Future Tools as Drivers for Innovation and Growth of SMEs

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Abstract: Regional development and innovation system are to be designed to give SMEs tools and cooperation forums to enhance new innovation and growth. In this paper we describe the regional forum concept and the different tools developed or adapted to this purpose. Technology cluster foresight serves here as the methodological basis and example of regional cooperation and open innovation. We will also share the results of the pilot company workshops and forums called FutureCircuses. Adapting the minitrend concept into technology field indicates that new idea generation and questioning are potential minitrends for the future. Preliminary results from the technology field foresight in Finland as well as signal barometer development are also reported.

Keywords: Foresight Methodology; Future Competence; Innovation Capacity; Open Innovation; Regional Innovation System; SMEs; Technology Cluster.

1 Innovation process in SMEs needs new tools

To be able to produce new innovation most companies need external resources and competences. Small and medium sized companies (SMEs) often lack both resources and networks for the effective use of the latest knowledge. The innovation environment set the limits to the resources and outside institutional and geographical structures often determine the information flows that are available for the companies.

SMEs may have difficulties in implementing cooperative relations and lack the input from the academic research. An innovation can be seen as a micro level interactive

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learning based phenomenon and therefore social forums and interaction are crucial for its development in SMEs.

Knowledge-sharing and routines (Dyer and Singh, 1998) within a company include innovation as learning by collaborating with other organizations. It is influenced by the absorptive capacity, the ability to recognize the value of new external information, assimilate it and apply it for commercial ends. This requires exploiting the outside resources of knowledge. SMEs seldom have time for doing this. Our final aim is to create competitive advantage and growth capacity for our regions by creating future orientation and forums for knowledge creation especially for SMEs.

We have earlier studied the needs of the SMEs by carrying out a company survey, interviews as well as two innovation workshops (Manninen et. al 2011). We found out, that the innovation process of machinery and metal sector SMEs is unclear and their contact networks are diffuse as well. There is very little, if at all cooperation with the universities. As SMEs need new capabilities in order to grow cooperation and networks are crucial for them. Companies with a high innovation performance also seem to have a higher innovation capacity (Forsman 2012). Therefore the regional informal networks benefit especially SMEs as they gain access to the local information communities. Open innovation is also more widely used in regional and local networks. Small companies with their limited resources are therefore more bound to deep and long-lasting relationships.

Recent studies reveal that internationally grown SMEs share three dynamic capabilities: knowledge absorbing capabilities, acquisition and integration capabilities as well as dynamic internationalization capabilities. In order to develop new capabilities SMEs need both new tools and access to latest information and knowledge networks. Future orientation is important for gaining competitive advantage. The foresight process includes the provision of future information and its analysis and use for strategic decision making. SMEs lack the ability for all of these stages. They need new dynamic tools and other support for their innovation processes.

2 Enhancing open innovation and critical capabilities

Open innovation exploits the inwards and outward flow of information to speed up internal innovation process and explore new markets (Chesbrough 2008). It also changes the core competence of the company. SMEs gain new possibilities through specialization and widening up their technological information base. SMEs seldom have time for this. Cooperation with universities is a way to faster learning and gaining new competence required by open innovation.

The future performance of the innovation system will mostly depend on the social processes between regional economic actors. Regional information networks may also explain differences in the efficiency of open innovation. Innovation requires institutional learning concepts and probably also regional concepts. Interactive learning functions become crucially important for the whole process. From this framework, innovation is constructed of three overlapping processes: the production of scientific and technological

knowledge, the translation of knowledge into working artefacts and responding to and influencing market demand. (Pavitt 2005).

The regional innovation system consists of a set of institutions whose interaction determines the production, diffusion and use of economically useful knowledge. This is a graduated and cumulative process where innovations are resulting ultimately from processes of learning, searching and exploring. Key actors in production and innovation systems apart from business companies are universities, private and public research institutes, organizations of technology transfer and the government. A well-functioning system needs diversified and broad use of the human factor, interaction processes within and between companies, cluster formation, networking and decentralized organisation structures, highly qualified workforce, technology transfer institutions, regional innovation policy and national expertise programme. In this social system, innovations are the results of social interaction between economic actors and interaction is based on common analytical framework (Cooke, 1998).

