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Regional Development Platform Analysis as a Tool for Regional Innovation Policy

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Abstract

European regions have to direct their innovation and technology policies in a world of ever increasing competition. The correct policy decisions, aiming towards a sustainable future, are essential in achieving a competitive advantage for a region. The strategic choices are especially important because of the often very scarce regional resources.

The evolutionary economic theory has indicated the great difference between the regional development paths in seemingly similar circumstances, which manifests the unique character of each region, and the need to understand the importance of path dependency in regional development. Useful tools for supporting regional strategy building and decision-making in extremely different regions are needed. In this study, "Regional Development Platform Analysis" is presented as a method of finding the regional potential for future technology and innovation strategies.

Contents

1 Introduction

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The evolutionary economic theory has indicated the great difference between the regional development paths in seemingly similar circumstances, which manifests the unique character of each region, and the need to understand the importance of path dependency in regional development. Useful tools for supporting regional strategy building and decision-making in extremely different regions are needed. In this study, "Regional Development Platform Analysis" is presented as a method of finding the regional potential for future technology and innovation strategies.

The method is under construction at Helsinki University of Technology Lahti Center. It needs to be developed further in order to fulfil the demands of a real instrument for regional development. However, this paper presents a pilot case conducted in the Lahti Region, where the method has been used as a tool for building the regional science park concept.

A regional development platform is a concept understood as an industry or expertise based "platform" presenting the business potential of the actors working for the platform. The actors of a regional development platform are the firms, technology centres, expertise centres, research centres, education organisations, etc. contributing to the defined development platform. A regional development platform must be separately defined each time. A development platform is often based on an industry, including the development organisations and the regional innovation system supporting the development of the industry/platform.

The analysis method consists of seven phases:

- Benchmarking through the assessment of regional innovation system theories
- Background study of the industries and areas of expertise in the region
- Expert panel
- Assessment of future technological scenarios
- Analysis of statistical and empirical information
- Definition of the form of the regional innovation system
- Search of core processes of the regional innovation system.

2 Developing Regional Innovation System

The development environment of the regions has changed radically (at least in Finland) in recent years. There has been a clear change from nation-led regional policies towards competitiveness policies from a regional starting point (see Harmaakorpi & Niukkanen 2002). In the regions, there has been much confusion over how to adapt to the situation. The old institutions are looking for their places and it is often difficult to find leaders for the development processes. However, the actors are building strategies and development programmes in an ever tightening network on a regional level.

Regional technology and innovation policies have changed in the innovation-driven society. The focus has changed from the aim of achieving radical innovations towards emphasising innovation and learning processes as a tool for increasing regional competitiveness. Although we are living in a highly globalised society, the importance of the local milieu for innovation has not lessened (Porter 1990, 1998).

The concept of the innovation system provides a good framework for assessing technology and innovation policies in the new regional environment. At least three different schools have contributed a lot to the framework: the Marshallian school of industrial districts (see Marshall 1916, 1932, Piore & Sabel 1984, Beccatini 1990, Pyke & Sengenberger 1992, etc), the school of new industrial spaces taking as their starting point the works of Coase and Williamson (see Coase 1937, Williamson 1979, Storper & Scott 1992, etc), and the mainly European GREMI-school emphasising the importance of the concept of innovative milieu (see Aydalot & Keeble 1988, Camagni 1991, Crevoisier & Maillat 1991, etc).

The theory of industrial districts has its basis in Adam Smith's (Smith 1776) recognition of the benefits of specialisation. Marshall pondered the concept of industrial atmosphere describing the characteristics of spatial industrial agglomerations. He found regions where this atmosphere was very beneficial for certain industries. An important observation was that the atmosphere had been developed over a long period and could not be moved. Marshall also saw that the interaction in an industrial district was not just buying and selling. He called the interaction constructive co-operation, describing the multifaceted characteristics of the communication process. In the theory of industrial districts, the co-operation of small and medium size enterprises and the transparency of the regional actors are emphasised, as well as building a real service network for the enterprises. Such famous theorists as Porter with his diamond model (Porter 1990) and Krugman with his research into the agglomeration of business activities (Krugman 1991) have been influenced by Marshall's theories.

