of Itä-Uusimaa agreed very strongly that the virtual platform must be a platform for learning. They saw the need to communicate with each other and the outside world.

The entrepreneurs and the other actors of tourism sector in the region need information on researches in order to develop their operations and business in general. But this information should be applied to their use and needs. Wanted topics were winter tourism, whether supply and demand meets, and the influence of regional marketing campaigns, regional tourism in numbers, and visitor feedback. A possibility to ask questions or to look for suitable researches via the platform was also emphasized. (Ritalahti & Lassila, 2006)

Information was needed of the regional tourism cluster that includes retailing and culture actors as well. The information needed from other companies will be discussed under the next sub-title.

The entrepreneurs also expressed, that they would appreciate a database with contact information of tourism companies in the region Itä-Uusimaa, in order to look for business partners. It is not only about pure tourism companies the participated entrepreneurs are looking for. Tourists of today are very seldom happy with one or two services a small provider is able to offer – they want more. And for this reason an individual supplier must have a wider network available. Networking was seen very strongly as a tool to look for partnerships, and not only in Itä-Uusimaa but also in other parts of Finland. (Ibid.)

Links and calendar for development events/learning forums were seen important as part of the platform. Preferred links were the links to existing registers, region's tourism enterprises and other actors like educational institutions, congregations, museums, theatres, festivals, municipalities and touristically attractive shops and markets.

Actors in tourism cluster are interested in regional projects that are going on. They want to know if it is possible for them to join and what are the costs. In order to make the decision easier, the projects should present their strategy plans in the platform.

Information on Enterprises

The needs of information concerning the companies present in the database are very basic: a short description of the company with some information of the location. General supply with core products and main season were also requested. Further wishes concerned direct links to companies' home pages and identification of contact persons. This information bank now comprises 90 tourism enterprises.

As to the database the first question that rose was: should there be a regional exclusion? Should only Itä-Uusimaa companies be involved? The second question concerned the tourism cluster in the region: should it be only the core of the cluster or a wider view of it? The participants preferred a wider cluster but the regional definition is still open. But it was emphasized that there should be enough user enterprises in the system.

Even though Eastern Uusimaa is a small province, tourism enterprises do not know each other that well. It is not a question of knowing the owners but a question of knowing the operations and products. According to the entrepreneurs the lack of the knowledge of the two latter ones is an obstacle for a deeper cooperation. (Ritalahti & Lassila, 2006)

4.3 Future of Tietotori

The present or second stage of the Learning Network focuses on making the challenges of research and development work visible in the province, as well as constructing methodological tools for development work. The project for building a virtual learning platform has been an endeavour for that.

For the moment the Learning Network Project is responsible for the development of the virtual learning platform. All the participants are very aware of this, and most of them are a bit worried about the future – what will happen after the project? They don't want to commit to a tool which lives only a short time till the end of the public funding. The vision or view must be in a more long-span action. (Ritalahti & Lassila, 2006)

In the next or third stage of the Learning Network Project, it is essential to develop further these tools in order to make them applicable to entrepreneurs and other actors in tourism business, as well as to establish a new way of interaction among actors and experts in tourism business. At the third stage of the project, the development work will continue with the themes initialized during the second stage, and new potential development challenges will be grasped. The development of winter tourism and innovations will take place entirely in the third stage of the project. (ibid.)

During the gathering stage of the Learning Network Project, enhancing and creating an open dialogue among actors and between projects in tourism has proved to be the essential challenge in the area. Enhancing dialogue and multi-voicedness has been one of the main goals of the Learning Network for tourism business in the region of Itä-Uusimaa. In the future, it will be important to study carefully the dialogue also through the methods of discourse analysis. It will be essential to understand, whose voices will actually be heard, and how to support the Learning forums to become more dialogical. Studying and developing the Learning forums will be the core task through the Learning Network.

The future aims and challenges of the virtual learning platform are linked very closely to the Learning Network Project in the region Itä-Uusimaa. The platform is one tool among other tools introduced by the Learning Network for the enterprises to develop their operations today and in the future.

5 PRELIMINARY ANALYSIS AND RESULTS

Analyzing the situations organized for participative design of Tietotori is an ongoing process. We have audio taped and written to transcriptions and to memos the Planning Workshop (3.5.2005, 2 hours) and the Planning Seminar (23.5.2005,

6 hours). In the paper we will inspect some very preliminary analysis of the data of the Planning Seminar 23.5.2006, and especially of one workshop there.

5.1 Co-configuration as a multi-voiced process

The paper deals with the planning process of Tietotori as a process of 'co-configuration' (Victor & Boynton, 1998). The concept of co-configuration is near to the concept of co-creation (see e.g. Nambisan, 2002; Sawhney & Prandelli, 2000) used in the research of innovations and of product development. According to Victor and Boynton (1998) co-configuration has following characteristics: the object of co-configuration is a product or a service that has a long life-cycle and that will never be finished; that can adapt to the activity of the user. There is also 'customer intelligence' embedded that requires continuous reconfiguration in a dialogue between the user, the producer and the product (Engeström 2004, 80–82).

The views of Bodker and Groenbaek (1998) about a cooperative systems design support our view of a design process as a learning process, and thus, an importance of studying a design process as a learning process also. Hyysalo & Lehenkari (2005) consider the systems design process from the viewpoint of activity theory, and therefore emphasize the historical understanding of design activity besides the viewpoint of user. We have found historical understanding as a challenge for future in our study.

We are writing just now another article focusing on analyzing multi-voicedness of the design process. It will be interesting to see, what kind of "voice gallery" we will find out, and, what happened to different voices. And what voices or whose voices will be listened during the planning process. In the paper we will bring just some examples of the workshop discourse that will shed light on the dilemmatic topics in the discourse.

The workshop inspected here was working out the question: "*What kind of knowledge do you need for supporting the business development of your firm?"*

The dilemmatic discourse

The discourse been going on in the workshop brought up a contradictory like and dilemmatic topic related to a reliability of studies and statistics in tourism business area. On the one hand, the participators thought that reliable statistics are needed for planning their own business activity. On the other, the value of statistics were questioned and the entrepreneurs were not willing to give information about their own business and their customers to increase a reliability of statistics, because of a lack of time.

The theme of a reliability of studies and statistics formed a main topic in the workshop, especially in the beginning of the discourse. The voice of entrepreneur

picked up that statistics are not reliable. Many of the participants told examples of the problems of a reliability of the statistics.

> *"It is my view that the figures (in tourism statistics) are highly unreliable. The number of tourists visiting for instance Loviisa town is based on those tourists who have contacted the tourist office. (Entrepreneur, N6)*
>
> *Year 2001 there was an attempt to find out (the number of the visitors). There were interviews and …perhaps not so reliable, but done by different way. (Entrepreneur, N2)*
>
> *As far as I am concerned I am too busy to make any statistics of my clients. Neither do I give any figures concerning them to the authorities. (Entrepreneur, N5)*
>
> *Certainly you are obliged to give the figures (to the authorities). (Principal lecturer, N4)*
>
> *I am not obliged to give any figures… I have made an agreement with the police. No one has asked me to give any figures. (Entrepreneur, N5)*
>
> *OK then, in that case it (the lodging house) is not registered. (Principal lecturer, N4)*
>
> *I don't send them anywhere…they have told me that it is enough to have them in a binder. (Entrepreneur, N5)*
>
> *It is really interesting to know, if someone has estimated that in Porvoo there are 700,000 day visitors in a year. A really nice report… It would be important to find figures of the overnight stays. Interesting, that the figures are not requested…" (Entrepreneur, N2)*

From the viewpoint of expansive learning just dilemmatic and contradictory like discourse is interesting, because it will possibly tell something about the developmental tension of activity. The developmental tension and contradiction will often arose as dilemmatic way of talk. (See e.g. Engeström, 2004, 117-118)

The co-configuration of Tietotori can be seen as an activity, in which a lot of experts in tourism business area work together in planning and grasping a shared object. The most of this work is speech; interaction between different kinds of viewpoints, ideas and opinions. Thus, methods of voice analysis are essential for analyzing co-configuration as an activity.

The concept of voice is a core concept in voice analysis. In the paper we understand a voice as a thought, opinion, idea or viewpoint that some person do produce is a certain social situation. The voice is understood also as historically formed and influenced by the personal experiences and by the organization the person presents, as well as by the other persons sharing the social situation and by the voices of them. Also, one person can produce different voices in a same situation. (Engeström, 2004, 112-113; Engeström, R. 1999)

The method of voice analysis is seen in the paper as a tool for studying a multi-voicedness of the co-configuration and for making it visible. The topic of a reliability of statistics is related to an important question of how the knowledge is understood that is basic question when constructing the virtual platform Tietotori. What knowledge is and who do produce it? Somehow the discourse inspected

above give the feelings that knowledge is perceived as coming from somewhere outside, not produced by the actors themselves and from their own activity.

5.2 Example of discourse on Tietotori: regional tourism strategy

Tietotori was opened officially 14th of February 2006. In the same time the province was developing a tourism strategy for the region. The Regional Council of Itä-Uusimaa, which was coordinating the process, wanted to give the tourism actors an opportunity to involve already in the writing of the strategy plan. The writing group just gave the outline for the strategy plan with open questions and published it at Tietotori. Entrepreneurs in the region were able to read the outline and write their comments in the strategy plan. All the comments were visible for other entrepreneurs and also they could be commented. During the four weeks, when the commenting was encouraged, there were 93 visitors in the strategy pages and all together 45 comments made by 12 different persons.

There are clear signs of both hope and fear in the comments. Some entrepreneurs write that in the past they have not been heard in decision making in the region and therefore they do not believe that this time the strategy would bring any difference.

> *”There is no use to create branch strategies as there is no future due to administration which has negative attitude towards entrepreneurship.” (Entrepreneur, N9)*

The strategy writing process also receives criticism. Even if the entrepreneur had participated in the discourse actively he still had a feeling that entrepreneur involvement in the process is insufficient.

> *“I would like to come back to the questions that were raised already in the strategy evening. If and when the implementation of the strategy is very much dependent on entrepreneurs, should the entrepreneurs be more actively involved in the strategy work? For some reason I myself have a feeling that strategy work is not at the level in which we could reach the most necessary dimension that is involvement of the entrepreneurs in creating and implementing the strategy. What could help? I would say if I knew.” (Entrepreneur, N7)*

When the first draft was published in the virtual platform this topic came up again.

> *“In overall the strategy seemed to be one of the best tourism strategies in Finland. Thank you especially for the actions that you have drawn. The main frame is still production driven or especially administration driven. We can not really talk about strategy, but*

about vision and making the vision reality in administrative sense. This kind of paper has the value of just a paper; it does not guide the practices. No one will deeply involve." (Entrepreneur, Lecturer, N10)

The tensions in the discourse seem to appear between the different tourism areas of the region Itä-Uusimaa: archipelago, countryside and old towns which present cultural heritage. Another tension is the customer focus: does the area serve business customers or individual customers?

"So fa the projects in the archipelago have focused on developing services in the archipelago. This benefits those people who have summer cottage or boat as well as those who live in the archipelago… Most of the enterprises which operate in sea tourism business offer services mainly for companies and foreign travelers. …The products have high quality and they are rather expensive. In order to reach these target groups we need to use different marketing tools." (Entrepreneur, N8)

"I would like to add the word countryside to that text 'Well developed services in the archipelago', because we have important tourism clusters there as well." (Entrepreneur, N12)

"… Should we emphasize more the special characteristics of the region?" (Senior lecturer, N13)

"New models are built all the time both in Finland and abroad, so nurturing the old and valuable could offer also historical knowledge for the visitors. We could use this in marketing our product and services." (Entrepreneur, N11)

"Tourism image of Itä-Uusimaa Region has been discussed also in workshops. It is important to differentiate from other regions. In Finland we have few old towns. Therefore Finland's second oldest town Porvoo and chic Loviisa differentiate positively from the newly built towns. Porvoo River and Loviisa seaside are an important part of regional identity. The tourism interest of the region is mainly built on Porvoo's attraction. Porvoo is part of the Finnish national heritage." (Entrepreneur, N8)

In order to enhance the discourse inspected above and to give alternative ways to participate, The Learning Network arranged a discussion evening 27.2.2006 under the strategy theme. This discourse continued 5.4.2006 in a yearly held seminar called Tourism Parliament and the final strategy paper will be available in the virtual platform.

