The role of KIBS in knowledge commercialisation

Kari Laine
Satakunta University of Applied Sciences
Faculty of Technology and Maritime Management
Tekniikantie 2, 28600 Finland
kari.laine@samk.fi

Abstract
In this paper the role of technology based knowledge intensive business services (KIBS) in commercialisation of knowledge is examined. The paper is written from the point of view of innovation management and the paper is based on a broad conception of innovation. In this conception innovations are embedded in social activities, there are many kind of innovations besides radical technological innovations, innovation is closely linked to learning, tacit knowledge has an important role in innovation, innovation is a complex process, innovation diffusion is important in addition to innovation creation, and innovation is a collective undertaking and networks are essential for it. A case study of a technology based KIBS firm started in 1997 in the incubator of Satakunta University of Applied Sciences (SAMK) is used to bring the theory to practice. The development path of the firm is described as a process and the links to the above factors will be addressed.

Background and theories in use

Universities have a new role in commercialisation of knowledge, considered as "second revolution" (Etzkowitz 1998). It began with science parks and increased collaboration in 1980's and with other forms of commercialisation broadened to licensing and spin-off creation in 1990's. In spin-off creation also students became involved (Rasmussen et al. 2006). Commercialisation has led to a situation where a complex web of relations exists between higher education, spin-offs created by them and large firms. All together the "commercialisation of knowledge" connects the higher education to the users of the knowledge (Etzkowitz 1998). The rise of knowledge based society also brings creation of knowledge intensive firms into the focus. The aim of the paper is to create more understanding how small technology based KIBS firms can have a new role in knowledge commercialisation. However, the innovation chain has to be managed as a whole. In this paper, the innovation chain is considered as a continuum from basic research through applied research to product development and finally commercialisation. There still exists a valley of death between research and commercialisation (Markham 2002). Spin-offs are one means to cross it.

The innovation process consists of searching, selecting and implementing which are all closely connected to learning (Tidd et al. 2005). New business opportunities are based on co-creation of value and discontinuities, in many cases on a combination of many discontinuities (Prahalad and Ramaswamy 2004, Hamel 2000, Tidd et al. 2005). Sources of discontinuity include new markets, new technology, new political rules, mature industries run out of road, new market behaviour, unthinkable events, new business models, new regulation or deregulation is done, systemic changes, architectural innovation (Bessant et al. 2005). Idea screening and concept development, the fuzzy front end of the new service development process is less fuzzy if customer interactions occur already in this phase (Alam 2005).

Innovation capability can be targeted in four ways: products, processes, positioning and paradigm. This "innovation space" gives also a model for innovation project portfolio management. (Francis and Bessant 2005). Innovations can also be divided as incremental, radical, continuous and discontinuous innovations. Systemic innovation is a combination of these, like using new technology in a new process and simultaneously rethinking the role of organisation. Systemic innovation is many times required in adaptation of innovation to make innovation desired (Saranummi et al. 2005). Successful innovation also requires integration and management of the whole innovation chain (Tidd et al. 2005). Research suggests that the entrepreneurs should concentrate more on organisational and market innovativeness than on technological (Gans and Stern 2003). Increasing knowledge focus is one way for the entrepreneur to stay on the growth path (Salojärvi 2005).

Innovation is a social process. It involves people meeting and sharing ideas. There are several types of innovation networks including a new product or process development consortium, sector forum, new technology development consortium, emerging standards, supply chain learning, cluster and topic network. Different types of networks can be used when targeting to different types of innovations. Operating an innovation network is difficult. Success factors for innovation networks are the following: partners with wide range of disciplines, science partners as universities, and access to investors and proactive management. Some of the challenges are: how

to manage something which is not in total control, how to operate on system level, how to build trust and shared risk taking without contracts and how to avoid free riders and spillovers. Configuring innovation networks must be in balance with innovation targets. (Tidd et al. 2005).