Innovation is crucial for the survival of the firms and requires many learning interfaces inside and outside the firm. As rapidly responding innovation processes increase the importance of versatile skills and the ability to network, learning becomes a crucial part of the overall performance of the firm. The stages of learning include learning by doing, by using, by interaction and also by learning. Interactive learning functions become crucially important for the whole process.

Knowledge creation is both a social and an individual process in organizations. The production of innovative knowledge requires three characteristics: reflexivity, transdisciplinarity and heterogeneity. They can be enhanced in the context of innovative regional clusters. We have described the regional forum for knowledge sharing in a former work called the FutureWatch. The regional forum helps SMEs to find the latest information and partners for developing new capabilities needed in their innovation process.
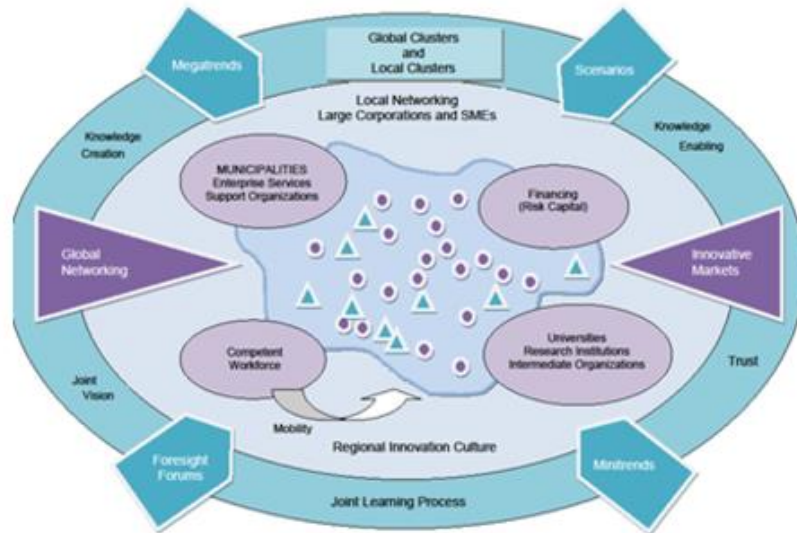
Picture 1. FutureWatch Framework (Manninen, Meristö & Laitinen 2012)

The innovation process of the SMEs includes its own resources and tacit knowledge, local environment with its resources and networks as well as outside networks and resources. Practice seems to be the main source of innovation. The innovation process is characterized by synthetic information processing in non-linear, multifunctional and multidisciplinary networks (Virkkala 2008). According to Heinze et al. (1998) one of the challenges is that SMEs have particular difficulties in implementing cooperative relations. In the worst case company innovation processes lack the input from the academic research. This is especially true when speaking about research tools.

3 The aim and research question

In order to develop new capabilities SMEs need both new tools and access to the latest information and knowledge networks. We aim to build up a regional forum for creating and sharing knowledge and to support SMEs in their innovation process. We also develop tools and learning processes for SMEs to be able to use future information and foresight as part of their business development. This developmental framework needs to answer the following questions:

1. Which features of the regional forum structure support SMEs in their innovation process?

2. How do we build up a system of continuous information flow and barometers to follow-up the future signals from both global and regional sources?

3. Do the different future tools and learning process provided increase the innovation capacity and critical capabilities of SMEs?

4 Research design

Our research is based on two earlier projects, Rocket and RACS as well as ongoing projects called BOAT and PUFs. All the projects support the innovation process of SMEs mainly in the fields of technology.