6 CONCLUSION

In the gathering stage of the Learning Network a stimulating concept of 'learning region' turned up. A learning region can be identified with following characteristics: identity and authenticity based; a shared vision; horizontally and vertically networked actors; developed information and evaluation systems; development strategies. A learning region can be regarded as a metaphor but it can also be understood also as an ideal of regional development; a striven state of

a region that continuously makes visible and develops its practices and social capital. Later, in the project, it will be possible to study, how a learning region and regional identity will be constructed in research and developmental practices, and, in the virtual platform of Tietotori among them.

In the activity of the Learning Network, promoting open dialogue among actors and projects in tourism has proved to be one of the essential challenges in the area. As a matter of fact, enhancing multi-voicedness has been one of the main goals of the Learning Network for Tourism Business in Itä-Uusimaa, and, as a research object as well. In the future, it will be important to study the dialogue through the methods of discourse analysis carefully. It will be essential to understand, what voices and whose voices will actually be heard, and how we can support the learning forums to grow more dialogical. Studying and developing the learning forums will be the core task for the Learning Network through entire project. The region and regional identity were matters that were captured in the different forums of the Learning Network. In a long run, it would be interesting to analyze, whose voice would be listened, in what context that would happen, and, what would that listening mean for the regional development.

The role of the Learning Network is to make more visible, how the region and developmental challenges there are understood and conceptualized in the different discussion forums. The preliminary hypothesis is that these conceptualizations contain essential and contradictory elements related to the regional zone of proximal development. ´The learning region` can be conceptualized as a region that becomes more conscious about its regional characteristics, and contradictions within, which provides a basis for regional development work. In the Learning Network, making tensions shared and visible has been taken as a challenge.

From the activity theoretical viewpoint of learning it is essential to create multi-voiced forums, where the different voices could participate on the process of: -perceiving new kind of common object for regional cooperation; -recognizing and making tensions and challenges in the region more visible; -and making choices about how to progress at the regional zone of proximal development.

Perceiving the Learning Network from activity theoretical perspective - as progressing on the regional learning cycle, hopefully expansive learning cycle, and, as progressing at the regional zone of proximal development - enables that the activity of the Learning Network can be analyzed as a process of recognizing tensions in the region. The object of the Learning Network can be seen as evolving through a multi-voiced discourse. The idea of expansive learning and zone of proximal development as the theoretical-methodological framework has supported the idea that progress takes place through such multi-voiced, tensed discourses. The research and development work of our Learning Network has an important role in finding out and making visible the developmental tensions and contradictions related the tourism business in the region of Itä-Uusimaa. It has been a huge challenge for the Learning Network to perceive a qualitatively new

kind of common object for regional cooperation and development work in tourism business area. The Learning Network is targeting long term developmental work instead of answering only situational needs for cooperation and development, as before. As a consequence, it will be important that research and development work are progressing hand in hand in a close dialogue. In future, it will be necessary not only to carry out development actions but also to conceptualize the phenomena we are working with.

Also, one of the difficult challenges in the Learning Network has been that it is not easy to go beyond the orthodox empirical and rational Western epistemology. Most of the participants of Learning Network are not that familiar with the notion of Action research, or the idea of 'extended epistemology'. As a consequence, the participants do not easily grasp what is or could be regarded as 'practical, living knowledge', that would be useful to people in their everyday conduct of their lives/tourism business. Knowledge is easily understood as a traditional way; as an information coming somewhere outside, not being produced from the own activity of participators and by themselves.

Ideally, knowing will be more valid – richer, deeper, more true to life and more useful – if different ways of knowing are congruent with each other; if our knowing is grounded in our experience, expressed through our stories and images, understood through ideas, concepts and theories which make sense to us, and expressed in worthwhile action in our lives (Reason 1999). These ideas would form challenge when developing Tietotori and the Learning Network as entire in the future.

It is also a question of empowerment; how the micro-firms could affect and participate more to the developmental work in the region in the future, and, to construct the region as a learning region as subjects, in active roles and possible as coordinators of subprojects, too.

In this paper, the process of planning the virtual Tietotori is perceived as a process of co-configuration and collective learning. The paper describes the backgrounds of Tietotori and the planning process of it, that process was purposed to be multi-voiced, targeted at shaping conceptions of the virtual platform. The paper also inspects one example of the discourse that has been going on quite recently at Tietotori. The planning discourses of Tietotori and the discourse have been going on at Tietotori have been preliminary analyzed as an example of a discourse picking up tensions related to development work of tourism business in the region Itä-Uusimaa.

In this stage, after the preliminary analysis of the data, there seems to be more questions turned up for future study than ready-made answers to the questions. It will be of interest to analyze future efforts on how the region and regional development will be identified through discourses, and what forms discussions may actually take. It is important to find out how the shared process of perceiving

and conceptualizing the region, its identity and developmental challenges, does contribute to constructing Itä-Uusimaa as a learning region.

7 REFERENCES

Alasoini, T. (2004). The new Finnish workplace development programme (TYKES-FWDP) as an approach to innovation. Concept and transformation. International Journal of Action Research and Organizational Renewal, 9 (3): 279-295.

Alasoini, T. Hanhike, T, Lahtonen, M, Ramstad, E & Rouhiainen, N. (2006). Learning Networks as Forums for Knowledge Creation. A New Approach in the Search for Workplace Innovation. Paper presented in the Innovation Pressure International ProACT Conference in Tampere, 15-17 March, 2006.

Bodker, S. & Gronbaek, K. (1998). Users and designers in mutual acitivity: An analysis on co-operative activities in systems design. In: Engeström, Y. & Middleton, D. (toim.) (1998). Cognition and Communication at Work. Cambridge: Cambridge University Press.

Engeström, R. (1999). Toiminnan moniäänisyys. Tutkimus lääkärinvastaanottojen keskusteluista. [Multi-voicedness in activity: A study of discourse in medical encounters.] Helsinki: Yliopistopaino (in Finnish).

Engeström, Y. (1987). Learning by Expanding: An Activity-theoretical Approach to Developmental Research. Helsinki: Orienta-Konsultit.

Engeström, Y. (2000). Activity theory as a framework for analysing and redesigning work. Ergonomics, Vol. 43, No. 7, 960-974.

Engeström, Y. (2004). Ekspansiivinen oppiminen ja yhteiskehittely työssä [Expansive learning and co-configuration at work]. Tampere: Vastapaino (in Finnish).

Gherardi, S. (1999). Learning as Problem-Driven or Learning in the Face of Mystery? Organization Studies, 20 (1), 101-124.

Gherardi, Silvia (2000). Where learning is: Metaphors and situated learning in a planning group. Human Relations, Vol.53 (8), 1057-1080.

Gherardi, S. & Nicolini, D. (2003). The Sociological Foundations of Organizational Learning. In: Dierkes, M., Antal, A.B., Child, J. & Nonaka, I. (Eds.). Handbook of Organizational Learning & Knowledge. Oxford University Press.

Gherardi, S. (2006). Organizational Knowledge: The Texture of Workplace Learning. Blackwell Publishing.

Hyysalo, S & Lehenkari, J. (2005). Instrument-oriented history, etnoghraphy and interventions in studying information systems design. Teoksessa: Engeström, Y., Lompscher, J. & Rückriem, G. (Eds.) (2005). Putting activity theory to work: Contributions from developmental work research. Berlin: Lehmanns Media.

Kantola, T., Lassila, S., Ritalahti, J. & Kalliokoski, S. (2005). Collecting Regional Learning Network as Constructing Possibilities for Learning. Paper for the 6th International Conference on Organizational Learning and Knowledge "The Passion for Learning and Knowing". June 9 – 11, 2005 in Trento, Italy.

Knight, L. 2002. "Network Learning. Exploring learning by interorganizational networks." Human Relations. 55(4): 427-454.

Reason, P. (2004) Action Research: Forming communicative space for many ways of knowing. Response to Md. Anisur Rahman. International Workshop on Participatory Action Research, Dhaka, March 2004-03-27

Ritalahti, J., Lassila, S. (2006). Challenges of a virtual learning platform. Paper presented in the Enter 2006 Conference in Lausanne, Switzerland.

Toiviainen, H. (2003) Learning Across Levels. Challenges of collaboration in a small-firm network. University Press: Helsinki.

Victor, B. & Boynton, A.C. (1998). Invented here: Maximizing your organization's internal growth and profitability. Boston: Harvard Business School Press.

Vygotsky, L.S. (1978). Mind in Society: The psychology of higher mental functions. Cambridge: Harvard University Press.

Regional Networks between Industry and Academia: What can we learn from Bourdieu?

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Abstract. This paper is based on an empirical field study on the establishment of a regional network between regional (software) industry and academia. Inspired by recent critique of too harmonic community research under the aegis of mainstream social-capital analyses, this study reflects on related basic concepts. As a consequence, it uses Bourdieu's theory in the interpretation of the results and concludes that Bourdieu´s theory is complex, but helpful for the detection of preconditions of sustainability of regional communities.

1 Introduction

Many organizations have undergone considerable change during recent times. Besides formal team work, networking has gained significant influence in many inner- and inter-organizational fields. IT-technology has played an important role in these processes, as it enabled new forms of distant communication and remote cooperation, which retroacted on organizations by allowing for new strategies, forms and visions such as, for example, the virtual organization. In the volatile economic environment, diverse change processes often interacted. Clear-cut boundaries between organizational units thus often became blurred. Centralized decision monopolies were reduced, for example, by strategies to reduce the time to market, which became an important success factor on the markets (Lay 1998).

Economic development had a strong impact on innovation and knowledge transfer, and vice versa.. A lot of new disciplines sprang up, established ones often adopted new ICT-related branches. Knowledge management theories have first tackled the opportunities of new technologies for the information support of different actors´ roles in organizations and networks by means of repository systems and intranets. However, it turned out that related problems often originated in missing capacity to share and use knowledge (Brown & Duguid 2000b).

At the same time, the conception of regional clusters to promote hi-tech regions and branches (among which ICT is often rubricated) has been widely adopted, in particular, among politicians. Regional clusters, propagated as a means of face-to-face knowledge-sharing and Social Capital generation, have come under scrutiny in diverse disciplines, among which knowledge management, economics, sociology, regional planning, and more. Some of the theories mentioned have received impulses from Pierre Bourdieu, whose focus, however, was oriented on the structural conditions and involved power relations of mutuality and reciprocity. Bourdieu´s considerations on conditions of social capital generation do not easily fit into the often micro level-based approaches on regional networks. But a rethinking of community-building efforts on the basis of a Bourdieu-inspired analysis may be helpful for reflection.

In the empirical field study on the regional establishment of a “usability network” presented here, therefore, Bourdieu´s capital theory has been used to investigate into the power and knowledge relations between the industrial and scientific actors involved. The paper, therefore, starts with some theoretical considerations on the concept of social capital and its relevance in regional communities. The following paragraph addresses Bourdieu´s theory and his concepts of habitus and forms of capital. After a short reference to the methodology, the results of the study will be analysed. Some concluding remarks form the end of this paper.

