Towards Regional Clusters: Networking Events, Collaborative Research, and the Business Finder

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Abstract. Networks of organizations can improve the competitiveness of their member companies. Over the past years, the IS group of the University of Siegen has performed a series of research activities to foster networking among companies in the Siegen-Wittgenstein region. Our research covers a variety of activities such as: networking events, internship programs and joint research projects together with regional companies. Based on these experiences, we developed an expertise matching tool, the Business Finder, to improve mutual awareness among small and medium enterprises (SME) in the region. In this paper, we describe the different activities as an integrated, holistic approach of network support among regional companies.

Introduction

Networks of regionally collocated organizations improve the competitiveness of their member companies. This is not only a result of lower transportation costs when delivering or purchasing physical goods. Other matters like mutual trust or a higher diffusion of specialized knowledge among companies have emerged as important aspects of regional networks. Even an increased competition among collocated companies can lead to competitive advantages over externals as a result of an increased pressure for innovation. While it is widely investigated *why* regional networks of companies offer comparative advantages, the question arises *how* networks can be developed in terms of higher interconnectedness and deeper connections.

Up to now, technical approaches aiming at fostering mutual awareness and collaboration among companies in regional networks are scarce. Regarding the search for companies or services in general, we can use web search engines like Google or Yahoo which cover websites of all kinds. Nevertheless, their results can hardly be limited to regional companies. We can also find directories of regional companies, hosted and maintained by regional business development agencies. However, they often suffer from outdated or incomplete profiles and require high efforts to keep them up-to-date. Recent approaches to knowledge management aim at networking among human actors within organizations (*expertise sharing*, Ackerman et al. 2003, Reichling et al. 2007). While they may offer potential for regional development, they have not been applied to networks of companies yet.

Research in the domain of regional networks of companies has been carried out by Porter (1998a, 1998b, 2000). Porters' theories are strongly directed towards highly interconnected networks of geographically close companies along a value chain, so-called *clusters*. Popular examples of regional clusters are Silicon Valley, Hollywood, or, for the metal industry, the Ruhr Area in Germany. Porter holds that cooperation and competition are important elements of regional clusters. Both coexist within a cluster, do not exclude each other and are even necessary for a successful development.

While Porter's argument primarily addresses clusters, we assume that less dense networks among regionally collocated companies may create benefits even though no distinctive cluster structures are given. Since networks are dynamic constructs, which grow and shrink vigorously, IT support can contribute to their creation and development by improving interconnectedness. With regard to the domain of KM, expertise recommender systems have proved to be promising technologies for networking among human actors within organizations (cf. Hinds and Pfeffer 2003, Huysman and Wulf 2004, Reichling et al. 2005 and 2007). We assume that these technologies can be applied to successfully support awareness and visibility in networks of regional companies, too.

In this paper, we present an integrated and holistic research approach we performed over five years in the region of Siegen-Wittgenstein (Germany). Our approach covers a series of social events and interventions carried out in collaboration with actors of regional companies. The entire set of these research activities was realized in two Action Research cycles. The first cycle features qualitative empirical methods, aiming at gathering a better understanding of the dynamics in our field of application – the media and IT sector of the Siegen-Wittgenstein region. In the second cycle we turned to a more technical approach. Following demands for technical support, we designed a search engine (Business Finder) which supports regional companies in finding potential customers, suppliers or cooperation partners.

Related work

A variety of studies indicate that regional proximity and interconnectedness are important factors for the success of companies. While globalization and new media appear to outperform these seemingly antiquated assets, they seem to maintain their significance nevertheless. Porter (1998) labels this phenomenon *The Location Paradox*. Lower costs for transportation or resources cannot explain sufficiently why companies of a given sector appear to settle down in the same region.

Donhauser (2006) finds incentives for regional concentration in an increasing potential for innovation, productivity and growth by better preconditions for cooperation. These are a result of different circumstances: First, regional proximity leads to vivid informal communication among human actors even across companies, resulting in a rapid diffusion of expertise and best practices. Second, the regional proximity often goes hand in hand with the creation of a highly specialized "Labour Pool" (Schiele 2003) from which regional companies can select their staff and thus save time and costs for training. Thirdly, another issue concerned with knowledge

dissemination among actors of interconnected enterprises is trust (Porter 1998). Since trust is a property of social ties, *social capital* (SC) affects processes of knowledge dissemination (Huysman and Wulf 2004). Social capital is not transferable among human actors. It encourages the actors' willingness to mutually support each other, initiate business cooperation and share knowledge.