Knowledge creation acquires two different processes (von Krogh, Ishijo and Nonaka 2000): knowledge enabling and organizational knowledge creation. The first means instilling a knowledge vision, managing conversation, mobilizing activists, creating right context and globalizing knowledge. Organizational knowledge creation is sharing tacit knowledge, creating concepts, justifying concepts, building a prototype and cross levelling knowledge. The process of knowledge creation is fragile. Sharing knowledge can include insight in customer needs and new technologies. It also requires personal skills to perform complex tasks. Knowledge creation is both a social and an individual process in the organizations.

The regional forum FutureWatch forms the frameworks for foresight, joint learning and competence development. The forum has its input from thematic cluster interviews and global and regional Signal Barometers to be developed (Picture 2)
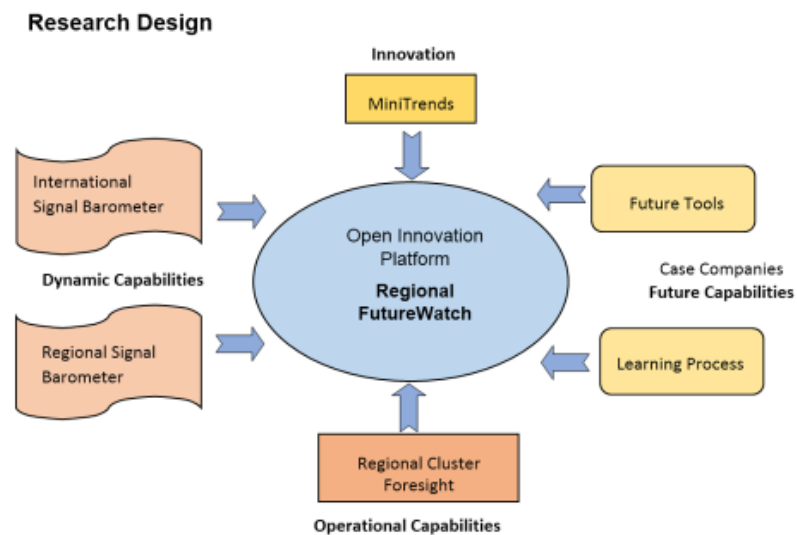

Picture 2. Research design.

The foresight process has four main stages: 1) information collection, 2) information processing, 3) using the knowledge created for strategic purposes 4) evaluating and

developing the process itself. Each stage may be tackled by different tools or methods chosen by the case companies (Peltola et al. 2003).

The regional cluster forum has its input from thematic cluster interviews and surveys. In addition, global and regional Signal Barometers are under development. The tools for the future are to be productized by individual case company studies. The first pilot workshop has already been held. The process is shown in Picture 3. We also test the MiniTrends concept (Vanston and Vanston 2011) by individual or clusters of companies.

The process enhances the innovation capacity as well as the critical competences such as dynamic, future and operational capabilities of the SMEs. The innovation capacity and capabilities are studied by self-reported data of the case companies. The future tools and competences have been processed in three workshops called Future Circuses. Similar design also forms the basis for learning and competence development.
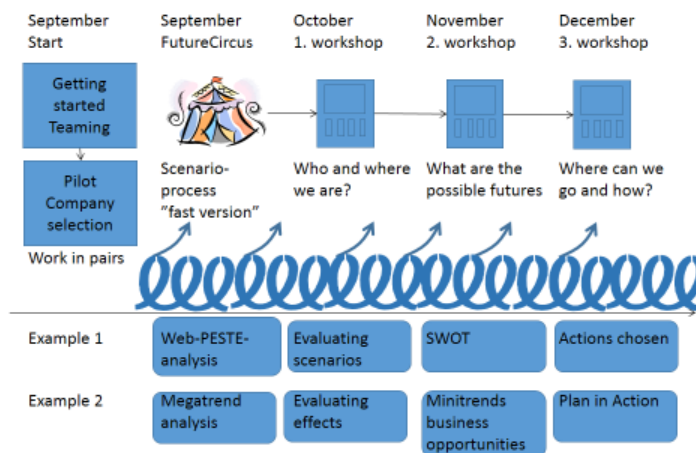

Picture 3 The Future competence and tools workshops based on the phases of the action scenario approach (Meristö 1991).