Dominant logic limits the ability to see new business opportunities. (Prahalad 2004). Focus should be on next practices, not on best practices. Low cost experimentation is needed to show the true potential of ideas (Prahalad 2004, Hamel 2000). Fast learning and articulation of experiments are needed. Firms must look beyond borders of industries and look beyond geographic borders and see exciting discontinuities instead of disruptive changes. Discontinuities challenge the dominant logic (Schumpeter 1950). Seeing forward, forecasting, is considered to be one of the main competencies of the strategic thinking (Major et al. 2001, Major 2003). There are two usual mistakes in forecasting: the change is estimated to be faster than what will happen in reality and the impacts of the change are underestimated (Mannermaa, 2004).

Peripheral vision is a part of learning. The process consists of the sequential parts: scoping, scanning, interpreting, acting and learning and adjusting. Learning and adjusting affect mental models. To improve interpretation, appropriate channels have to be created to share and interpret information internally and externally. Frequent and free dialogue should happen spontaneously. It requires culture of trust, respect and curiosity. It must also be noticed that sharing information is important (Day and Schoemaker 2004). Scanning of environment must be active, because passive scanning tends to reinforce old beliefs. This is because the information comes mostly from known sources. Successful entrepreneurship requires not only analytical, but also creative and practical intelligence, which all together constitute successful intelligence (Sternberg 2004). Knowing what is not enough and knowledge have to be turned to action (Pfeffer and Sutton 1999). Prior knowledge affects the ability to recognise the value of new information, assimilate it and apply it commercially. This is called absorptive capacity. Learning and problem solving are close to each other. “Problem solving skills represent capacity to create new knowledge”. Capability to learn is also connected to r&d. Firms that have their own r&d are also better in absorbing external knowledge. Absorptive capacity is therefore a critical part of innovation capabilities. ”Ability to assimilate new knowledge is a function of the richness of the pre-existing knowledge structure” (Cohen and Levinthal 1990). Combining innovation with learning also suggests informal modes of technology transfer instead of traditional transfer models (Siegel et al. 2004). In regional context the “innovative milieu” refers to physical and socio-cultural proximity which make up “glue” that binds organisations together (Camagni 2003). Learning from customers by observing them consists of a primary feedback on which the new service and process development can be based on (Cunningham 1994).

The context in which the process is managed brings up three elements: the strategic context, the innovativeness of the organisation and the connections of the organisation with the key actors in the environment (Rothwell 1992). The implementation can be divided to several core processes and their enabling support processes (Chiesa 2001, Chiesa et al. 1996). Operating environment is becoming more and more dynamic. New knowledge, new technology and new players make the situation more complex and accelerate the change. Development of the new knowledge is a continuum. New knowledge is built on the top of older knowledge. The timing must be correct to ensure that the new knowledge can create competitive advantage (Chiesa 2005). Open innovation means that internal and external channels for idea generation and exploitation are

considered as equal (Chessbrough 2003). Even innovation can be outsourced, but it must be managed (Quinn, 1999, 2000). New forms or networking are emerging to reach continuous innovation in communities of creation and in the form of collaborative entrepreneurship (Miles, Miles and Snow 2005, 2006). Value is embedded in experiences and value is co-created with customers in interaction. There emerges a new requirement for value creation: experience network (Prahalad 2004). We are moving towards the fifth generation innovation process the key aspects of which are integration, flexibility, networking and parallel information processing (Rothwell 1994). Value is created in interaction with customers (Prahalad and Ramaswamy 2004).

Innovation diffusion is important in addition to innovation creation. There are five characteristics that may explain the success of an innovation and at least affect the rate at which the innovation is adopted: relative advantage, compatibility, complexity, trialability and observability. Relative advantage means that the innovation must offer an advantage compared to status quo. Compatibility refers to previous experiments and current needs of potential users of the innovation. The more complex is the innovation the more less likely it is to be adopted. Trialability means that there should be a possibility to try out the innovation without total commitment to it at once. There should also be visible results from the use of the innovation for the users and for those who are observing the use. There are two main challenges, to support early adopters and to win mainstream credibility. (Rogers 1983, 1995, 2003).