2 Basic concepts

2.1 Regional Networks

There is a lot literature on innovative regions, learning regions, innovation clusters, and related subjects. A lot of related conceptions attempt to confer the success of the “Silicon Valley” to other regions. However, not always there is the necessary devotion to the meaning and preconditions of this “model” and to the situation in the targeted regions. Many of them draw upon the opportunities for face-to-face communication, which may benefit from regional proximity.

Porter (2000) points out that in knowledge-intensive branches, geographical proximity in regions can be of major importance. In his definition regional clusters are concentrations „of interconnected companies, specialised suppliers, service providers, firms in related industries, and associated institutions (e.g., universities, standard agencies, trade associations) in a particular field that compete but also cooperate“ (ibid 15).

Further points of theoretical reference can be the cluster concept of Michael Porters (1990, 2000), the “innovative milieus” (Maillat 1996) or “learning regions” (Lawson & Lorenz) or “flexible specialization” (Piore & Sabel 1984). However, as knowledge sharing demands more than merely better opportunities for face-to-face meetings, it can also be advisable to rethink the inter-organizational learning, which is seen as the centre of regional networks´ advantages by knowledge-management related approaches.

2.2 Communities and Networks of Practice

Restructuring of economic organizations often has been accompanied by severe problems, some of which can be traced back to missing information. Therefore, the capacity of ICT to support remote communication and to transfer data worldwide was welcomed in order to reduce information problems. However, in organizations, knowledge is related to competences, responsibilities, interests and conflicts. Therefore, relevant information may remain blocked even after the implementation of a data-transfer technology; in this case, it remains too “sticky”. When on the other hand, employees do not care about discretion and communicate the business model of their enterprise to competitors, knowledge may have become too “leaky”.

Identifying the nature and environment of knowledge has become a major problem for organisational development (Brown & Duguid 2000b). The exchange of knowledge is not as simple as the transfer of data via ICT. Lave and Wenger (1991) developed the Community-of-Practice (CoP) concept to describe knowledge-exchange practises which neither demanded for technical bases of

abstract knowledge nor pre-defined interaction rules, but only for simple opportunities for narrating and over-the-shoulder learning of situated knowledge (Suchman 1987). In order to function, however, the self-organizing interaction between the actors demanded for some pre-conditions such as a common practice, understanding of problems and sense of purpose, all reproduced in shared narratives and identities.

The CoP concept has some similarity to occupational communities (Van Maanen & Barley 1984), clusters of people in or among organizations, who do not necessarily share an organizational role, but feel related to each other due to some perceived commonalities in work situations. In order to identify the CoP concept in relation to this view upon the work situations clearer, Brown and Duguid (2000a) differentiated Networks of Practice (NoP) from CoPs: they saw the difference between both concepts in the fact that in NoPs "people […] engage in the same or very similar practice, but unlike in a community of practice, these people don't necessarily work together".

The discussions on CoPs and NoPs motivated many attempts to promote related structures in order to allow for inter-organizational learning. Therefore, it is not surprising that community building has been identified as an important means to promote regional knowledge exchange. However, not in all related research, the different concepts and the conditions for successful knowledge exchange are taken into consideration in necessary detail. Before trying to apply related differentiations to a concrete case, another general concept requires regard, the concept of Social Capital.

2.3 Social Capital

The concept of social capital stems from a longer history of development in social sciences. First shaped at the beginning of the 20th century, it has been theoretically funded by Coleman (1986) and Bourdieu (1986) in the Eighties in reaction to the narrow neo-classical concept of the "homo oeconomicus", that distincted sharply economic from social action. Coleman (1988, 98) defines social capital as a "variety of entities with two elements in common: they all consist of some aspect of social structure, and they facilitate certain action of actors - whether persons or cooperated actors – within this structure". In the course of emphasising the embeddedness of economic action (Granovetter 1985) the social metaphor facilitated the analysis of social issues in economic activities.

Its sudden and excessive use in several recent research fields leads back to the Harvard political scientist Robert Putnam. His application of the concept of social capital to empirical research on civic engagement on regional and (US-) national level draw special attention in politics and public opinion. From Putnam´s communitarian view, social capital enables joint cooperation and activities for mutual benefit in horizontally formed self-regulating networks. Putnam

interpreted engagement in voluntary organisations as an indicator for mechanisms of trust-building between the actors and in between these networks. In a next step, participants even develop generalised trust.

Recently, his understanding of the concept has been very much criticised, especially for the fact of concentrating on horizontal communities and networks by blinding out power issues and suggesting harmonic views on society. In contrast, by focussing the "dark side of social capital", researchers as Portes (1998) and Uzzi (1997) have identified negative aspects of social capital of communities, e.g. for those who stand outside the community borders. Additionally, Putnam's use of the bridging/bounding concept in/between communities has been criticised. Harriss (2005) argues that Putnam's concept of bridging between communities is to reproduce power issues and social inequality rather than being an instrument to broach the issue on power inequalities.

The discussion on Social Capital has drawn much attention in the last years (Huysman & Wulf 2004, Coleman 1988, Putnam 2000), especially due to the problems with human-capital formation in the context of the "first generation of knowledge management" (Huysman 2004) and its attempts to store all relevant information in central data stores and to see knowledge management mainly as a technical challenge. Taking relational and socio-cultural issues at the community level into account heralded a "second wave of knowledge management" as a sociotechnical, context-related matter. This new course engaged in "[…] addressing in more detail how people relate to one another, how shared practices emerge and how communities evolve […]" being able "to understand better if, when, how and why such communities use or do not use technologies" (Huysman & Wulf 2005, 82).

Recently, Bourdieu's view on social capital has become more widely discussed, having been marginalized under the "Putnam boom". Pierre Bourdieu receives social capital as an aspect of the (re-) production of power, for him, power is inherently bounded to controversial social activities. While Putnam only peripherically addresses such vertical dimensions and power relations and conceptualizes social capital with collective values and societal integration, Bourdieu's approach starts from the viewpoint of actors engaged in a struggle in pursuit of their interests (Siisiäinen 2000.)

After having cleared some of the basic conception to interprete regional networks, in the following chapter Bourdieu's concepts of capital and habitus, two of his main figures in his practice theory, will be presented in more detail.

3 The concepts of capital and habitus by bourdieu

Østerlund & Carlile (2005) refer to traditional sociological scholars as Bourdieu (1977) and Giddens (1979) as the groundwork of recent practice theories. In order to compare the relational issues in recent practice theories Østerlund & Carlile create a framework of several attributes. One of the identified attributes are power issues. They state that sociologists and anthropologists influenced by Marxist views as Bourdieu held the assumption that "the most important forms of action or interaction for analytical purposes are those that take place in asymmetrical and unequal power relations." (p. 94)

The notion of power relations subsequently leads to the notion of conflictive relations. Although early emphasised by Jean Lave (1993), this standpoint has not very often been explicitly referred to in the CoP- Discussion. Putting the relational aspect to situated action, she noted that uniformity of knowledge or belief of a set of people must not be taken for granted. Rather different knowledge, experience and interests from other situations are likely to come to conflictive situations and relations in other practice situations.

3.1 Forms of capital

At the centre of Bourdieu's theory there is reproduction of classes by means of production of meaning (Bourdieu 1980, 1986). In his research he pointed at social connections to be a matter in the reproduction of classes. He concluded that the investment in connections within an elite club can be a form of social capital to be transferred back into economic capital. In his understanding, social capital is "the aggregate of the actual and potential resources which are linked to possession of a durable network of more or less institutionalised relationships of mutual acquaintance and recognition" (Bourdieu 1986, 248.) The access to specific durable connections may open the doors to important resources.

In this reception of the term, social capital is a personal asset providing advances to those individuals or groups that are connected. This is a significant difference to the perception of the concept by Coleman and Putnam, who construct social capital as networks of trust, solidarity, and reciprocity of homogenous communities with common interests and shared values.

In contrast, Bourdieu described social capital in the context of other forms of capital, i.e. cultural, economic, and symbolical capital. In his conception, *economic capital* is directly convertible into money and may be institutionalized in the forms of property rights. *Cultural capital* is divided up into three states : 1. *embodied* in the individual person, i.e. incorporated in the *habitus*. The habitus will be outlined later. The second state equalizes to human capital and skills. 2.

objectified in cultural goods, 3. *institutionalised* as educational qualifications or academic credentials. Cultural capital is convertible on certain conditions.

Bourdieu argued that all capital forms have to be considered to get a complete picture of economic life. By the differentiation of the forms of capital he challenged economic theory for the narrow focus on economic capital. By this he argued against the reduction of the whole set of exchanges simply to those monetary ones, which are based on the self-interested maximization of profit, whereas all other forms of capital are perceived as non-economic and thus economically irrelevant. He advocated a general science of the economy of practices to examine capital (i.e. power) in all forms of appearance.

Bourdieu perceived the social world as a plurality of social fields. In these fields the forms of capital are to define the positions and possibilities of the singular actors in these fields. Each field has an own profile depending on the proportionate importance of each form of capital within it: “The structure of the field, i.e. the unequal distribution of capital, is the source of the specific effects of capital” (Bourdieu 1986). And thus the forms of capital under control of various agents in a field are trumps that define the chances of holding and reproducing the given position.

3.2 Habitus

Considering Bourdieus sociology as one of social practice, the category of *habitus* is at the core of it (Krais & Gebauer 2002). It describes a paradigm shift in the social sciences, as such, the turning away from the conceptions of social activity as a result of conscious decision-making *and* social activity solely as obeying rules: "I developed the concept of 'habitus' to incorporate the objective structures of society and the sub-jective role of agents within it. The habitus is a set of dispositions, reflexes and forms of behaviour people acquire through acting in society. It reflects the different positions people have in society, for example, whether they are brought up in a middle-class environment or in a working-class suburb. It is part of how society produces itself. (Bourdieu 2000, 19)

Habitus stands for principles of perception and thinking, principles of reasoning and evaluation being societal formed. Habitus is the embodied social (Bourdieu & Wacquant 1996, 161). As such, habitus is a social constituted system of structured and structuring dispositions, acquired by practice, and constantly focussed on practical functions (ibid. 154).

The concept of habitus can explain inter-action processes between different milieus. A person entering a new, unknown milieu is not expected to show an already perfect constructed habitus. But what he is supposed is to bring in a convertible habitus. By participation, the actor engages with the circumstances of the “game”. Thus, the actor accepts the interaction like the rules of a game, its

preconditions, assignments and goals. Without this form of commitment, society would appear absurd, because there is no basis for a negotiation of meaning.

Participation thus means inserting countless acts of recognition, investing resources, working hard to understand the explicit and the tacit rules and the positions of other people. All this requires a long process of learning (Krais & Gebauer 2002, 61-62.) As a “structuring structure”, the habitus, can be seen as a web of dispositions, absorbing and orienting experience. The habitus thus is a sort of interaction culture, influenced by class and power relations, but also dependent upon the (un-) consciousness of the actors.

Using Bourdieu´s theory for the interpretation of regional networks emphasized the “outside” factors at work, which may be helpful to explain conditions and limitations of regional networks without pushing aside their possible advantages.

4 Research Method

The research method used to analyse the usability network was strongly based to the “paradigmatic model” according to Strauss and Corbin (1990), which was combined to a classical interview-based hypotheses-testing procedure.

A heuristic model was used to commonly identify the research focus. In the model, focal actors’ activities meet in an autonomous network. Regional networks as frames of focal actors’ activities compete with, combine with or separate form other network structures, especially associations and entrepreneurial nets (e.g. bidding consortiums). Communicative or commercial relationships, for which a regional network has been an initial frame or motivation, were interpreted as indicators of potential sustainability, without the relations being defined more closely a priori.

Based upon this model, hypotheses were developed as a resource for reflected participation of the interviewers in the interview situation, not as to-be-tested propositions like in behaviourism. The hypotheses were completed iteratively and validated in ongoing adjustment by means of the analysis of collected empirical data.