5 Tools and methodology

During the first phase of the PUFs project we have concentrated on developing the overall future capabilities of the participants and testing the different methods. The development workshops called FutureCircuses covered the three phases of the foresight process: gathering information and data, processing it and using the analysed data for describing the future alternatives as well as for decision making (Picture 4). The participants of these workshops represented four different sectors which were start-ups & micro companies, technology, health & social care and nature & environment. The company workshops as well as the case company workshop follow the same design.

For information gathering we tested the following methods: Future cards, SWOT, Future`s table, "Applying for a job"-Game and Visionary Concept Design. The second workshop applied the Scenario process and the third concentrated on finding out the different company needs and end uses for the future tools. Case companies work in two groups: food industry and start-ups. Both will choose their own tools and methods to be tested.

The three different processes are documented and they form three different products: Learning content for Future´s thinking, Handbook for Future Tools and an Electrical Toolkit for SMEs Future processing.
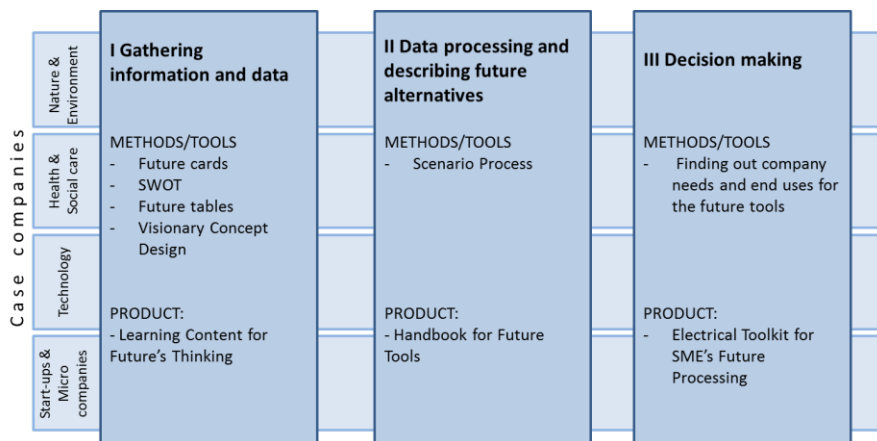
Picture 4 The phases and the products of the learning process.

6 Findings and contribution

As a summary, the key findings are based on 1) key visionary interviews, 2) Cluster Forum (trends and potential minitrends) and 3) Pop-up Futures Pilots (FutureCircuses and Tools for SMEs workshops).

Key visionary interviews

We studied the change in the technology business field in Finland by thematic interviews during the fall 2013. The questions covered strategy, change and competence from different angles to foster the futures thinking and dispel situational bounds. At this stage we targeted persons with broad insight in different fields of technology and research. Nine thematic questions were partly overlapping. The interview material was written up and the interviewees had a possibility to check the material produced to be in accordance with their views. The produced text was analysed based on the literature. New approaches, signals and key words were emphasized during the process. We will continue the process by interviewing individual company representatives in the region.

The technology business field in Finland and the region was studied by thematic interviews. We will describe the content of each theme including future competence

needs. The findings also give preliminary context and ideas for the signal barometer construction. The experiences of the first cluster forum and leaning cafe findings will also be reported. Our final aim is to create competitive advantage and growth capacity for our regions by creating future orientation and forums for knowledge creation and critical competence development especially for SMEs. This process and findings will be described. Individual case company study experiences as well as productized tools will form a handbook for SMEs.

The thematic interviews gave information about future trends from different PESTE dimension, i.e. political, economic, social, technological and ecological dimension. The changing factors based on the interviews are summarized in the table 1.