In the future of KIBS innovations are embedded in social activities. There are many kinds of innovations besides radical technological innovations. Innovation is closely linked to learning. Tacit knowledge has an important role in innovation. Innovation is a complex process. Innovation diffusion is important in addition to innovation creation. Innovation is a collective undertaking and networks are essential for it. (Toivonen 2004).

A case study of a KIBS firm

A longitudinal case study of a KIBS firm was implemented. The research covered a 9-year period from the start-up. The aim of the case study was to find out how the firm is connected to the value network of Satakunta University of Applied Sciences, how it manages its own innovation process (Tidd, Bessant and Pavitt 2005), how is the value network (Allee 2003) of the firm built and how the configuration of its innovation networks (Tidd et al. 2005) changed during the time the research covered. To connect the presence to the future a scenario analysis was done by using the soft system methodology (Checkland and Scholoes 1990). In the research, case study principles were applied (Eisenhardt 1989, Yin 1994).

The founder of the firm was a student of Satakunta University of Applied Sciences (SAMK). The student participated in r&d projects with regional SMEs during his studies. The entrepreneur also gained knowledge from a special field of knowledge during his Bachelor thesis while he made a power system analysis a large regional company. The entrepreneur had prior knowledge from most of the essential fields of his industry field like project management, r&d, power system analysis, field of industry and code of practice in serving the field of industry. He did not have

much knowledge about running the business in practice, but he was a second generation entrepreneur and had a very entrepreneurial way of thinking.

The firm was founded in 1997 by the student at the time of graduation phase. It was the first customer firm of the incubator in the Satakunta University of Applied Sciences. There was no IP transferred to the firm in the start phase but there was both explicit and tacit knowledge transferred. The entrepreneur did not make any market research before starting the enterprise. He was convinced that his mentor has a right vision about the future of the service. The firm was totally funded by the entrepreneur himself with the help of a bank loan. The firm was started as a limited company with a minimum amount of share capital. However, during the first years the firm also made automation and electrical system design to its customers to have more income to develop the new service development. The first power system analyses were done to a regional large company in 1999. Serving new customers with analysis services started in larger scale in year 2002.

The company grew every year in turnover over 30% except that there were two unprofitable years 2003-2004 and it grew finally 63% last year. The turnover is now about 400.000 euros and the firm has six employees. The growth was not based on a single factor but selling existing services to new customers and simultaneously the development of new services have created most of the growth. The growth of the Internet created totally new business opportunities for the firm. A whole set of new services was created. The firm has also found a development partner for this. The new partner was also a firm started in the same incubator by students in the Satakunta University of Applied Sciences. In the firm one third of the personnel is developing new services and technology and about 5 % of the turnover is used to new service development.

Like many small companies, this company also had many factors that hindered the development. During the first years working mainly with one major customer was hindering new business opportunity recognition and searching of new customers. The entrepreneur finally decided to leave the customer to have more time to develop the new product and seeing new potential customers. Having more customers lately made it much easier to recognize business opportunities in the context of power system analyses. “Every time I see the customer in his real environment, I see a lot of new business opportunities”. The main customer cases were all international, so the firm also gained a lot of multicultural experience. They had projects all over the world.

During the years the entrepreneur learned appropriate ways to market the services. In the beginning the contracts the firm made were not optimized form its point of view. The contracts gave too free hands for their customers to make delays in the process. In this case the new opportunity recognition changed clearly when the new software product was launched. The firm was able to have many new customer contacts with this product. The firm immediately started to recognize new opportunities with accelerated rate. New features were added to existing services and a totally new way to produce the services is under development. But still the entrepreneur needs to meet the customer in his real environment to see the opportunities. This requires trust to be created. Some of the customers are also returning customers because they have changes in their power systems and they need to update the analysis done earlier. The entrepreneur says that renting office space and special laboratory equipment from SAMK was essential for his start up.