The theory of new industrial spaces is based on neo-institutional economic theories. Why do firms exist? That was the question asked by Coase (1937, 1960) more than 60 years ago. Even though it is not perfect, Coase's analysis of transaction costs and vertical integration provides a good starting point for the understanding of the existence of different organisational forms. According to the theorists of new industrial spaces, the regional production system is formed by the relation of intra-firm organisational costs and the transaction costs in the network of firms.

The concept of innovative milieu focuses on the relation between innovative capability and the regional economic milieu. Maillat, Quevit, & Senn (1993) suggest that entrepreneurship, the forms of the organisations, the atmosphere for entrepreneurship, and the ability to use technology are the basic elements of the innovative milieu. According to this school, economic success in a region depends a great deal on the quality of the internal innovation network in the region. The collective learning process is seen as being extremely important for the quality of the innovation network.

Practically all the theories related to regional innovation systems agree that there are some essential matters to achieving regional competitiveness by developing the regional innovation system. First of all innovation is widely seen as a collective process (Crevoisier & Maillat 1991, Camagni 1991, Storper 1993, Storper & Scott 1995). Many different firms, research units, universities, regional development agencies are involved in the process. A region is seen as a network of knowledge, technologies, and practises, which have arisen in the region. The network innovative capability depends on the ability to learn collectively, as well as the strongly interactive learning process included in the network (Asheim 1996, Lundvall 1999).

A regional innovation network cannot function effectively without an atmosphere of trust and co-operation. Gambetta (1988) defines trust as "a particular level of the subjective probability with which an agent assesses that another agent or group of agents will perform a particular action, both before he can monitor such action (or independently of his capacity ever to be able to monitor it) and in a context in which it affects his own action." The trust in an innovation network can be created and held through co-operation in the interactive learning process. Trust has to be built up between individuals and organisations. It is essential that the players of the regional innovation game fulfil their roles as trustworthy partners. A technology transfer organisation continuously deceiving the firms in the region can erode the whole system and poison the atmosphere.

To understand the needs of a developing regional innovation system is one thing; to make things happen is another matter. Building trust and leadership in regional development is a complex matter (see Harmaakorpi–Niukkanen 2002 and Niukkanen–Harmaakorpi–Hennala 2002), where different actors with their aims must be able to discuss constructively in order to develop the innovation system. The actors come from totally different backgrounds to take part in the discussion. There must be concrete tools for the development process to define the forms and networks of the innovation system.

3 Concepts and Methodology of Regional Development Platform Analysis

Useful tools are needed for supporting regional strategy building and decision-making in extremely different regions. In this study, "Regional Development Platform Analysis" is presented as a method of finding the regional potential for future development strategies. But even more it might be seen as a tool to promote network co-operation and build trustworthy relations between the actors in regional development processes. This paper presents a pilot case conducted in the Lahti Region in Finland, where the method has been used as a tool for building the regional science park concept (Harmaakorpi–Pekkarinen–Serkkola 2002).

3.1 Concept of Regional Development Platform

A regional development platform is a concept understood as an industry or expertise based "platform" presenting the business potential of the actors working for the platform. The actors of a regional development platform are the firms, technology centres, expertise centres, research centres, education organisations, etc. contributing to the defined development platform. A regional development platform must be separately defined each time. A development platform is often based on an industry, including the development organisations and the regional innovation system supporting the development of the industry/platform.

Figure 1 shows the regional development platform system used in the Lahti Region. The industries chosen for the analysis are listed in the columns. The areas of expertise chosen for the analysis are shown in the rows. Areas of expertise are supposed to be essential for success in many industries. Marketing expertise and design expertise are examples of these.