A half-standardized questionnaire was set up intended to motivate a strong influence of the persons interviewed upon the interview. Interviewees’ emphasis diverging from the hypotheses was accepted. Starting from document analysis (member lists etc.) the interviews were organised, executed and recorded (if permitted). The interviews were transcribed in paraphrases, conserving argumentation patterns.

The 20 interviewees were, besides the organizers, entrepreneurs and employees of SMEs, one agent of regional business development, and officials of concurring networks. Qualitative data interpretation was carried out using a combination of

methods: As a first step, codes commenting on hypotheses were identified. Ongoing research then elicited remarks that had not been addressed by the interviewers when defining the hypotheses. An additional level was finally identified through semantic conspicuties uncovered in the interviewees' responses and narratives.

5 Empirical evidences

The creation of the regional usability network was first initiated in 2002 by three colleagues of a research institute in the Rhineland area that came up with the idea to promote the knowledge transfer between research and local firms in the field of usability engineering. The three colleagues are now members of the managing committee of the usability network with two other regional firms and are responsible for organizing the different network activities. The main activities of the usability network are events that take place regularly two to four times a year. These events are organized in form of meetings on which researcher and representatives of local firms come together to discus about different usability engineering topics. The meetings take place in the evening in an ancient castle on the campus of the research institute. Usually the meetings are launched by an introductory lecture on a specific usability topic by a prominent guest from industry or research. After the lecture the participants have the possibility to discuss about the lecture, before going on to the more informal part of the event which consists of small-talk accompanied by sparkling wine and canapés served in the special atmosphere of the ancient castle.

The first event was held in 2002 and 500 invitations where send off via a mailing list from the regional chamber of commerce to potentially interested regional actors in the field of usability engineering. Since that, the number of participants for each event varies between 40 and 15 persons.

5.1 Reciprocity requires dispositions for negotiation of meaning

Organizers of regional networks may have different perspectives and motives. Besides mutual support and a shared understanding of a professional field, they can aim at other motives, according to Bourdieu´s approach, for instance, power. Therefore, one can look, if common activities are organized according to power reproduction motives.

In the given network, a part of the invitations was sent to persons of the personal networks of the organizers. Thus the events were used to strengthen existing personal ties. If these invited persons attended the event or not, the

invitations eased the sustaining of relationships of the focal actors. They could combine private and common interests, other members could not.

Another strong motive of the organizers was the possible acquisition of projects. In some cases there has been success of these efforts. Yet, such motives were not directly communicated to other participants. Instead the accentuation of reciprocity was presented as the main target “outward-bound”, whereas within the inner circle of the organizers and their personal network partners self-interests were not hidden. To the outside, a different self-image was transported than to the insiders.

But how could the focal actors know before hand about promising images to be presented outside? This can be explained by Bourdieu´s concept of habitus: the relational perceptions between industry and academia were mediated by differences in habitus, which allowed for mutual anticipation and ongoing negotiation of meaning.

5.2 Social capital is constituted more easily by the social powerful

Some external participants raised the claim of receiving support by the research institute by means of getting perfectly elaborated “best practices” free of charge, which conflicted with the interests of the majority of the organizers to reduced preparation efforts for the events and keep their basic competencies “sticky”.

Some other external participants demanded to focus more on the actual practice of SMEs regarding the content of the presentations and the organisation of the events, for example, using workshops and focussing more on a defined target group. This critique does not succeed, as it demanded more from the focal actors without rewarding them.

In social worlds, interests seldom exactly coincident. But interests may be interpreted by actors allowing for a common production of mutuality. But such a state of mutuality in interests is only possible, when actors are not fully excluded. In the given case, a network has mainly emerged among the focal actors, while their relation to visitors was not of equal inclusion.

5.3 Even merely staged activities may contribute to social capital

Another motivation of some organizers in the beginning of the activities was to improve their reputation in their own institute. At this time, they had just started their jobs at the research institute and needed to produce more visibility of their activities. The activities around the regional network thus were directed in part to

the institute. Even when pronounced goals of regional network building, i.e. reciprocity, shared meaning, and mutual support remained very limited, on behalf of the visibility and reputation, there could be benefits.

Another example of staging came from an organizer, who was an external entrepreneur and engaged in usability issues for large firms. On the occasion of one event, he brought with him colleagues of this firm. Thus, he could demonstrate his social and cultural capital. Although he was friend with some of the researchers, he used the network event as a representative surrounding to bring people together.

5.4 Common dispositions ease the access to situated and tacit knowledge

Motivations of participants can roughly be divided by the mode of the acquaintanceship to the organizers: Those, who did not know the organizers before their attendance to the events, were mainly attracted by the topics. Those, who were familiar to the organizers, e.g. former colleagues, business partners and friends, mainly stressed communication in the second part of the event as a major motivation of participation in the events.

Some individuals appreciated to talk to their former colleagues on both professional and private issues. In contrast, participants who did not know any organizer did not like the atmosphere, but often bemoaned that presentations and discussion were too academic. Thus, acquaintanceship to the organizers represented cultural capital that eased the access to situated and tacit knowledge on the events. In contrast, the participants from SMEs found it difficult to get into discussion or derive valuable insights from it.

6 Conclusion

In this paper, Bourdieu's theory was used for the interpretation of empirical research conducted on a regional network. While the especially Robert Putnam´s reception of the social-capital concept has become identified with the thesis that a high level of social capital automatically emanates positive effects on community building and knowledge sharing, the application of Bourdieu´s Marxist view is useful to catch problematic aspects of social capital more sharply.

Bourdieu´s concept of social capital refers to his understanding of economic and cultural capital. All these capital forms are to define the positions and possibilities of actors in social fields. Thus, power relations can be defined by the ability of mobilising the different capital forms. With the related habitus concept

Bourdieu explains the interaction between actors entering different fields and milieus.

Bourdieu's theory shows social relations as connected with resources issues. Mutuality thus stems from the resources the actors are willing to invest for a common negotiation of meaning. Adopting this view, social capital is constituted and accumulated by actors in relation to their access to resources.

Applying Bourdieu´s theory, it was possible to focus on power relations and understand problematic aspects in the activities aiming at bridging between regional entrepreneurs and scientists in a regional network. This critical view, however, does not necessarily focus upon a "dark side of communities". In contrast, it can be useful to elaborate the preconditions for a common understanding and functioning of mutuality. The detection of such contextual preconditions can be extremely important in order to improve the performance and sustainability of regional networks.

7 REFERENCES

Bourdieu, P. (1977) *Outline of a theory of practice.* Cambridge, UK: Cambridge University Press.

Bourdieu, P. (1986): The Forms of Capital. In: J. Richardson, (Ed.): *Handbook of Theory and Research for the Sociology of Education*. New York, 241-258.

Brown, J.S. & Duguid, P. (2000a) *Mysteries of the Region.* In The Silicon Valley Edge, ed. W. Millar et al. Stanford University Press, 16- 39.

Brown, J.S. & Duguid, P. (2000b) *The Social Life of Information.* Boston: Harvard Business School Press.

Coleman, J. S (1988) Social capital in the creation of human capital. *American Journal of Sociology* 94, 95-121.

Giddens, A. (1979) *Central problems in social theory: Action, structure, and contradiction in social analysis.* London: Macmillan.

Granovetter, M. (1985) Economic Action and Social Structure: The Problem of Embeddedness. *American Journal of Sociology*, 91, 481-510.

Harriss, J. (2005) Das eingebildete Sozialkapital. *Peripherie: Zeitschrift für Politik und Ökonomie in der Dritten Welt*, 99, 267-285.

Huysman, M.H. (2004) Design Requirements for Knowledge-Sharing Tools: A Need for Social Capital Analysis. In M.H. Huysman & V. Wulf (Eds) *Social Capital and Information Society*, MIT-Press, Cambridge MA, 187-208.

Huysman, M.H. & Wulf, V. (2005) The Role of Information Technology in Building and Sustaining the Relational Base of Communities. *The Information Society*, 21, 81-89.

Lave, J. (1993) The practice of learning. In S. Chaiklin & J. Lave (Eds), *Understanding practice: Perspectives on activity and context*, Cambridge University Press, Cambridge UK, 3-34.

Lave, J. & Wenger E. (1991) *Situated Learning: Legitimate Peripheral Participation.* Cambridge UK: Cambridge University Press.

Lawson, C & Lorenz, E. (1998) Collective Learning, Tacit Knowledge and Regional Innovative Capacity. *Regional Studies*, 33, 305-317.

Lay, G.: (1998) Time to market als strategische Größe: Verkürzung von Produktentwicklungszeiten mit Prozeßinnovationen eröffnet neue Marktchancen - Analyseergebnis aus über tausend Betrieben bringt den Beleg. *Wissenschaftsmanagement*, 4, 37-43.

Maillat, D. (1996) Du district industriel au milieu innovateur: Contribution à une analyse des organisations productives territorialisées. *Working papers Université de Neuchâtel*, 9606a, IRENE, Neuchâtel.

Østerlund, C. & Carlile, P. (2005) Relations in Practice: Sorting Through Practice Theories on Knowledge Sharing in Complex Organisations. *The Information Society*, 21, 91-107.

Piore, M.J.& Sabel, C. (1984) *The Second Industrial Divide: Possibilities for Prosperity*. New York: Basic Books.

Porter, M. (1990) *The Competitive Advantage of Nations.* New York: Free Press.

Porter, M. (2000) Location, Competition, and Economic Development: Local Clusters in a Global Economy. *Economic Development Quarterly*, 14, 15-34.

Portes, A. (1998) Social Capital: Its Origin and Application in Modern Sociology. *Annual Review of Sociology*, 24, 1-24.

Putnam, R. (2000) *Bowling alone: The collapse and Revival of American Community*. New York: Simon & Schuster.

Siisiäinen, M. (2000) Two Concepts of Social Capital: Bourdieu vs. Putnam. *ISTR Fourth International Conference "The Third Sector: For What and for Whom?"*, Trinity College, Dublin.

Suchman, L. A. (1987) *Plans and Situated Action. The Problem of Human-Maschine Communication*. Cambridge UK: Cambridge University Press.

Strauss, A., Corbin, J. (1990) *Basics of qualitative research: Grounded theory proceedures and techniques*. Newbury Park CA: Sage Publications.

Uzzi, B. (1997) Social Structure and Competition in Interfirm Networks: The Paradox of Embeddedness. *Administrative Science Quarterly*, 42, 35-67.

Van Maanen, J. & Barley, S.R. (1984) Occupational communities: Culture and control in organizations. *Research in Organizational Behavior*, 6, 287-365.

Wenger, E. (1998) *Communities of Practice: Learning, Meaning, and Identity*. Cambridge UK: Cambridge University Press.

Semantic Discovery of Services in Peer-to-Peer Based Inter-Firm Grids

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1 INTRODUCTION

The concept of inter-firm network, *i.e.* a group of related organizations that partner and/or cooperate with each other in order to provide expanded products and services, in our opinion fits nicely with the Grid computing concept of coordinated resource sharing in dynamic, multi-institutional virtual organizations [14]. Effective, ICT-enabled cooperation among enterprises and other institutions calls for seamless interoperability and strong security at each layer involved, from the lower network-level protocols up to the application-level data-model. Virtualization and standardization are of paramount importance to overcome the differences in models, processes and tools adopted by each enterprise, for example regarding the key issue of identity management. By leveraging upon service orientation, federated security and dynamic provisioning of resources, modern Grid middleware has the potential to enable scalable, flexible, yet controlled information and service sharing across s enterprise boundaries.