Later also the expertise support from the SAMK was important because of the complex nature of the service.

In a technology based firm the correct timing is essential. The entrepreneur must be able to meet the right people at the right time and to have the courage to start the business with a high level of risk. Also funding the development is a challenge. In this case other services, like electrical and automation engineering, were used to create income to finance the development. During these projects the firm also gained multicultural experience. External funding was not needed. The entrepreneur even occasionally worked in another firm to have personal income during the first two years. Flexible risk funding for starting KIBS would be useful.

There was a strong supporting role from the Satakunta University of Applied Sciences in the beginning and during the whole development path until today. The support has not included any financial support. The support was in management, strategic thinking and technology development. Proximity to higher education has helped significantly. The entrepreneur has been able to use students in r&d projects in his firm. Also the new employees graduated from the same place than he did. Expert support has been available during the whole development period.

The best customers act as a development partner for a small firm. Although at the moment there are no immaterial property rights owned by the firm, in the future it may be one of the key issues. In a small firm, whether knowledge based or not, small things matter. The entrepreneur must stay focused all the time and still unexpected events can change the whole promising success story. The start of a spin-off may be based on regional needs, but the most promising companies will grow to at least national level players.

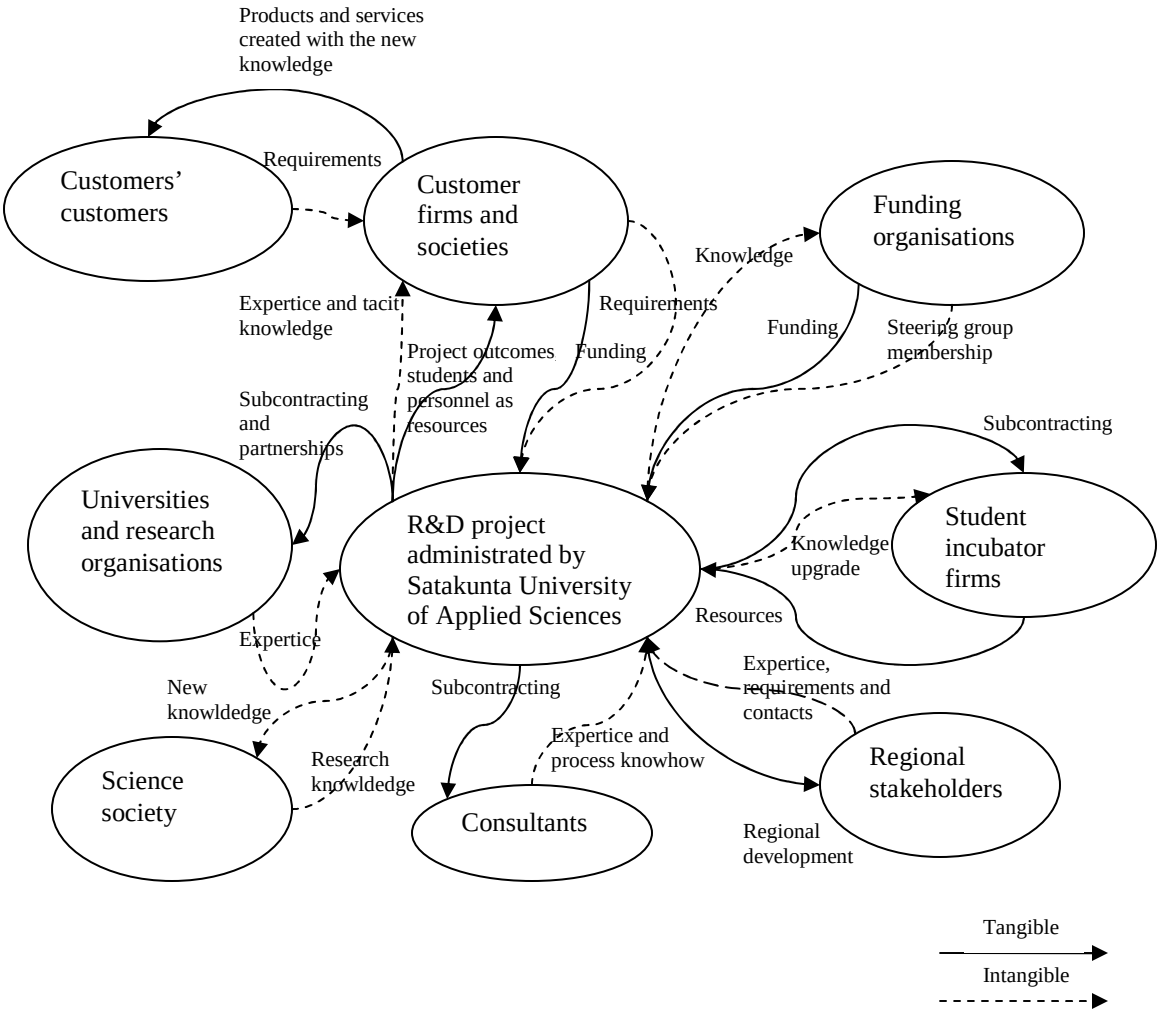
In the Satakunta region the hundred new firms created in the same incubator form a new cluster of knowledge intensive firms. Many of the firms are in close co-operation with existing firms in the region increasing the competitiveness of them and creating added value of their customers. There is a strong national policy to create spin-offs from higher education. However, in 1997 it was not common to motivate students to start their business during the studies in university. At that moment Satakunta University of Applied Sciences already had a policy to create spin-offs started by students. This has been proven to be a success for the region and a positive image builder for SAMK. Innovative new firms also collaborate in large r&d projects administered by SAMK. This is one way to upgrade their knowledge and make them more embedded in regional clusters. Picture 1 describes the value network of a typical large r&d project administrated by SAMK.