AREAS OF EXPERTISE / INDUSTRIES	-Plastics	-Environment	-Biotechnology	-Construction	-Electronics	-Information technology	-Mechanical wood products	-Furniture	-Machine and metal products	-Textiles and clothing	-Food products and beverages	-Media	-Tourism and culture	-Logistics	-Commence
-Design															
-Quality															
-Environmental techology and ecology															
-Biotechnology															
-Information technology															
-Mechatronics															
-Communication and content production															
-Economy and administration															
-Innovation management															
-Wellbeing															
-Assembly															
-Marketing															
-Internationalisation															

Figure 1. *Industries and Areas of Expertise of Regional Development Platform Analysis.*

A development platform is connected with the past trajectories, but the concept is merely describing the future potential of the platform. Technological development may create totally new platforms. However, they are usually based on the work done on the existing platforms.

Some central criteria occur when assessing different industries as part of a regional development platform system. They help us evaluate the industries' potential for the region. They are the growth potential of the industry, the quantity, quality, and structure of the industry, internationalisation of the industry, the innovative capability of the industry, the ability of the management in the industry, the quantity of the research conducted in the region, the quantity and quality of the education given in the region, and the ability of the technology transfer organisations in the region.

The following criteria can be used when assessing the areas of expertise in the region: the quantity and quality of the knowledge intensive business services (KIBS), the innovative capability of the expertise, the interregional networks of the expertise, the quantity and quality of the education given in the region, and the ability of the technology transfer organisations in the region.

3.2 Methodology of Regional Development Platform Analysis

The analysis method consists of seven phases:

- Benchmarking through the assessment of regional innovation system theories
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- Assessment of future technological scenarios
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One should never try to reinvent the wheel. Therefore, it is important to learn from the past, compare what has been done in other regions, and try to do some benchmarking. Even though each region is individual, it is worth trying to find which practices that might best be suited to one's own region. A study of the mainstream theories of the regional innovation system gives a good basis for future development.

The background study of the industries and areas of expertise gives an idea of where the region currently stands. The main information source is the available statistical data. Supplementary information can be received, for example, from various reports and analysis. It is important to compare the information on one's own region with that of other regions to be able to get an idea of how the region is doing in competing with other regions.

There is often much tacit knowledge about the development platforms in the region. This cannot be found in the statistics or reports, for example. Therefore, it is valuable to organise an expert panel to obtain the "hidden" information. This panel can be organised by inviting groups who are supposed have a broad overview of the business life in the region. The panellists are given four tables to complete (see Appendices 1 to 4). The first table is to evaluate the industry potential for the region using the given criteria. The marks given in each table are from 1 to 10 with ten being the best. In the second table, the panellists give marks to the potential of the areas of expertise in the region. In the third table, the significance of each area of expertise for the different industries is evaluated. In the fourth table, marks for the importance of industries to each other are given. The panellists are given the material prepared for the background study and before completing the tables a proper discussion should be held on the meanings of the criteria and so forth.

The rapid technological development in the innovation-driven society is constantly changing the regional business environment. Old technologies and methods are dying and new ones springing up. It is essential to look briefly at the future. According to the statistical information, some very potential development platforms for the region could be in great difficulty under the future technological trajectories. On the other hand, some seemingly weak platforms could provide a good basis for prosperity in the future taking into account the opportunities of some new technologies.

The fifth phase of the study is the analysis of statistical and empirical information. The analysis is concerned with comparing the statistical data with the empirical data gathered by the expert panels to see if the statistically promising industries also seem to have potential from the point of view of the experts.

The most challenging part of the process is to find promising combinations of industries and areas of expertise while taking into account the possibilities offered by the visible technological development. The aim is to find the most fruitful regional development platforms where the scarce resources are put to good use in order to create regional prosperity.