Unfortunately, this Grid vision has only been partially realized by currently available Grid architectures. To fill the gap between aspiration and practice in Grid computing, the application of Semantic Web technologies both on and in the Grid has been advocated [7]. Semantic Web gives to the Grid a standard ontology language for information interchange, while the Grid provides the Semantic Web with an extensive and flexible middleware platform for heterogeneous resource/service integration. Semantic Grid architectures should enable automatic location, selection, employment, composition, and monitoring of services. To

establish a framework within which computer-interpretable service descriptions are made and shared, W3C is developing OWL-S [16], which is an OWL-based Web Service ontology supplying a core set of markup language constructs for describing the properties and capabilities of Web services in unambiguous form.

In this context, our research and development efforts focus on making it easier to design, configure, deploy and maintain semantically enriched service-oriented applications. The peculiarity of our approach lies into a flexible peer-to-peer overlay network architecture, which improves the performance of semantics based service discovery while maintaining a high degree of node autonomy and fault tolerance. Recently, there has been an increasing interest for a possible convergence between the Grid and Peer-to-Peer (P2P) technologies [13], to the purpose of progressing beyond traditional client/server approaches and centralized service provisioning, and of developing robust and highly decentralized, knowledge-based Grid systems.

The application of the peer-to-peer paradigm to the problem of service sharing and discovery could allow for greater flexibility and robustness with respect to what it can be achieved with industrybacked centralized registries such as the Universal Description, Discovery, and Integration (UDDI) project [22]. Notwithstanding their ample technical features, and the outstanding commercial weight of their maintainers, their centralized nature exhibits evident shortcomings in terms of rigidity, faulttolerance and performance. Our Peer pattern [4] has been defined to cope effectively with the needs of Virtual Organizations (VOs), *i.e.* network-enabled, transitory communities made of individuals and institutions, which are mostly related to information and service sharing/discovery, resource scarcity as well as security and trust. In a Peer-based distributed system, *i.e.* peer-to-peer network, all nodes have the same structure (regardless of the type and quantity of local resources) and are not only potential users but also potential resource providers.

We applied the Peer pattern to realize the *Service-oriented Peer-to-Peer Architecture (SP2A)* [5], a lightweight framework for the development of service-oriented peers for efficient and robust Grid environments. In writing the functional and technical specification of SP2A, we considered the Service-Oriented Architecture Reference Model (SOARM) proposed by OASIS [21]. In particular we respected the principle that a service is a set of functionalities provided by one entity for the use of others, and it is invoked through a software interface but with no constraints on how the functionality is implemented by the providing entity.

A service is opaque in that its implementation is hidden from the service consumer except for (1) the *data model* exposed through the published service interface, and (2) any information included as *metadata* to describe aspects of the service which are needed by service consumers to determine whether a given service is appropriate for the consumer’s needs. Consistent with the axiom of

opacity, a service consumer cannot see anything behind the service interface and does not know if one service is actually consuming and aggregating other services.

SP2A allows to share services which implement the mechanisms for managing the resources provided by each peer (*e.g.* computational power, storage, contents, sensors). Currently, these services are implemented as Web Services, and expose both WSDL and OWL-S interfaces. Remote services can be searched using different strategies, which are illustrated in this paper. The most significant is SDDM, *i.e.* semantic discovery with distributed matching. As we demonstrate with experimental results, the matching process of semantic profiles is time-consuming. For this reason, it is unreasonable to use a single server to collect all service profiles and perform matching analysis with requested profiles. Distributing service knowledge and computational workload among peers is the key concept of the SDDM solution provided by SP2A.

Logistics is a natural application for the service sharing model proposed by SP2A. Logistics is the geographical repositioning of raw materials, work in process, and finished inventories where required at the lowest cost possible, through the integration of information, transportation, inventory, warehousing, material handling, and packaging. In this context, we participate to a regional project named STIL ("Strumenti Telematici per l'Interoperabilità delle reti di imprese: Logistica digitale integrata per l'Emilia-Romagna", *i.e.* telematic tools for inter-firm networks interoperbility: digital logistics for the Emilia-Romagna region).

The paper is organized as follows. Section 2 illustrates two strategies for resource sharing based on the semantic approach. Section 3 describes the implementation of the SP2A framework as a Java API. Many details are given about two basic modules, *i.e.* the Semantic Extractor and the Semantic Matcher, along with their performance evaluation. Section 4 discusses related work in the Semantic Grid research field. Section 5 illustrates our background and the STIL project, to which we contribute with SP2A. Finally, an outline of open issues concludes the paper.

2 DEPLOYMENT AND DISCOVERY OF RESOURCE PROVISION SERVICES

The SP2A framework allows users to share their resources, *i.e.* publishing local *Resource Provision Services (RPSs)*, as well as locating and interacting with remote ones. SP2A design is based on the Peer pattern [4], which defines a set of modules and their interactions. The most important module is the *Router*, which defines the rules for addressing, filtering, sending, and receiving messages. Most of the peer operations, such as publication, search and delivery of resources, rely

on the Router. Resource sharing in SP2A can be summarized by the following three phases.

1. When a resource is published, the description of its Resource Provision Service, including information such as security requirements, is made available to the Router. On resource discovery, (possibly complex) user queries are delivered to the Router. Messages for other peers are the third kind of input a Router can receive.
2. Based on the received input, the Router creates new messages and computes their destination.

   On resource discovery, queries can be either syntactically or semantically evaluated. This process can affect the computation of next destination peer.
3. The Router sends query-related messages to the computed destination.

   Consumers are allowed to check if a discovered RPS is available, if it performs a certain function or a set of functions, if it operates under specified constraints, and if it can be invoked through a specified means, including inputs that the service requires and outputs that will form the response to the invocation. Capturing service functionalities is a difficult goal to achieve. This aspect needs to be expressed in a way that is generally understandable by service consumers, but able to accomodate a vocabulary that is sufficiently expressive for the domain for which the service provides its functionalities. This may include, among other possibilities, machine-processable interfaces. All RPSs expose an interface which specifies how to access its functionalities. This information should be represented in one or more standard, referenceable formats. The service interface prescribes what information needs to be provided to the service in order to exercise its functionalities and/or the results of the service invocation to be returned to the service requester [21]. In particular, SP2A allows to define RPS semantics, which are the shared expectations associated with the resource. RPS consumers perceive the semantics as broken in three main parts: the data model, the process model, and the behaviour. The latter is the intended real world effect of using a RPS. Semantic description of RPSs allows for fine-grain tuning of the discovery process, which should be efficient, fault tolerant, scalable and autonomic.

2.1 Semantic Discovery of RPSs

The Router allows the user to choose among the following strategies for searching remote RPSs:

- <attribute, value> discovery with distributed matching (AVDDM)
- semantic discovery with local matching (SDLM)
- semantic discovery with distributed matching (SDDM)

In the first solution, AVDDM, the keyword set provided by the user, possibly filtered (using Boolean analysis) by a *Syntactic Extractor*, is propagated in the

network. Any other involved peer activates its *Syntactic Matcher* to find local RPSs which syntactically match with the received keyword set. In the second solution, SDLM, the *Semantic Extractor* module builds a small ontology from the textual query issued by the user. For each class of the ontology produced by the Semantic Extractor, the Router sends an <attribute, value> syntactic query, and the *Semantic Matcher* compares discovered RPSs with a locally produced semantic Profile.

In the third solution, SDDM, the Router propagates the semantic Profile of the required RPS. Any other involved peer activates its Semantic Matcher to find local RPSs which semantically match with the received Profile.

Figure 1 and 2 illustrate, respectively, the SDLM and SDDM strategy in the same unstructured supernode network scenario.

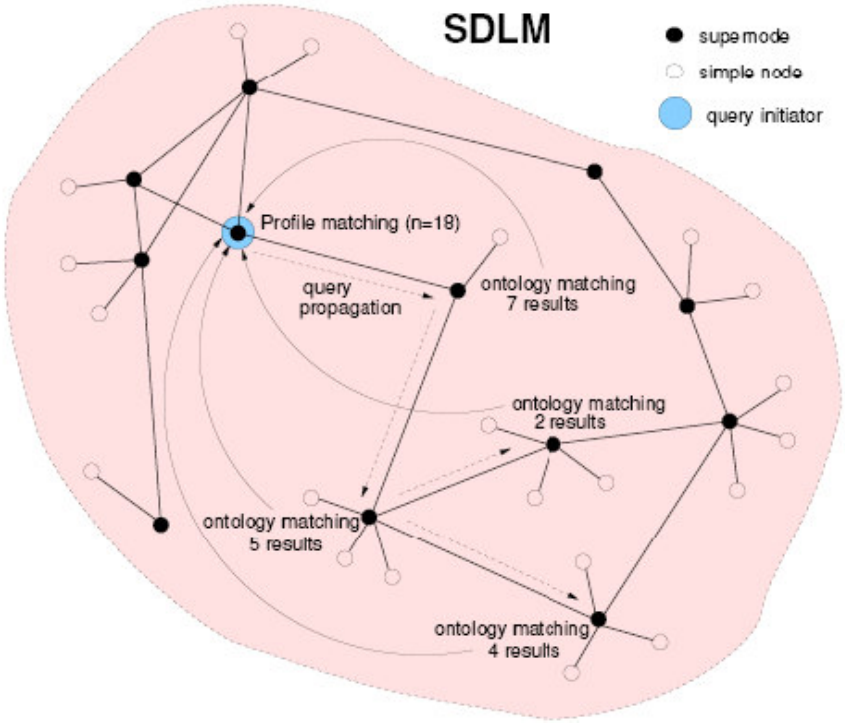

Figure 1 – Semantic discovery with the SDLM strategy.

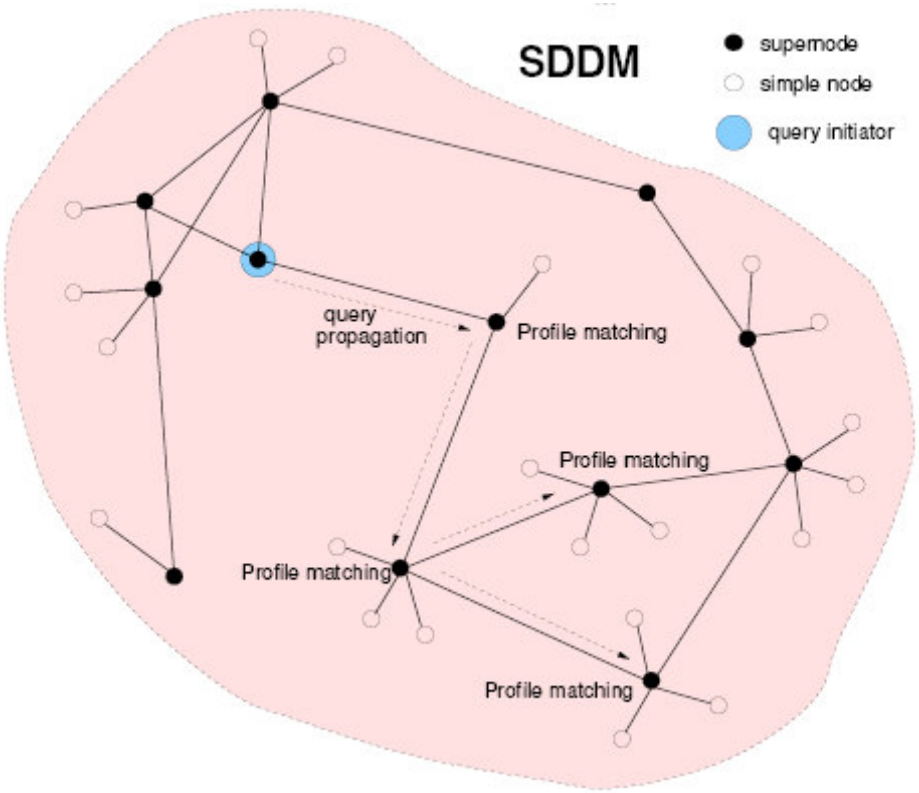

Figure 2 – Semantic discovery with the SDDM strategy.