Table 1 The summary of changing factors based on the thematic interviews.

|	**Changing factors**
Political	Mobility and digital services will continue to develop as far as possible. EU has too many directives constraining enterprises. Taxation harmonization and holes, competition and national subvention. In Finland: national economical shortfalls, unemployment
Economic	International share of work is changing, production follows the market. Potential growers Asia, Japan and Russia. In Finland: short of capital, too small enterprises and huge global market potential
Social	Consumerism, fast real time services, distributed processing, ICT, anticipated services and maintenance, conceptualization. In Finland: low hierarchy, workers participate in the innovation process, proto economy, new managerial challenge
Technological	Two main trends digitalization and personalized user friendly inter operational systems. Clean water, air and energy
Ecological	Environment: green values and processes essential, climate change will affect attitudes, new expectations, minimalism, adjusted processes, New urban village, New luxury. In Finland: Forestry, green processes

According to the interviews important factors on the global level include also global-local rethinking, polarisation between the rich and the poor, climate change and refugees and economical equalization. In the case of Finland also unhealthy competition was mentioned as well as the role of the metropolitan area versus counties.

When considering future competence needs and trends it was mentioned in the interviews that old patterns will not work. We will need new combinations, human engineers. Competition will get harder. It is no use to run after low production costs. Tasks in production will get more and more challenging and they will require automation, programming, planning and understanding as well as managing of the whole structure. Branding, resilience, entrepreneurial skills and internationalization in global context are essential. Technology will penetrate others fields, people need to know and understand

programming and its meaning for everything. Flexibility, anticipation and fast building and changing of study programmes are needed. Digitalization and new equipment should be brought into schools at once. Individuals require combined multiunderstanding and deep knowledge of a field. The ability to learn and identify one's competences and use them and the ability to gain new competence for certain end use and confidence are important. We will also need new ways of leadership, logistics and financing. There are also several uncertainties which have an impact on future competence needs. E.g. unexpected effects of technology, threats of resistant bacteria causing pandemia, information security risks, financing, allocating support in wrong ways, crime, the changing material balance of the world, phosphorus, earth gas, the role of soil and artifical food are going to be important questions. Therefore, different technological interfaces should be studied in order to understand what is coming: cross disciplinary and cross scientific are key words!
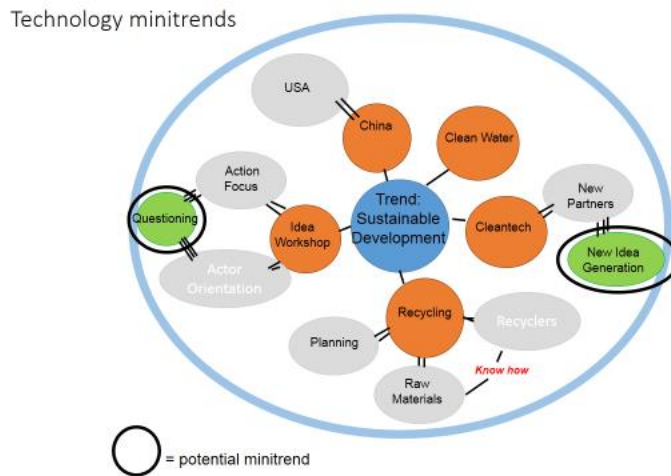
Cluster Forum