The sixth and seventh phases aim to conceptualise the form of the regional innovation system and find the core processes helping the defined development platforms grow. It is necessary to build a systemic picture of the institutions aiming at increasing the innovative capability of the region. The role of each institution and a visionary goal for the whole system should be defined. It is essential for players of the regional system to understand the core processes in order to secure the effective development of the most important development platforms in the region.

4 Case: Building a Science Park Concept in the Lahti Region

4.1 General Description of the Lahti Region

The Lahti Region (Region of Päijät-Häme) is situated in Southern Finland, about 100 kilometres from Helsinki. The region comprises twelve municipalities, and has about 200,000 inhabitants, equivalent to four percent of the Finnish population. The population of the Lahti Region doubled from 1940 to 1975. (Committee for Urban Policy 1999). The Lahti Region population slowly decreased from 1992 to1999, but began to increase again in 2000.

Figure 2. *The Lahti Region. (The Regional Council of Päijät-Häme.)*

The geographical and functional centre of the Lahti Region is the city of Lahti with about 96,000 inhabitants, making it the seventh largest city in Finland. Among the municipalities in the Lahti Region, the differences in, for example, surface area, population density, and industrial structure, are considerable. The population and industries, especially manufacturing, are concentrated around the cities of Lahti and Heinola. The rest of the region is characteristically rural and has a sparse population.

The Lahti Region has a favourable geographic location, which gives it great potential. The railway from Helsinki to St. Petersburg goes via Lahti, so the Lahti Region can be called a gate to the East. The traffic connections between Lahti and Helsinki improved as the Lahti–Helsinki motorway was completed in autumn 1999. (Committee for Urban Policy 1999, 60.) The Finnish Government has decided to build a new, direct railway connection between Lahti and Helsinki. This connection will shorten the route by 26 kilometres, which will mean an average 50-minute

trip from Lahti to Helsinki instead of the current 95 minutes. The construction will begin at the end of 2002 and the new railway will be in service in 2006.

Figure 3. *The geographical position of Lahti. (The City of Lahti.)*

The Lahti Region was strongly affected by the collapse of the Soviet Union and the recession in the early 1990s. In 1990, there were 90,370 jobs in the Lahti Region. The number of jobs dropped over the next couple of years, so that in 1993 there were fewer than 70,000 jobs in the Lahti Region. Since then the number of jobs has slowly increased, and there were 79,138 in 1999. (Statistics Finland.)

In 1989, the unemployment rate in the city of Lahti (reflecting the whole Lahti Region) was 3.8 %. Since then the number of unemployed rapidly increased, and five years later, in 1994, the unemployment rate was 26.8 %. Over a few years, the number of employed people decreased by over 20,000 in the Lahti Region. Since 1995, the situation has been slowly improving; in March 2002, the unemployment rate was 16 %.Most of the unemployed are from industrial occupations. The region has traditionally been characterised by the manufacturing industry, and Lahti has suffered from the structural changes in the industry. There were considerable losses in the core manufacturing industries, i.e. metal, textile and clothing, food and beverages, and wood. (The Regional Council of Päijät-Häme.)

The increased value of production in all industries was 2,400 million euros in 1989 (in 1995 prices). It was at its lowest in 1992, 1,900 million euros, and in 2000 it was 2,500 million euros. The increase in value is estimated to rise to over 2,600 million euros by 2004. During the recession of the 1990s, the value of production decreased, especially in the mechanical engineering industry and other manufacturing industries (e.g. the furniture industry). Production also decreased in the textile and clothing industry. In 1999, in construction, trade, and private services, the increase in value was still below the 1988 level. The value of information communications, on the other hand, doubled its rate of growth from 1988 to 1999. (ETLA and Päijätpuntari.)

With a relatively high unemployment rate and a status as a declined industrial area, the Lahti Region is one of the European Union Structural Funds Objective Two regions. The Lahti Region will be eligible for Objective Two until 2006. Public funding for Objective Two in the Lahti Region

will total 149.4 million euros in 2000–2006. EU funding will amount to 59.9 million euros and Finnish Government funding pledged for the programme will exceed 69 million euros.