To compare the duration of a search process based on the two strategies, we define $t_o(n_w)$ as the time for extracting the ontology from a n_w-words query, $t_{om}(n)$ as the time for syntactically matching n RPSs with the required ontology, and $t_{pm}(n)$ as the time for semantically matching n RPSs with the required Profile.

For simplicity we suppose that, for a given network topology, the path followed by a query is the same for both SDLM and SDDM strategies. Thus, propagation time can be neglected because it is the same for both approaches, and we can define semantic discovery time as:

$$t_{SDLM} = t_o(n_w) + t^d_{om}(n_{tot}) + t_{pm}(n_{om})$$
$$t_{SDDM} = t^d_{pm}(n_{tot})$$

The *d* stands for „distributed“, as ontology matching in SDLM and Profile matching in SDDM are concurrently performed among involved supernodes. Conversely, Profile matching in SDLM is performed by the query initiator peer, after the „pre-filtering“ process realized by the distributed ontology matching, which reduces the number of service to compare with the Profile. Depending on the behaviour of $t_{om}(n)$ and $t_{pm}(n)$, SDDM is more or less convenient than SDLM.

3 SYSTEM IMPLEMENTATION

The SP2A framework has been implemented as an open source Java middleware, illustrated in figure 2, which includes four components providing interfaces and classes for managing the main aspects of the service-oriented peers: state, group, security, and rps (the latter is the acronym of *resource provision service).*

Peer-to-peer connectivity is based on JXTA [23], *i.e.* Sun's open initiative. Each RPS is implemented as a Web Service, and exposes both WSDL and OWL-S interfaces which are collected in a JXTA advertisement.

JXTA-SOAP [8], an official JXTA-related project we are currently managing, is the core of our SP2A system. JXTA-SOAP allows to share Web Services in JXTA peer-to-peer networks. Recently, we provided JXTA-SOAP of Web Service Security (WSS) support. We are now planning to extend the package to support the Web Service Resource Framework (WSRF), to make JXTA-SOAP comparable with current state of the art middleware for Grid architectures based on Web Services, *i.e.* Globus Toolkit 4 [1], with the added value of native peer-to-peer support. Moreover, SP2A adopts several third-party packages for text analysis, ontology extraction and semantic matching of service profiles. In the following we illustrate how these packages have been used to implement the modules which allow for semantic discovery of resources in SP2A.

3.1 Semantic Extractor

The Semantic Extractor (SE) module generates an ontology from a textual descriptions of the desired services. The SE is made of three sub-modules: the Information Extractor, the Word Disambiguator, and the Ontology Creator.

The *Information Extractor* uses GATE [18] to produce a *Corpus* which can be analyzed by a language-specific *Tokenizer*, exploiting a *Gazetteer* to perform syntactic text analysis and to extract nouns, adverbs, conjunctions, etc.

Syntactical and structural information produced by the Information Extractor are then filtered by the *Word Disambiguator*, which is an implementation of the algorithm proposed by Navigli and Velardi in [19]. The Word Disambiguator uses WordNet [10] and JUNG [2] to create *semantic graphs*, which represent words (as nodes) and relations between words (as weighted arcs). For each given ambiguous word a semantic graph is built, connecting the word to its hypernyms, meronyms, holonyms and hyponyms. To disambiguate a word, the algorithm starts from the corresponding graph and tries to connect it to non-ambiguous word graphs. If an ambiguous word leads to many non-ambiguous words, the algorithm chooses the path with minor weight. Conversely, if an ambiguous word cannot be related to any non-ambiguous word, the algorithm chooses the meaning which is more frequently associated to the word (WordNet classifies word meanings based on

their usage frequency). Weights can be assigned using several policies. We chose to assign the same weight for all kinds of relations, and to increase weights at each hop (starting from the root of the graph with *w=1*). The *Ontology Creator* extracts ontologies from semantic graphs built by the Word Disambiguator, based on an algorithm which considers hypernymy ("is a kind of") relations. To avoid excessive depth of the resulting class tree, the Ontology Creator searches for common superclasses, and for class relations. In details, for each word, the hypernym sequence is compared with those of other words, searching for the common terminal string with the greatest number of hypernyms; the chosen superclass is the the first hypernym of the common terminal string. Moreover, for each discovered superclass, the hypernyms sequence is compared with those of other classes; further superclasses are chosen with the same procedure in previous step, paying attention to recursiveness. The process can be computationally expensive, depending on the total number of words n_w in the initial text provided by the user to the Semantic Extractor.

3.2 Semantic Matcher

As described in the previous section, semantic matching can be local to the query originator, once it has received some responses, or distributed across the supernode network. In the latter case, JXTA ResolverService uses the Semantic Matcher (SM) instead of the default syntactic matcher. The SM looks for OWL-S descriptions among discovered service advertisements, comparing them with an OWL-S Profile generated upon user inputs. The SM returns a result list, ordered according to the *Similarity Degree* [16] of each discovered service with the reference profile. The user can specify one or more constraints while creating the semantic description of the desired service, such as taxonomy classification (e.g. UNSPSC), input or output types, preconditions or a global matching degree. A OWL-S Profile is created, which can be incomplete if the user does not define all service parameters. The more the OWL-S description is detailed, the more the SM is selective, at the risk of too many false negatives. Conversely, an incomplete OWL-S description can generate many unacceptable results (false positives).

To measure the usefulness of a service the SM compares the so-called *IOPE parameters* (*i.e.* input, output, precondition, and effect) among wanted and discovered OWL-S Profiles. The result of matching operation is a complex object called *matching degree*, which also considers the conformity of discovered services to the desired *Service Category*.

Profile parameters values refers to an OWL ontology set, thus they can have the following matching degrees:

1. *Equivalent(P1,P2)*, if parameter values are equivalent, *i.e.* they define the same concept; the equivalence between two concepts is not limited to "is the same as" relation, because equivalent classes can have different names;
2. *Subsume(P1,P2)*, if one parameter value generalizes the other;

3. *Fail(P1,P2)*, if parameter values are not related.

3.3 Performance Evaluation

With reference to the strategies defined in the previous section, we illustrate the results of the experiments we performed to measure the performance of Semantic Extractor and Matcher modules.

We premise that, in current SP2A implementation, the time for syntactically matching *n* distributed RPSs with the required ontology is very short, thus we can assume $t_{SDLM} = t_o(n_w) + t_{pm}(n_{om})$, where $t_o(n_w)$ is the time which is necessary to the Semantic Extractor for extracting the ontology from a n_w - words user query, and $t_{pm}(n)$ is the time in which the Semantic Matcher implementation matches *n* RPSs with a required Profile.

The semantic richness of the ontology produced by the Word Disambiguator depends on n_w. Generally speaking, the more the number of words forming the user query, the more the richness of the ontology. On the other side, n_w affects the duration of the process, as illustrated in the figure 3.

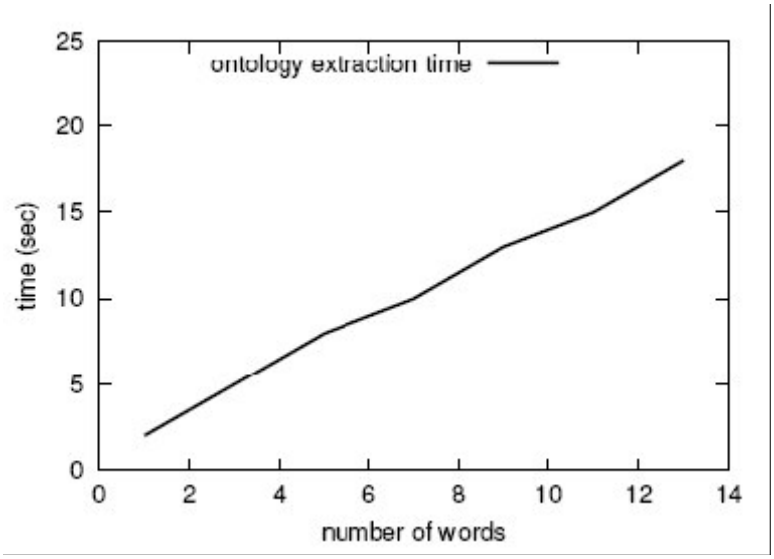

Figure 3 – Time behaviour of the ontology extraction process.

We observe that t_o increases linearly with the number of words n_w (a typical value for n_w is *5*). The Profile matching process returns an ordered list of services, through a semantic similarity measure. The duration of this process depends on the number *n* of service to order, and on the complexity of the Profile. We considered three cases: Profiles with only one parameter (the Service Category), Profiles with three parameters (Input-Output), and Profiles with complete service description (IOPE full). Figure 4 illustrates that $t_{pm}(n)$ has a linear shape, whose angular coefficient increases with the Profile complexity.

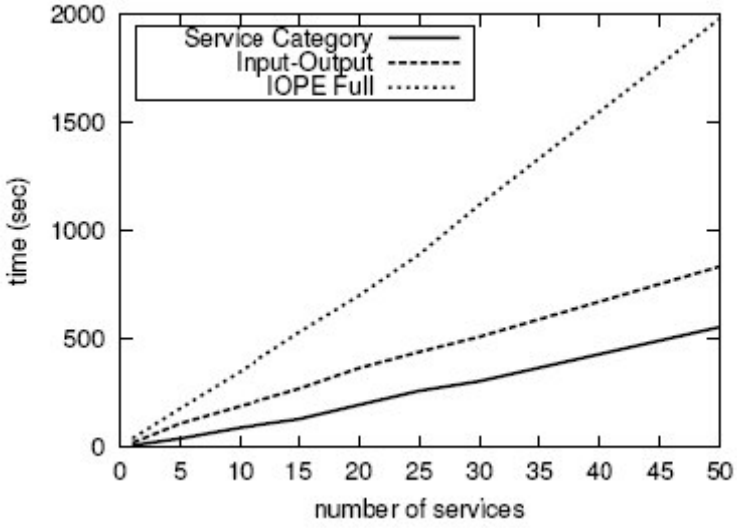

Figure 4 – Time behaviour of the profile matching process.

These results suggest that semantic Profile matching should be distributed in the overlay network, to avoid heavy workload on the query initiator peer which is already charged by disambiguation tasks. Thus the SDDM strategy should be preferred to the SDLM, in particular for supernode networks, where leaf nodes in general lack of computational power and storage. To this purpose, we are studying a possible refactoring of the JXTA routing package, to make it easy to support different routing strategies, and in particular the SDDM-based strategy.

4 RELATED WORK

After the introductory work of De Roure et al. [7], several steps have been made in the Semantic Grid research field. The Global Grid Forum has established the Semantic Grid Research Group (SEMGRID) [15] to track Semantic Web community activities and advise the Grid community on the application of Semantic Web technologies in Grid applications and infrastructure, to identify case studies and share good practice.

One of the most important topic is the choice of the language for semantic annotation of Grid services. SP2A adopts OWL-S [16], but other solutions are available. The Web Services Modeling Framework (WSMF) [11] is an alternative approach for semantically annotating Web Services, aiming at resolving interoperability problems faced by Web Service composition. Its main elements are: ontologies, goal descriptions, elementary and complex Web Services, and

mediators. WSFM is an extension of the Unified Problem-solving Method Development Language (UPML) [12], which has been developed to describe, implement and semi-automatically reuse knowledge-intensive reasoning systems based on libraries of generic problem-solving components. UPML is also the basis of the Internet Reasoning Service (IRS) [9], which provides a means for ontology-based Web Service selection using reasoning.