Besides the aspect of an improved information exchange, clusters are also characterized by stronger competition and improved transparency as a result of a large number of enterprises in the same sector. According to Porter (1998a) „Companies can mitigate many input-cost disadvantages through global sourcing, rendering the old notion of comparative advantage less relevant. Instead, competitive advantage rests on making more productive use of inputs which requires continual innovation. […] Without vigorous competition a cluster will fail". Porter realizes that cooperation and competition can coexist within a cluster and do not exclude each other. In fact, both are required for successful clusters.

We now turn to the question of how IT can contribute to the development of regional networks which may lead to the formation of cluster structures. With respect to cluster support, Porter (1998) suggests that IT systems could create awareness of other players within a cluster. Similarly, Leuninger and Held (2003) – without specifying certain technological approaches – argue for an IS based address and communication platform. Krätke and Scheuplein (2001) propose IT support for cluster recognition and analysis. IT should support and influence political decisions and interventions to foster cluster development. Krätke and Scheuplein (2001) demand for IT tools to visualize internal interconnections and to compare regional and super regional clusters.

Until now, IT had little significance in dedicated cluster support and is neglected in the literature. Instead, existing technologies from other domains appear promising for network development. For instance, Resnick and Varian (1997) recommend IT systems that perform algorithmic matching on model based descriptions. These approaches gain importance in different domains of information and communication technology (cf. Balabanovic and Shoham 1997, Resnick et al. 1994), especially knowledge management (cf. Hinds and Pfeffer 2003, Huysman and Wulf 2004, Reichling et al. 2005, 2007). In the context of KM, expert recommender systems can foster mutual awareness of skills and activities of human actors in organizations. They can also create visibility of corporate competencies of entire organizations or subunits or help to identify competence gaps. Different authors (cf. Cohen und Prusak 2001, Huysman und Wulf 2006, Ackerman et al. 2003, Huysman und De Wit 2004) mention the important role of social capital in knowledge intense processes among human actors. Recent KM approaches (a so-called "second wave" of KM) aim therefore at fostering as well as exploiting this resource within networks of human actors.

Organizational affiliation plays an important role when dealing with regional networking activities. Thus, it appears meaningful to apply the concept of social network building to regional networks of companies. In this way social capital may be fostered across different companies in order to improve awareness of others' competencies and needs, create mutual trust and disseminate specialized knowledge.

The existence of clusters as highly developed regional networks of companies that exist over considerable periods of time, illustrates how important these structures are.

The scientific work presented here – first of all Porter's (1998a, 1998b, 2000) theories about clusters – offer descriptive models that explain why clusters exist and which benefits they provide for their members. However, we are not aware of empirical studies on how these theories can be applied to create or strengthen structures of regional networks of companies that are not yet well enough developed in terms of their interconnectedness and sufficient coverage of the value chain. Economic approaches of cluster support have not yet proven to be successful, neither in creating clusters nor in supporting clusters (Alecke and Untiedt 2006).

In the subsequent paragraphs, we describe an integrated, holistic approach of "Regional Networking" which aims at developing interconnectedness and mutual awareness among players' competencies and activities in the Siegen-Wittgenstein (Germany) region. Our approach covers a variety of different methods, which we have applied over a couple of years. The different interventions were driven by the vision of a denser and stronger network of companies in the region, resulting in stronger cooperation ties between the companies and an increased competitiveness of the whole region.

Field of Application and Research Methods

In the following, we will describe the regional setting, particularly considering the software and media industry and the university. We also introduce the research approach and methods we applied to foster regional networking. The university's IS group plays a central part for the regional network support since it defines itself as a facilitator of regional networking. The authors are part of the IS group. The University had gained some regional reputation already before, as knowledge transfer and cooperation with industries has been a focus of the IS department's earlier activities.

The Regional Setting

Siegen-Wittgenstein is located in the state of North-Rhine-Westphalia. The region is almost 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. The university is located in one of its suburbs. The Siegen-Wittgenstein region has a long tradition of heavy industries, especially steel production. At the end of the 19th and the beginning of the 20th century, the region was an important location for mining in iron ore. Since the mines were closed and most steel mills disappeared afterwards, mid-size companies in the business of specialized machinery and plant manufacturing and 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 approximately 7%, which is below the federal and the state average.

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 or information systems programs. The regional business development department maintains a database in which about 380 small to

mid-size companies from the software and media industry were registered in spring 2008. These companies employ about 4.500 workers and are generally considered to be of central regional importance.