The core regional strengths contributing to and supporting entrepreneurial activity are: a competitive manufacturing industry; a favourable logistics position; expertise in design, quality, and ecology; cultural and leisure activities; inexpensive and diverse forms of accommodation; developing congress services; and EU funding. Intensive research and development is being carried out at the Lahti University Network (consisting of Helsinki University of Technology Lahti Center; Lappeenranta University of Technology Lahti Unit; University of Helsinki, Palmenia Centre for Research and Continuing Education; and University of Helsinki, Department of Ecological and Environmental Sciences), at Lahti Polytechnic, at the technology centre Neopoli, in the Centre of Expertise Programme, and in the Plastics Development Centre in Nastola. (Lahti Region Business Centre Ltd, 1999.)

4.2 Conducting Regional Development Platform Analysis in the Lahti Region

4.2.1 Benchmarking Through the Assessment of Regional Innovation System Theories

The change brought on by the information society and globalisation has also significantly altered the environment in which the regions act. The world is considered to have changed to a space of flows (Castells 1996) so that even regions are part of the global network society. This does not, however, diminish the importance of places. The places appear in the worldwide network economy as nodal points, whose wellbeing either increases or decreases according to the attractiveness they exercise on the flows. The success of a region is determined to a large extent by its capacity to attract different flows, such as information, capital, technology, cultural, specialist, and enterprise flows. For this reason, the region should be developed to become competitive enough to attract at least some flows.

A prominent feature of the information society is that information has become the most important production factor. Producing, processing, and controlling knowledge and expertise are crucial to the competitiveness of the regions. The Lahti Region is considered to be lacking in these aspects in the global information society. A low regional level of education, limited opportunities to study in higher education, and a low input in research and product development do not create an attractive environment with which to attract vital flows.

The Lahti Region has not been favoured in the allocation of state resources. No universities or important research centres have been placed there. This is the most significant reason for the reduced parameters in higher-level education and research. However, important resources have been directed to the region, for instance, through the structural funds of the European Union. Changing from a system-centred regional development directed at the state level to a networked programme-based development has, however, caused confusion among the actors, leading to a lack of unity in the development work. This in turn has caused the resources to be used somewhat ineffectively.

The background of the report is the framework of a learning economy and of the regional innovation system. In this case, they provide a sound basis for the study, because they take into account the characteristics of the Lahti Region, including a thin production structure and a low institutional thickness.

The regional innovation system does not constitute an independent theory as such, but rather a model of thought including characteristics from several approaches. It includes, for example, elements from the evolutionary economic theory, the model of production regions, theories related to rationalisation strategies, and models for business coordination (Kautonen, Sotarauta 1999).

According to Freeman, a regional innovation system is ”a network of public and private institutions, that through its activity and interaction creates, brings, modifies, and spreads new technologies” (Freeman 1987). In this context, the word 'technology' can be replaced with the word 'expertise', which as a concept is not as limiting in people’s minds as 'technology'.

The key element of the learning economy is made up of the following parts: development of human resources, development of new organisations, building innovation networks, directing innovation policies more and more towards developing service professions, and integrating universities and other institutions of learning in the innovation processes (Kautonen & Kolehmainen 2000). In the concept of a learning economy, the significance of the traditional trades is taken into account in the regional development, and it emphasises the interactive, multilateral, and social nature of the innovation processes. In accordance with the learning economy principle, the innovation activity can be defined as a multilateral learning process, in which, aside from the capacity to learn and change of personnel in an organisation, the co-operation partners become a significant source of renovation (Kosonen 2000).

The most important objective of the present day regional competitiveness and innovation policy is increasing the innovative capability of the region and its actors. This requires a systematic development of the innovation network and an increase in the institutional thickness that supports it.