In the peer-to-peer context, Crespo and Molina [6] propose that node connections be influenced by content, so that semantically related nodes are clustered together, forming a Semantic Overlay Network (SON). In a SON system, each query is processed by identifying which SONs are better suited to answer it. Then the query is sent to a node in those SONs and forwarded only to the other members of that SON. Our approach is completely different, because SP2A peergroups are userdriven, not self-organizing. Moreover, in SP2A queries are propagated in a particular peergroup only upon user decision, otherwise they are routed in the main group.

Our solution can be compared to the one proposed by Nakauchi *et al.* [17], whose key mechanism is query expansion at nodes that receive the query. In details, a searcher issues a query which indicates several keywords. This query is flooded (forwarded to all neighbors) with a certain TTL (time to live). A node which receives a query performs query expansion using its local KRDB, *i.e.* a thesaurus which keeps some information about the data items stored locally in the node. An interesting metadata-based P2P infrastructure for educational purposes is provided by the Edutella Project [20]. Edutella Peers use JXTA P2P primitives to form the Edutella Network, in which they can share and retrieve services. The Edutella Query Exchange Language and the Edutella common data model provide the syntax and semantics for an overall standard query interface across the heterogenous peer repositories for any kind of RDF [3] metadata. Edutella wrappers are used to translate queries and results from the Edutella common format to the local format of the peer (*e.g.* RQL, TRIPLE, SQL, dbXML, AmosQL) and vice versa.

5 DSG AND THE STIL PROJECT

The research activity of the Distributed System Group (DSG) at the Information Engineering Department of the University of Parma mainly focuses on service-oriented architectures, Grid computing, peer-to-peer architectural models, and multimedia streaming in wired and wireless networks. The DSG is involved in several projects, both national (STIL and FIRB Web Minds), and international (EU Multi-Knowledge).

In this section, we shortly illustrate the STIL project (“Strumenti Telematici per l’Interoperabilità delle reti di imprese: Logistica digitale integrata per l’Emilia-Romagna”, *i.e.* telematic tools for interfirm networks interoperability:

digital logistics for the Emilia-Romagna region). In STIL, logistics is considered in the context of interactions between providers and consumers of products and services in the e-market place. STIL's final purpose is to create a region-wide Virtual Logistic Pole (VLP) providing Enterprise Application Integration (EAI), for both business to consumer (B2C) and business to business (B2B) applications to manufacturing firms, transportation carriers and logistic hubs.

The concept of *value-chain* is applied not only to the providers-producers chain, but also to public interext, with particular emphasis on process observation and optimization for environment and quality of life safeguard.

STIL defines an ICT infrastructure which offers mechanisms and policies for the semantic integration of applications (*eServices*) which realize stategical features for the value-chain. An eService is a software entity deployed by a service provider across the Internet. eServices can be statically selected by subscribing off-line contracts, or dynamically discovered using several approaches (for example, the SP2A approach). Obviously, an eService can be selected not only for its functionalities, but also for the quality of service (QoS) it guarantees.

From the technological point of view, eServices are implemented with Web Service technologies. By focusing solely on messages, the Web Service model is completely language, platform and object model-agnostic. A Web Service can be implemented using the full feature set of any programming language, object model, and platform. A Web Service can be consumed by applications implemented in any language for any platform. For these reasons, STIL system developers are able to independently implement services using their favourite languages and tools, and to choose among several deployment architectures, either client/server oriented, such as Tomcat, or peer-to-peer oriented, such as SP2A.

6 CONCLUSIONS

In this paper we illustrated our approach to the semantic discovery of services in peer-to-peer based inter-firm Grids. We illustrated two discovery strategies for the Router component, *i.e.* Semantic Discovery with Local Matching (SDLM), and Semantic Discovery with Distributed Matching (SDDM). We described the implementation and performance evaluation of their basic modules, and demonstrated that SDDM is the best solution because it evenly distributes service information and computational workload among all peers.

We are currently working to the implementation of the SDDM strategy, which introduces ontologybased functionalities at the overlay network level and thus requires JXTA modifications to enable semantic query matching on supernodes (*i.e.* routing peers). An additional goal is related to the investigation of automatic

service orchestration for SP2A based on semantic discovery and inputoutput matching.

7 REFERENCES

The Globus Alliance. Homepage http://www.globus.org.

Java Universal Network/Graph Framework. Homepage http://jung.sourceforge.net.

Resource Description Framework. Homepage http://www.w3.org/RDF/.

Amoretti, M. & Reggiani, M. & Zanichelli, F. & Conte. G. Peer: an Architectural Pattern. The 12th Pattern Languages of Programs (PLoP), Monticello, Illinois, September, 2005.

Amoretti, M. & Zanichelli, F. & Conte, G. SP2A: a Service-oriented Framework for P2P-based Grids. 3rd International Workshop on Middleware for Grid Computing, Co-located with Middleware 2005. Grenoble, France, November, 2005.

Crespo, A. & Garcia-Molina, H. Semantic overlay networks for p2p systems. Technical Report, Computer Science Department, Stanford University, 2002.

De Roure, D. & Jennings, N. & Shadbolt, N. Research Agenda for the Semantic Grid: A Future e-Science Infrastructure. Technical report, National e-Science Centre, December 2001.

Distributed Systems Group. JXTA-SOAP project. Homepage http://soap.jxta.org.

Domingue, J. & Cabral, L. & Hakimpour, F. & Sell, D. & Motta, E. IRS-III: A Platform and Infrastructure for Creating WSMO-based Semantic Web Services. *Workshop on WSMO Implementations,* Frankfurt,Germany, September, 2004.

C. Fellbaum, editor. WordNet - An Electronic LexicalDatabase. *MIT Press*, 1998.

Fensel, D. & Bussler, C. The Web Service Modeling Framework WSMF. *Electronic Commerce Research and Applications, 1(2), 2002.*

Fensel, D. & al. The unified problem solving method development anguage upml. *Knowledge and Information Systems, 5(1), 2002.*

Foster, I. & Iamnitchi, A. On Death, Taxes, and the Convergence of Peer-to-Peer and Grid *Computing. 2nd International Workshop on P2P Systems (IPTPS '03), Berkeley, CA, February, 2003.*

Foster, I. & Kesselman, C. & Nick, J. & Tuecke. S.. The Anatomy of the Grid: Enabling Scalable Virtual Organizations. *International Journal of Supercomputer Applications*, 15(3), March, 2001. [15] Global Grid Forum. Semantic Grid. Homepage https://forge.gridforum.org/projects/sem-rg, 2005.

Martin, D. & al. Bringing Semantics to Web Services: the OWL-S Approach. In *First International Workshop on Semantic Web Services and Web Process Composition (SWSWPC 2004),* San Diego, California, USA, July, 2004.

Nakauchi, K. & Morikawa, H. & Aoyama, T. Design and Implementation of a Semantic Peer-to-Peer Network. In 7th IEEE International Conference on High Speed Networks and Multimedia *Communications (HSNMC '04), June, 2004.*

Natural Language Processing Group. General architecture for text engineering (GATE). Homepage http://gate.ac.uk.

Navigli, R. & Velardi, P. Learning Domain Ontologies from Document Warehouses and Dedicated Web Sites. *Technical Report*, 2004.

Nejdi, W. & al. Edutella: a P2P Networking Infrastructure Based on RDF. *WWW2002*, May 2002.

S. O. A. Reference Model TC. Service Oriented Architecture Reference Model. *Technical report*, OASIS, June 2005.

The Stencil Group. The Evolution of UDDI -UDDI.org, *White Paper*, July, 2002. [23] Traversat, B. & al. Project JXTA 2.0 Super-Peer Virtual Network. *Technical Report*, Sun Microsystems, May, 2003.

Promoting Broadband Internet Use in Rural Areas Through Rural Business Clusters

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1 INTRODUCTION

Rural areas continue to be a disadvantaged population in the Information Society. In the United States, for example, the rural-urban gap in basic Internet access is closing but a new gap in broadband access has opened (Bell, Reddy, & Rainie, 2004; NTIA, 2004). As in many developed countries, this has led to a concerted effort throughout the U.S. to increase access to broadband throughout rural America, using both wired and wireless platforms (Pigg & Crank, 2005). While providing the basic technical means of access is an obvious and important first step that has received most of the attention to date (Strover, 2003), access alone is not enough. Rural areas lag behind urban ones in broadband access even after adjusting for urban-rural demographic differences (Prieger, 2003). Education and income are significant factors when explaining household-level urban-rural differences in Internet adoption (Mills & Whitacre, 2003). In addition, rural residents tend to be older, make less money, and attain a lower level of education when compared to urban residents, factors that may also limit broadband adoption (Bell, Reddy, & Rainie, 2004). These findings suggesting that infrastructure improvements alone may not be the answer to closing the urban-rural broadband divide. Despite this, in the U.S., the public sector has begun to subsidize the extension of broadband access to rural homes through grants to rural broadband providers, funded by the Rural Utilities Service and other federal and state initiatives (Pigg & Crank, 2005; Pittman, 2002). But will these investments

stimulate broadband adoption and improve rural life or should resources for broadband development be directed elsewhere in rural communities?

In this short position paper, we suggest that one way to improve the adoption and use of broadband in rural areas is take a cluster approach. We suggest that in order to achieve ubiquitous access and the social and economic benefits it may convey to rural residents, policy makers should concentrate on ensuring broadband adoption by businesses in rural communities. Recent research suggests that the most important correlate of dial-up Internet adoption in rural homes is Internet usage in the workplace (Hollifield & Donnermeyer, 2003) and this appears to hold up for broadband as well (LaRose et al., 2005; LaRose et al., 2006). And, within the business community, we argue that for many of the same reasons that regional clusters seem to convey competitive advantages on their members, cluster members are more likely to gain from their use of broadband. Positive experience with broadband at work can then stimlate take-up at home.

2 RURAL BUSINESS CLUSTERS AND GAINS FROM BROADBAND

Since exposure to broadband Internet connections in the work place is the "prime mover" in this scenario, the question becomes how to stimulate their adoption by rural businesses. We propose that the adoption and use of broadband in rural communities will be more successful when it occurs within the context of a well-functioning regional cluster. A considerable literature has focused on the pivotal role of business clusters found in cities and regions as drivers of economic health (Porter, 1990). Clusters are groups of companies in a common industry located in the same geographic area, often including a range of supporting players such as local trade associations, and education and research organizations.

Normally considered an urban or suburban phenomenon, recent work has explored the value of clusters in rural contexts (RTS, 2003; Gibbs & Bernat, 1996). Rural business clusters have been identified as a key economic development strategy for rural areas (Rosenfeld, 2001). Examples span the nation, from an aquaculture cluster on the coast of Maine, to a wood products cluster in Oregon (RTS, 2003). One important aspect of rural clusters is that they are largely comprised of small businesses, which has implications for their ability to adopt and successfully use information and communication technologies.

Despite the disadvantages from limited resources, small businesses may still be able to benefit from their broadband use if embedded within a well-functioning cluster (Steinfield & Scupola, 2006). We propose that the combination of broadband access by rural businesses embedded within a cluster yields greater economic benefit than rural business use of broadband without the support of a cluster. The mechanisms through which clusters convey advantage in the use of

broadband include such factors as enhanced coordination among companies, learning effects, and trade/export benefits through e-commerce that are enhanced by client recognition of the cluster even without explicit prior knowledge of individual businesses. As these advantages become known to rural entrepreneurs they may be expected to cause further deployment of broadband connections and inspire innovative business plans and new business creation. In this perspective, businesses ultimately serve in the role as "change agents" for broadband adoption by the larger community only if they profit from Internet-based business innovations. A variety of factors are related to the success of electronic business (e-business) technologies adopted by small firms (Windrum & de Berranger, 2002) including the size of the organization, its experience with e-business technologies, in house skills, training, financial resources, management resources, and the time available to implement new systems (Steinfield and Whitten, 1999). Support from CEOs, their age, experience, innovativeness, and effective use of internal and external experts also play a role. Finally, the nature of an enterprise is also important. Service industries and technology-intensive manufacturing terms are inherently more likely than others to benefit from network connections, for example (Windrum & de Berranger, 2002). Relatively new and smaller information service businesses are especially likely to benefit from Internet connections (Traxler & Luger, 2000).