Firms form their own networks for innovation and service development. In Picture 2 the value network of the case firm is described. It is a simplified model where only the most important value adding transitions between the key actors are marked. There are several industrial partners for new service development. The regular customers fund the service development.

In Picture 3 the innovation chain is modeled. The chain begins with active searching. In search the entrepreneur was able to exploit external connections effectively. The firm has a flexible strategy with a vision of “Total power system analysis”. All development efforts are leading to that direction. The strategy changed many times according to new customer needs detected,

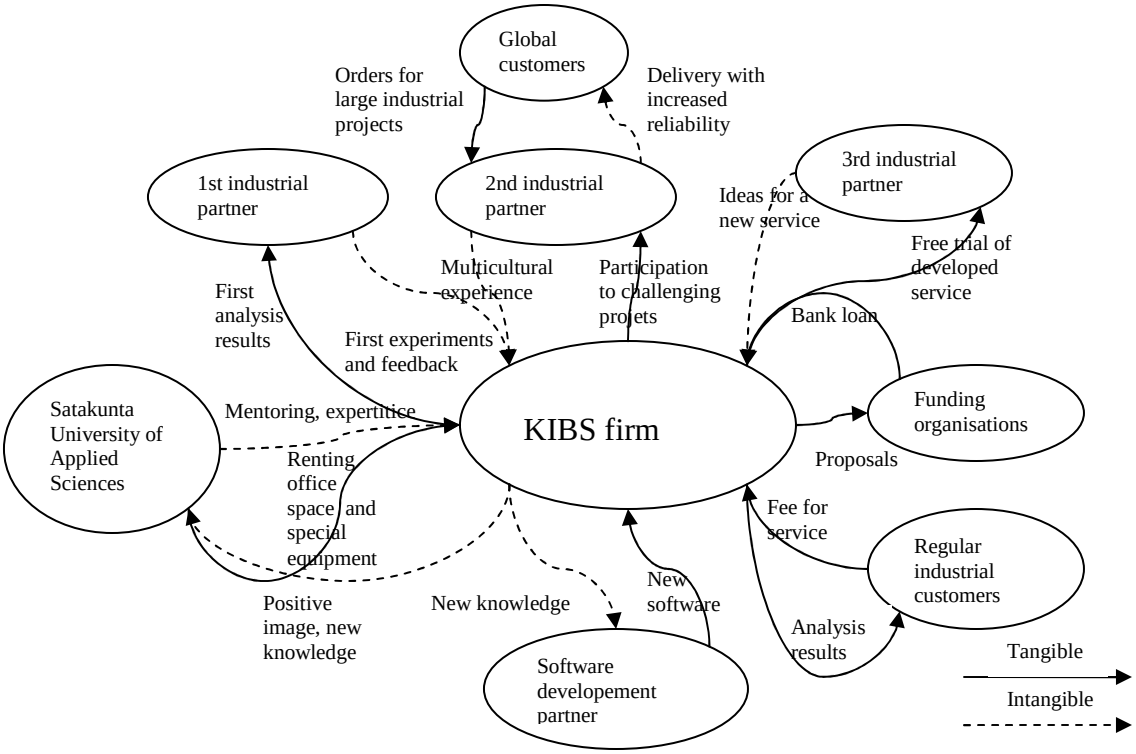
dominant changes in environment and unexpected events. The implementation was effective from the very beginning of the firm because the entrepreneur had experience from r&d. The entrepreneur used time to evaluation and reflection of experiences. Innovativeness was built in the organization by doing constantly small improvements to services. Learning required a combination of knowledge from several sources including also tacit knowledge.

In picture 4 the innovation network transitions are described. In the beginning the firm was helping other tenants in the incubator. The firm was also introduced to local clusters by the mentor. The entrepreneur himself started strategic partnership with industrial clusters. The next step is an option for heterogenous innovation networks depending on the success of the ongoing service and process development. There was a simultaneous use of all the networks so that beginning of a new network did not mean the end of previous networks. In 2006 three future scenarios were built for the firm by scenario analysis using the soft system methodology. The analysis revealed that the entrepreneur has possibilities to choose between different development paths. Business as usual leads to strong position in Finnish markets but focusing on a specific area of services gives possibilities to grow international.