The members of the Cluster Forum answered to a web survey in which the importance of different trends were examined. According to the survey, the three most important trends were networking, sustainable development and economic uncertainty (Picture 5). There were some small differences between clusters. For example, in the culture & media sector the most important trend was social divergence while in other clusters it was not seen as important.
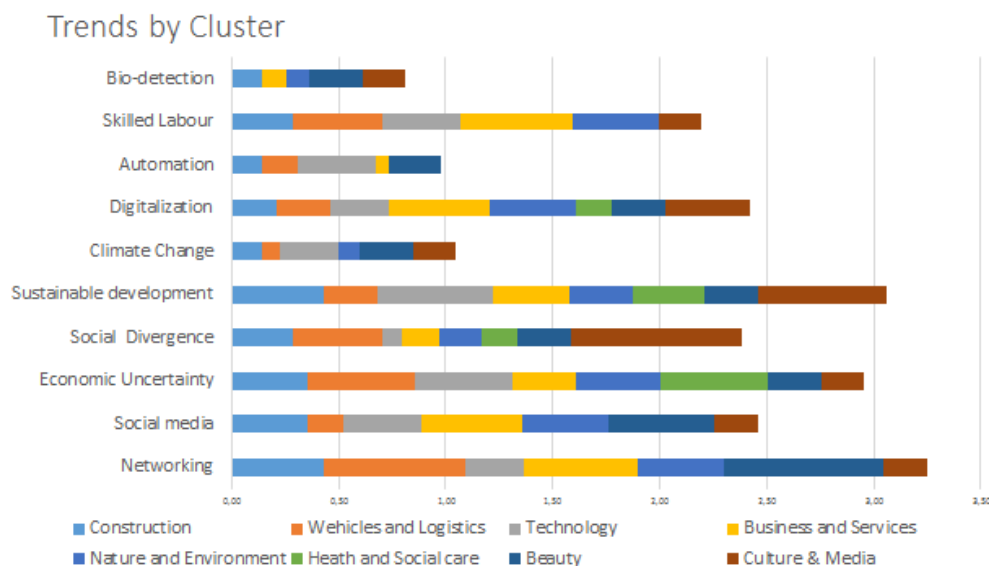
Picture 5 The most important trends according to the Cluster Forum.

In the Cluster Forum workshop held in October 2013 the participants figured out potential minitrends in group works. The minitrends provide business opportunities to the individuals or organisations which are vigilant enough to perceive them and bright enough to utilise the recognized opportunities. A typical feature of a minitrend is that the

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general public or most of the business world has not identified it yet. However, their development of the trends has proceeded so much that the acceptable projections can be made concerning the development of the future. The possibilities brought by the minitrends will often be connected to the future within 2-5 years from the present. To find out minitrends the tool called an Impact Wheel was applied. Its idea shortly is to choose a trend and consider direct and indirect impacts related to the trend (Vanston 2012). Each group used the trend sustainability development in the center of the Impact Wheel when trying to find minitrends. The Impact Wheel of technology group illustrates the idea of finding minitrends (Picture 6). According to te Technology group a potential minitrend could be e.g. new idea genetation and questioning. To mention some other exaamples of minitrends the Constrution group's suggested minitrends were the right language in education and additional services such as decoration. Culture & Media group's minitrend was combining genres and sub-cultures.

Picture 6 An example of the Impact wheel created in the Cluster Forum workshop .

Pop Up Futures Pilots

Workshops with SMEs in two thematic groups during autumn 2013 show that resources in small companies, especially in start-ups, are very limited overall. Everyday business requires easily all allocated time. This means that foresight information, tools and processes have to be pre-organized or half-done. E.g. all the megatrends and alternative scenarios from the operating environment have to be well documented and communicated beforehand. Then, SMEs can effectively use all the time available focusing on their business more concretely. Also, clear rules for using alternative scenario in the course of time are needed and e.g. the need for flexibility has to be recognized precisely. SMEs are often entrepreneurial by nature, working alone, and they need an entrepreneurial foresight community for foresight activities.

7 Practical implications

Future tools will be modified to support the innovation process of SMEs and further create readiness, competences and agility to their business development. The role of foresight activities is to offer the essential information concerning the future development possibilities to the innovation process. The foresight process can be divided into four main stages, which are 1) information collection, 2) information processing, 3) using the knowledge created for strategic purposes 4) evaluating and developing the process itself.

Each of these four stages includes several tools and methods which can be chosen by the case companies. One of the most essential benefits of the foresight process and analysis, which also supports the innovation process, is illustrating the alternative future developments related to market potential and customer needs as well as societal requirements and technological feasibility (Meristö et al. 2009). There exists at the moment a gap between regional development and the innovation system and cluster foresight processes. National and global foresights tend to be too general or deal with global level problems which do not easily translate into regional level business targets or seeds for innovation. Using the minitrend concept helps to translate megatrends into realistic business ideas. This is an ongoing project and still open questions are e.g. critical capabilities and innovation capabilities of SMEs and developing the signal barometer or other future based barometer applications. We will continue our research work to fulfil these needs in the near future.

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