Membership in a business cluster can amplify the relative advantage of broadband connections for rural enterprises. The classical economic explanation for this phenomenon is that clustering endows certain localities with resource advantages, such as a pool of trained IT professionals, and the pressure of nearby competition sparks innovation (Breschi & Malerba, 2001; Pratt, 2000, Porter, 2000). An alternative view is that proximity can stimulate innovation activities where there is an institutional network that facilitates interactions among firms, customers, suppliers and knowledge centers (Maskell, 2001; Morgan, 1997). Proximity also is highly related to the notion of "embeddedness," whereby social relations among neighboring firms in a common industry encourage norms of reciprocity, as well as informational and economic exchanges for mutual benefit (Granovetter, 1985; Uzzi, 1997). Rural clusters may aggregate around enterprises involved in producing similar products, enhancing the competitiveness of local firms, especially regarding their ability to export goods and services outside the region (Porter, 2004). Similar effects due to proximity may also result from online associations among firms in disparate industries that are located in a specified area but organized through online forums in which information and communication technology applications are discussed (Deakens, Galloway & Mochrie, 2004; Traxler & Luger, 2000). Finally, there is some evidence to suggest that firms in a cluster gain more benefit from their use of the Internet, especially as the cluster itself develops a reputation (Yukawa, 2004; Steinfield & Scupola, 2006). This may not only arise from the social capital benefits arising

from proximity and interaction (Steinfield, 2004), but also because the cluster's reputation may transfer to the individual members, improving their e-commerce prospects outside the region (Steinfield & Scupola, 2006).

3 BROADBAND EFFECTS ON CLUSTERING?

Electronic linkages among firms may also stimulate the formation of business clusters in rural areas that can improve the performance of firms (Porter, 2004) and boost rural economies. In a global economy, the emphasis in rural economic development must shift from "smokestack chasing" to cultivating rural entrepreneurs and the telecommunications infrastructure is an important element of that strategy (Drabenstott, Novack, & Abraham, 2003). Reliable broadband connections could allow rural residents to hold down jobs with urban enterprises while they reside in rural communities, creating new economic opportunities that can reduce out-migration (Speare, Kobrin & Kinckade, 1982). Such connections can also link rural entrepreneurs to remote sources of expertise, including former business partners and research collaborators (Saxenian and Hsu, 2001). However, there is as yet no reliable evidence that advanced Internet technologies in fact cause economic development (cf. Pigg & Crank, 2005).

4 CONCLUSIONS AND IMPLICATIONS

Our brief position paper has argued that the degree to which a business is located within a cluster can affect the success of Internet-based e-business applications. The clustering phenomenon is also of interest from a policy perspective since it could provide a cost effective means of stimulating the adoption of broadband Internet connections by small firms without offering financial incentives such as tax credits or government subsidized services. Communities benefit as well as firms from clustering, as both employment and wages rise among the clustered firms (Gibbs & Bernat, 1997).

Social outcomes and economic ones are intertwined (Laudeman, 2005). Rural quality of life issues (Kellogg Foundation, 2001) lead to the exodus of young rural residents, with more educated young adults showing a particularly high propensity to leave (Mills & Hazarika, 2001). Expanded educational and entertainment opportunities might stem the out-migration of young rural residents and attract new residents and enterprises from urban areas. Quality of life issues also have an impact on relocating firms to rural areas and retaining existing ones (Johnson & Rasker, 1995). Broadband users are more likely than dial up users to use the Internet for entertainment and to bank, buy products, obtain the news, search for health information, interact with government agencies, and search for a job online than dial up users (NTIA, 2004). So, broadband access might improve social and

economic conditions beyond levels achievable with basic Internet access. Broadband networks could attract entrepreneurs from urban areas and stimulate return migration (Malecki, 2003).

5 REFERENCES

Anderson, J.R. (1983) The architecture of cognition. Cambridge MA : Harvard University Press.

Bannon, L.J. & Kuutti, K. (1996) Shifting perspectives on organizational memory : from storage to active remembering. IEEE HICSS'96, Hawai, January, 1996.

Bartlett, F.C. (1932) Remembering. Cambridge : Cambridge University Press.

Chi, M.T.H., de Leeuw, N., Chiu, M.-H. & LaVancher, C. (1994) Eliciting self-explanations improves knowledge. Cognitive Science, 18, 439-477.

Falzon, P., Sauvagnac, C. & Chatigny, C. (1996) Collective knowledge elaboration. In Group COOP (Ed) COOP'96, Second international conference on the design of cooperative systems. INRIA Press, Rocquencourt.

Suchman, L. (1998). Distributed agency : Is there any other kind ? In F. Darses & P. Zaraté (Eds), COOP'98, Third international Conference on the design of cooperatives systems, INRIA Press, Rocquencourt.

Bell, P., Reddy, P., & Rainie L. (2004). Rural areas and the Internet. Washington, DC: Pew Internet & American Life Project. Retrieved May 30, 2005, from http://www.pewinternet.org/pdfs/PIP_Rural_Report.pdf.

Breschi, S. and F. Malerba (2001). The geography of innovation and economic clustering: Some introductory notes. Industrial and Corporate Change, 10(4), 817-834.

Deakens, D., Galloway, L., & Mochrie, R. (2004). The Use and Effect of ICT on Scotland's Rural Business Community. Stirling, Scotland: University of Stirling. Downloaded from the W e b o n D e c e m b e r 1 , 2 0 0 4 , Available: http://www.scotecon.net/publications/Deakins%20Full%20Report.pdf.

Drabenstott, M., Novack, N., & Abraham, B. (2003). Main streets of tomorrow: Growing and financing rural entrepreneurs-a conference summary. Economic Review – Federal Reserve Bank of Kansas City, 88(3), 73.

Gibbs, R. & Bernat, A. (1996). Rural industry clusters raise local earnings. Rural Development Perspectives, 12 (3).

Granovetter, M. (1985). Economic action and social structure: The problem of embeddedness. American Journal of Sociology, 91(3), 481-510.

Hollifield, C. A., & Donnermeyer, J. F. (2003). Creating demand: influencing information technology diffusion in rural communities. Government Information Quarterly, 20(2), 135-150.

Johnson, J. D., & Rasker, R. (1995). The role of economic and quality of life values in rural business location. Journal of Rural Studies, 11(4), 405-416

Kellogg Foundation (2001). Perceptions of rural America. Battle Creek, MI: Author.

LaRose, R., Carpenter, S., Strover, S., Struabhaar, J. & Gregg, J. (2005). Internet Generations in Place: Exploring the Rural Broadband Gap. Paper presented to the Association for Internet Researchers, Chicago, October 8.

LaRose, R., Carpenter, S., Strover, S., Struabhaar, J. & Gregg, J. (2006). Understanding the rural broadband gap. Poster presented to the USDA project director's meeting. Washington, D.C., February 12.

Laudeman, G. (2005). Information technology and community-level socio-economic development. Journal of the Community Development Society, 36 (1), 41.

Malecki, E.J. (2003). Digital development in rural areas: Potentials and pitfalls. Journal of Rural Studies, 19 (2), 201-214.

Maskell, P. (2001). Towards a knowledge-based theory of the geographical cluster. Industrial and Corporate Change, 10 (4), 921-944.

Mills, B. F. & Hazarika, G. (2001). The Migration of Young Adults from Non-Metropolitan Counties. American Journal of Agricultural Economics, 83(2), 329-340.

Mills, B. F., & Whitacre, B. E. (2003). Understanding the non-metropolitan-metropolitan digital divide. Growth and Change, 34 (2), 219-243.

Morgan, K., 1997, The learning region, institutions, innovations and regional renewal, Regional Studies, 31, 491-503.

NTIA (National Telecommunications and Information Administration) (2004). A Nation Online: Entering the Broadband Age. Downloaded from the Web November 25, 2004: http://www.ntia.doc.gov/ntiahome/dn/html/toc.htm

Pigg, K. and Crank, L. (2005). Do information and communication technologies promote rural economic development? Journal of the Community Development Society, 36 (1), 65- 76.

Pittman, D. (2002) Broadband pilot program: RUS celebrates second anniversary. Rural Telecommunications, 21 (5), 32-35.

Porter, M. (1990). The Competitive Advantage of Nations. New York: Free Press. Porter, M. E. (2000). Location, competition, and economic development: Local clusters in a global economy. Economic Development Quarterly, 14 (1), 15-34.

Porter, M.E. (2004). Competitiveness in rural U.S. regions: Learning and research agenda. Cambridge, MA: Institute for Strategy and Competitiveness, Harvard University. Downloaded from the Web November 25, 2004: http://www.eda.gov/ImageCache/EDAPublic/documents/pdfdocs/eda_5frural_5fregions_5ffinal_2epdf/v1/eda_5frural_5fregions_5ffinal.pdf.

Pratt, A.C. (2000). New media, the new economy and new spaces. Geoforum, 31, 425-436.

Prieger, J. E. (2003). The supply side of the digital divide: Is there equal availability in the broadband Internet access market? Economic Inquiry, 41(2), 346-363.

Rosenfeld, S. A. (2001, Sept). Networks and Clusters: the Yin and Yang of Rural Development.Exploring Policy Options for a New Rural America Kansas City, MO: Federal Reserve Bank of Kansas City: Center for the Study of Rural America.

RTS (Regional Technology Strategies) (2003). Snapshots of rural innovation: A compendium of rural industry cluster vignettes. Minneapolis, MN: Author. Downloaded from the Web January 22, 2005: http://www.rtsinc.org/rc/rc_home.html.

Saxenian, A., & Hsu, J. Y. (2001). The Silicon Valley-Hsinchu connection: Technical communities and industrial upgrading. Industrial and Corporate Change, 10 (4), 893-920.

Speare, A. Jr., Kobrin, F., & Kingkade, W. (1982). The influence of socioeconomic bonds and satisfaction on interstate migration. Social Forces, 61 (2), 551-574.

Steinfield, C. (2004). Explaining the underutilization of in business to business e-commerce in geographically defined business clusters: The role of social capital. V. Wulf. Social Capital and IT. Cambridge, MA: MIT Press, 209-229.

Steinfield, C. and Scupola, A. (2006). Explaining ICT infrastructure and e-commerce uses and benefits in industrial clusters: Evidence from a biotech cluster. Proceedings of the 39th Hawai'i International Conference On System Sciences (CD/ROM), January 4-7, 2006, Computer Society Press, 2006, 10 pages.

Steinfield, C. and P. Whitten (1999). Community level socio-economic impacts of electronic commerce. Journal of Computer Mediated Communication, 5 (2).

Strover, S. (2003). The prospects for broadband deployment in rural America. Government Information Quarterly, 20 (2), 95-106.

Traxler, T., & Luger, M.I. (2000). Businesses and the internet: implications for firm location and clustering. Journal of Comparative Policy Analysis. 2 (3), 279-300.

Uzzi, B. (1997). Social structure and competition in interfirm networks: The paradox of embeddedness. Administrative Science Quarterly. 42(March), 35-67.

Windrum, P., & de Berranger, P. (2002). The adoption of e-business technology by SMEs. Maastricht, Netherlands: Maastricht Economic Research Institute on Innovation and Technology. Downloaded from the Web November 30, 2000: http://www.merit.unimaas.nl/publications/rmpdf/2002/rm2002-023.pdf

Yukawa, K. (2004). Internet Companies in Japan after the Collapse of the Internet Bubble – An Analysis of Internet Companies and their Cluster. Tokyo: Fujitsu Research Institute Economic Research Center: 47.