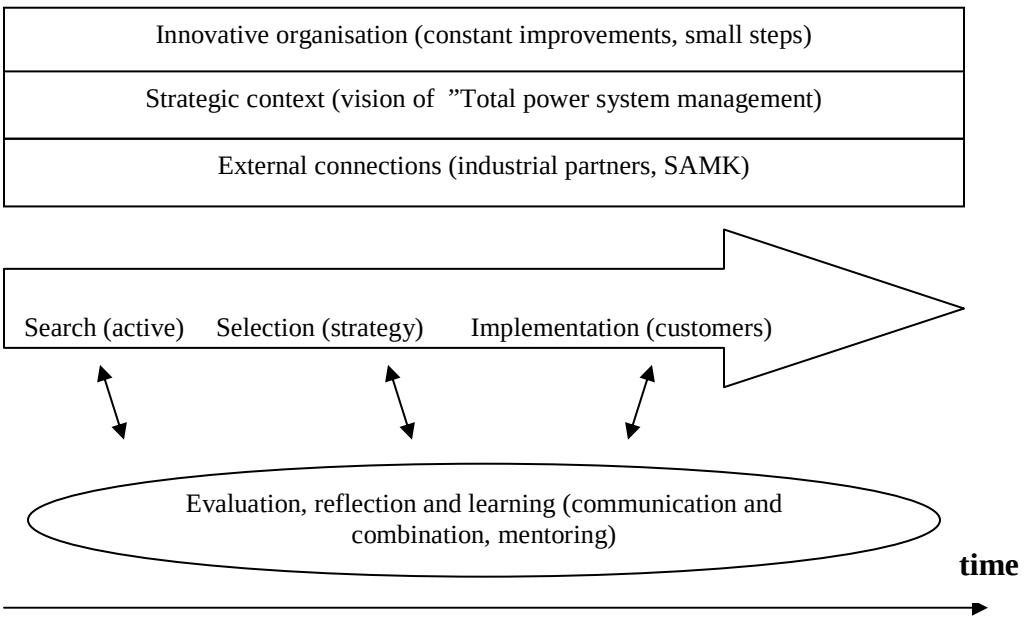


Picture 1. A typical value network of a r&d project in Satakunta University of Applied Sciences.

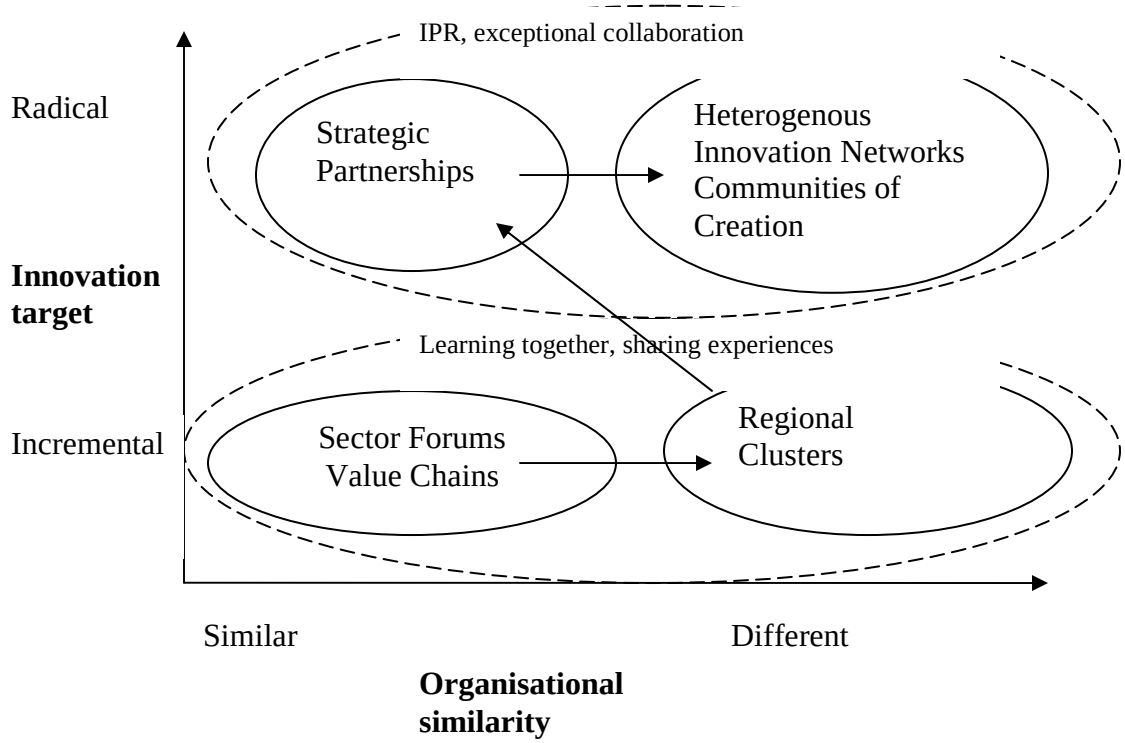
In 2006 three future scenarios were built for the firm by scenario analysis using the soft system methodology. The analysis revealed that the entrepreneur has truly possibilities to choose between different development paths. Business as usual leads to a strong position in Finnish markets but focusing on a specific area of services gives possibilities to grow international. Possibilities to exploit these new directions require success in ongoing development projects. It looks like there are much more opportunities than true possibilities to exploit them. Systemic innovation gives possibilities to adjust the dimensions of innovation so that adoption comes more manageable.