The action research program presented in this paper was conducted by researchers at the University of Siegen's department of Information Systems. The research group works in the field of human centred computing, specifically in the subfields of 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 15 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. Research practice develops within individual projects or bundles of related projects.

Research Methods

The research group started its regional network activities within the local software and media industries in 2002. At the beginning, there were mainly two motivations to become engaged in regional activities: (1) access to regional companies was seen as an important element in information systems' education (cf. Rohde et al. 2007), (2) cooperation between university and local industries was necessary to receive research funding by the German national government and the European Union. These funding schemes usually require joint applications from industries and academia. While local partners are not essentially necessary, 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 networks from an action research perspective. We adopted three of Lewin's (1946) principles of action research:

- 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 (CoPs, cf. Lave and Wenger 1991, Wenger 1998) in the software and media industries.
- Research is a process of mutual learning of researchers and practitioners. It is based on an emergent process which takes shape as understanding increases.
- Researchers and practitioners join in tackling an issue of shared interest. When starting the process, we assumed that fostering regional networks of companies would be a desirable goal for the regional software companies, as well.

The research activities presented here can be understood as two cycles of an action research study that were performed over five years (2002 – 2007). In the first cycle we did not start with an overall phase model or plan for the different interventions. The interventions emerged due to a variety of opportunities and context factors. However, they followed the vision of increasing social capital and bridging among different regional CoPs (Lave and Wenger 1991, Wenger 1998). In the second cycle, we turned to a more directed set of actions, including technological components from the field of knowledge management that were applied and (briefly) evaluated.

In the first cycle we gained an initial understanding of 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 n initial networking event which again led to new insights and contacts. From this starting point, a series of events were initiated which will be described subsequently. Especially, an innovative education program, called "Courses in Practice (CiP)" was an important aspect of the networking process in which students were supposed to learn by enculturating into regional companies' CoPs.

In the past five years, we conducted a series of semi-structured interviews and additional observational studies. As part of the first cycle, the CiPs 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 in total. The interviews lasted between 60 and 180 minutes. We were specifically interested in their experience in establishing regional networks and their evaluation of our joint activities in fostering regional networks among local industry including the university. All interviews have been recorded with a DAT recorder and have been transcribed fully. In the evaluation, the answers were transformed into a table categorizing the role of students, academics and industrial supervisors.

In the second cycle, a series of 16 semi-structured interviews has been conducted with managers of regional media and IT companies. The interviews explored requirements for a search engine to support networking among regional companies. These interviews focused on internal and external cooperation, communication with partner companies and customers and the use of IT infrastructures. Additionally, the interviewees were asked about their strategies to find new partners and to identify specific interests, expertises and competences of internal colleagues, external partners and potential customers. The search engine was supposed to be used by employees of regional companies in order to find suitable customers, suppliers or cooperation partners within the region. Based on these requirements we designed and launched an experimental search engine called Business Finder. We combined two existing technologies: the database that was hosted by the regional business development department (see below) and an expertise finding system that was developed for matching individual actors within organizations (Reichling et al. 2007).

Fostering Regional networking

Our approach to regional networking includes a set of different interventions that we performed with a selection of companies located in the region of Siegen-Wittgenstein over five years (from 2002 to 2007). The interventions were carried out in two successive cycles (see above). The goals of our approach were (1) to gain a better understanding of how networking among companies can be supported by purposeful interventions and (2) create competitive advantages for the regional companies. Finally, in the second cycle, our approach applied the concept of recommender

systems to improve visibility and create mutual awareness among the regional companies. For this purpose we introduced the Business Finder which supports finding suitable customers, suppliers or cooperation partners f or the companies in the region. Demands for IT support were gained during the social events that were accomplished in the first action research cycle. More explicit design requirements for IT support were gained in the second cycle which was directed towards IT support. The activities we carried out in both cycles are described subsequently.

First action research cycle: Increasing Visibility and Connecting Actors by means of Networking Events

As a result of the talks with the regional business development department, a concept for a series of networking events was developed, which was called „Lyz Media Breakfast“ (because of the location the meetings took place). It tried to reach out towards heads or the upper management of regional software and media companies. Following an invited talk in the early morning (starting at 8:30 am.), there was a joint breakfast for the participants to network with each other. It was planned in a way that allowed the participants to leave at 10 am to go on with their daily work.

At the first of these events, the head of the IS research group gave an introduction to the work of his group at the University of Siegen. The regional business development department had sent invitation letters to the heads of approximately 380 software and media companies stored in its database (see below). The first event had some 25 participants and led 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 organize more events; they planned to have around four meetings a year.