Picture 2. The value network of the case firm.



Picture 3. The model of the innovation process of case study firm (developed from Tidd et al. 2005, p. 89).



Picture 4. Innovation network transitions in the case study (developed from Tidd et al. 2005, p. 413).

Discussion and implications from the research

The entrepreneur had rich prior knowledge structure and it helped him to have a high absorptive capacity. The absorptive capacity was further improved by r&d competence. Probably due to the high absorptive capacity the entrepreneur was able to actively scan the business environment and technology knowledge. He was able to perceive forthcoming changes from weak signals and he was able to start new service development just in time. He was even able to create added value for the customers with the dominant changes. He also was able to challenge the dominant logic on the field. The firm also added the absorption capacity of two local clusters by transferring knowledge to them.

The entrepreneur was able to transfer tacit component of knowledge in several occasions. He was also able to make low cost experimentations to prove the concepts created. He was able to manage the whole innovation chain and make implementation effective. Customers were connected to development projects in application phase, not too early or too late. The entrepreneur had strategic approach to new service development. He was able to identify his weak points so that he could search for expert support on those fields. The entrepreneur sustained connections to the original source of the knowledge, SAMK, all the time. The development steps have been small enough to ensure success in development, rapid service development and fast feedback from customers for double loop learning.

The entrepreneur was not able to commercialise knowledge alone, but he was able to create a value network to support service development and commercialisation. He was able to manage the value network without excessive contracts. He was able to prove the advantages of the service with support materials. The services were divided to easy-to-try parts to add the trialability of the services and to accelerate the diffusion among potential users. Although the theory and process is complex the service itself was easy to understand. The results of the service were observable. He was able to support early adopters and with references he earned the credibility of the mainstream users of the services. The entrepreneur was highly successful in building social networks. He embedded deeply in local clusters in the early phase of his entrepreneurship. He also had successful intelligence and concentrated more on markets than on technology itself. He used primary feedback from his customers to develop new services.

The implication from this case study for a small firm is the selection of partners. The customer partners could give insights to the industry and help in recognizing the new business opportunities. They can also co-develop the new services or products (based on their needs), pilot the new services and offer a test platform for them.

The implication to the regional development policy is a service development support for small KIBS when they commercialise knowledge from higher education. When supported, the KIBS firms could create many innovative services for regional traditional industry clusters. These innovations are necessary for traditional industry to ensure its competitiveness. The support should only be used for product and service development and networking, not for providing the services.

Implication to the higher education is to increase the embedding of small KIBS. Units of higher education can help in creating the regional embedding, in networking, in recognition of the technology trends and in scanning new research knowledge and in giving expertise support. This includes creation of networks and any kinds of action that increase the interaction with other regional clusters. They can also help in original opportunity recognition, in business planning and strategic thinking. The incubator should be able to resource a mentor for all tenants. However, every case is its own. Much depends on the mentor and the firm itself. The research also brings up the question of strategic and expert support. Renting the special equipment for small firms lower the threshold to launch new services based on the use of this sophisticated equipment. In many cases an incubation process is essential to provide effective services for the entrepreneurs.

KIBS are one channel to commercial knowledge from higher education. Most of the commercialization is still done by customer firms after collaboration projects when they use transferred knowledge or technology in new services or products. However, KIBS are an important channel because they add the dynamics of the regional economy and offer opportunities of entrepreneurship for the students. The KIBS firms may also be interested to commercial knowledge which is not seen important by existing firms. For higher education the KIBS create a live connection to users of knowledge when the interaction is further developed after the launch of the firm. The interaction also opens a whole spectrum of opportunities for research. The future research will concentrate on the beginning of the innovation process of KIBS firms.

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