Bridging between University and Industry: Courses in Practice

Based on earlier experiences in entrepreneurial education, we have developed Courses in Practice (CiP) as a didactic concept which bridges communities of practice 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 the duration of typically one term (4 months). During this time about five meetings among the students and their academic supervisors take place.

At the end of the term, the students and their company advisors present the results of their projects in public. The students give a 20 minute talk on their results on which the company advisers comment for about 10 minutes. 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. Thus, typically some 30 employees of other companies, faculty members, journalists, and students join the presentations which ends with a

small reception. These events became occasions for further networking among the regional actors as well as for acquiring new companies and students.

The first CiP were held in the summer term 2003 at the University of Siegen. Since 2003, four instances of the CiP have been conducted. Eight student teams, two every year, consisting of overall 19 students got encultured in 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.

Bridging among Regional Industries: A Funded Networking Project

Another branch of activities was centred around externally funded cooperative research projects between industries and academia. In 2004, the European Structural Fund (ESF) provided grants for a regional networking and business development project in the IT and media sector. We were funded by this initiative to consult the participating companies individually and set up consortia meetings to foster expertise sharing among them. Managers from six companies met once a month to exchange experiences in the domain of marketing.

At the same time, we took part in the process of establishing a joint research centre (Media Design and Experience Lab) in the field of interactive television (iTV). The centre was supposed to focus on research and development of innovative technological features and suitable formats of iTV. We partnered with a local software company which had moved into the entertainment computing market. While the project was never realized due to changes in the anticipated funding scheme, it strengthened our cooperative ties with the company.

Finally, we have 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 of the industry. Some of them explicitly require SME participation. Thus, it made sense for the IS group to include regional companies into their research proposals if there were matching interests and converging practices. The participating companies were both involved in the CiP program (see above) and in the ESF funded networking project. Thus, the research proposals were grounded in an already well-established cooperation between university and industry. While some of these applications failed, the opportunity to receive public funding via the university's activities stabilized the regional network to some extent.

Second action research cycle: Support for Intra Organizational Knowledge Management

As a result of the action research activities carried out in the first cycle, it became clear that fostering expertise sharing and creating mutual awareness among companies could be beneficial. Therefore, we directed additional research activities towards technical tools to deal with those demands. An early approach of technical support was carried out by the regional business development department which had

set up a company database (DRC[1]) containing about 380 different firms from the media and IT industry in the region of Siegen-Wittgenstein. This database contains the main address data and some keywords regarding the companies' core business. However, enquiries showed that the database was felt to be less informative than the companies' websites. Log files of DRC confirmed that it was rarely used, and thus, had little impact of fostering regional cooperation.

In order to increase the perceived value of DRC, we approached ways of improving the DRCs performance by extending it with elements of an expert finding system. The ExpertFinding (EF) system (Reichling et al. 2007) had originally been developed to foster cooperation between human actors in large or distributed organizations. It has been designed based on requirements that were gathered in a major European industrial association (Reichling and Veith 2005). We took the approach to merge EF and DRC technologies in order to foster the development of regional networks of companies.

The EF system helps to become aware of persons' expertise by making individual knowledge and interests visible. The system's core feature is the so called "keyword profile" which is generated by a set of text documents the user selects from his recent workspace (local hard disk or server drives). These documents are expected to reflect the user's interests, skills and recent activities, since users are requested to properly select folders and documents that are strongly associated with their actual working context or their abilities (Reichling et al., 2007). Those *keyword profiles* can be understood as large vectors of keywords which are ordered according to the frequency of the individuals' keyword usage in the users' documents. That keyword listing can be edited by the individual user and is then pushed towards the central server. Therefore, users always have insight and control of the contents of their profiles.

An extensive evaluation of the EF system with a set of pilot users in the industrial association showed that the concept was highly promising for the case of intra organizational knowledge management (cf. Reichling 2007). The participants considered the keyword profile-based search results to be accurate in most cases. At the same time the creation of the keyword profiles was felt to be easy and not time consuming, as only representative documents or folders had to be selected instead of entering keywords directly. Moreover, no privacy concerns were violated by the system since the users controlled the information the system provided about them.

Support for Knowledge Management among Regional Networks of Companies

The requirements analysis we performed in the second cycle shows that regional companies are mostly willing to cooperate with each other. Since trust is a major precondition for cooperation, networking mainly happens by personal recommendation. However, in Siegen-Wittgenstein, where few large-scale enterprises reside, regional cooperation is structurally hampered due to missing large scale orders in the IT domain. Especially for suppliers of IT services (web designers, software developers) it is easy to transfer their 'goods' over far distances, so no compelling reason for regional cooperation exists. With regard to existing databases or directories

1 DRC (Directory of Regional Companies), which is actually not the real name, denotes the database of the business support of Siegen-Wittgenstein, containing 381 media and IT companies (seen 2007/07/26): http://www.lyz-media.de/datenbanken/index.htm

of regional companies, interviewees were very sceptical. Those had provided little value compared to the efforts necessary to keep the companies' profiles up to date. These efforts even increased with the number of systems or directories in which the companies were registered. Moreover, profiles happened to be maintained infrequently and became outdated quickly. Completeness in terms of the covered companies and a critical mass of registered companies were considered to be further central requirements for a comprehensive company database.
The participants' statements illustrate that actuality and effort spent on maintaining are central concerns. Hence, in order to minimize this effort, the Business Finder is capable of creating and updating profiles from existing data sources automatically (see below). This data should consist of specific text documents related to the company. While companies' websites may be updated rarely, newsletters provide up-to-date information about products, offers or services. Privacy and data security concerns were also discussed with the interviewees. We learned that product specifications, flyers, advertising material or newsletters do not collide with privacy concerns since these data are (semi-)public by definition.

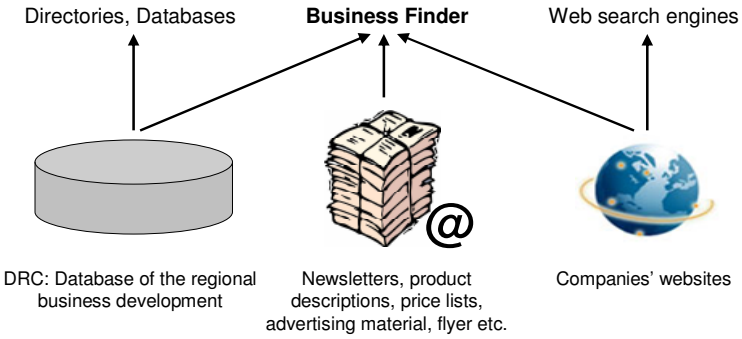

Figure 1 Basic concept of Business Finder including three sources of data

The Business Finder system is designed to integrate directory approaches and web search engines with expertise recommender technology such as the ExpertFinding. In order to semi-automatically create meaningful profiles of companies, we gathered data from three different sources (see figure 1): (1) Content of the DRC (see above) that is hosted by the business development department, (2) companies' web sites and (3) arbitrary documents that happen to describe the companies' products, services, processes, methods or special offers (newsletters, product descriptions, price lists, advertising material, flyers etc.).

Conclusions

Based on the theoretical approaches of Social Capital and Communities of Practice, we attempted to facilitate regional networks in the IT industry. The interventions

aimed at fostering interconnectedness and strengthening existing network ties. Following an action research approach, empirical evaluations of these measures by means of qualitative interviews showed achievements and shortcomings of the attempt: The close cooperation with local authorities helped to trigger networking of IT companies. The CiP approach helped to build trustful relationships among the university's IS research group, IS students and regional software companies. In an ESF-funded project, six software and media companies exchanged experiences with regard to their marketing and management practices.

However, we experienced some obstacles to networking: Certain regional actors were excluded 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 opaque communication behaviour of certain actors led to conflicts and set back the trust-building process. To be able to act as facilitators, the academic actors needed to invest a reasonable amount of time and dedication in order to just understand the social dynamics and to be accepted by the regional actors. Given differences in goal sets, practices and culture between industry and academia made enculturation processes as part of the CiP program sometimes difficult. Limitation in EU funds administrated by the region's department of business development led to competition among different industrial sectors. Negative decisions with regard to their project proposals created disappointment among the researchers.

The presented case within the IT and media industries describes a university-driven attempt to foster regional exchange of expertise. The study indicates that universities can develop different techniques of intervention and play a facilitating role in this process. However, processes of networking and enculturation require substantial efforts from regional companies as well as from academic actors. Mutual trust between regional companies and academia needs to be built over time through cooperation in various regional activities (cf. Fischer et al., 2007). From an academic point of view, such an action research program can help gaining insights into facilitating and hindering conditions for regional networking and foster the development of conceptualizations and theory.

A first evaluation of the Business Finder system showed promising results: The search results of Business Finder were judged to be more useful than those of the former DRC or common search engines like Google or Google Maps. However, further empirical research is necessary in order to gain deeper insights into the practical use of the system and its impact on the development of regional networks of companies.

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