Institutional thickness (Amin & Trift 1995) means the number of development-oriented institutions in the region and the interaction aimed at their capability to exchange and search for new information. This report centres especially around the thickness of enterprises aiming at developing innovation and entrepreneurial activities. The institutional thickness of places not having a university has traditionally been considered low. However, an institutional thickness sufficient for innovation activities is a necessary condition for the development of the innovation capability of the region.

The term 'innovation capability' is associated with the capability of the organisation to sense the changes taking place outside and to exploit their existing resources and competencies so that innovation activities can create a competitive edge for the organisation (Teece & Pisano 1998). The innovation capability includes many factors, but the most important one is increasing the inner and exterior interaction of the organisation.

A regional innovation capability means the joint innovation capability of the enterprises and other organisations of the region. So, it is made up of the innovation capability of not only individual actors, but also of the entire innovation network, which at best can be much more than just the sum of its parts. Kautonen and Sotarauta define a regional innovation capability as the capability of the innovation network of the region (Kautonen & Sotarauta 1999):

- To notice and modify the changes in the environment in which it operates
- To modify the resources available to the actors on the basis of new information
- To acquire completely new resources
- To combine these resources to form competencies that increase competitiveness
- Pass on information and to exchange information and know-how in large networks.

The definition given by Kautonen and Sotarauta is a very fitting guideline also for developing the innovation system of the Lahti Region, as well as for positioning the science park concept as a part of the innovation system. The main goal of the science park concept is increasing the regional innovation capability. It strives to achieve it partly by increasing the institutional thickness associated with innovation activities.

The objective of the concept of a science park is, as part of a regional innovation system, to enhance regional networking and exploitation of scarce resources. The idea of the science park concept is to create a regional scientific, technological, and innovation policy instrument, with which regional development can be made more efficient. It should be the kind of integral solution that would be jointly accepted by all the actors of the region and supported by the strategies and programme frameworks existing in the region. As such, it would support regional network co-operation and bring stamina and focus to it. It would also constitute an important instrument for internal and external communication making it easier to serve the interest of the Lahti Region both in state and European connections.

4.2.2 Background Study of Industries and Areas of Expertise

All the possible information concerning the industries and areas of expertise in the region was gathered in the background study. The information consisted of statistical information and various reports. In this paper, the information gathered concerning the plastics industry, which appeared to have the most potential in the Lahti Region according to this analysis, is given as an example.

Plastics industry: Growth potential, global, and national trends

The growth of the plastics industry follows the social and technological development, because the communications industry is an important client industry for the plastic products industry. For example, the fact that as telephones get smaller, the proportion of mechanics in the telephones increases, is of significance for the plastic products industry. In the present telephones, plastic parts constitute about one half. As production and competition become more international, the supplier of plastic parts is faced with great challenges. The producers of mobile phones expect their suppliers to be prepared to develop their production globally, because the parts supplier must be located as close to the telephone factory as possible (Ministry of Trade and Industry 2001).

The entire industrial production is predicted to grow in 2001 at a continuous growth rate of 4 – 4.5%. The production of plastic products is one of the fastest growing industries in Finland. The production of the plastics industry grew in 1999 (advance information) 0.8% with respect to the previous year. In 2000, the growth is expected to pass this percentage, but to slow down in 2001. Of the industrial branches in Finland, the chemical industry has risen to third place, after the forest and metal industries (Ministry of Trade and Industry 2001).

The profitability of enterprises making plastic products has remained reasonably stable in recent years. It is believed profitability and solidity will improve in the future. Profitability, especially in technical plastic products, is believed to be developing positively, and the industry has indeed become important in Finland. This is due to the positive development of the most important client industries of technical plastic products, namely the electric and electronics industry, the automobile industry, and the furniture industry in recent years. The further success of the electric and electronics industry will indeed be crucial for many suppliers of plastic parts. According to the small and medium size industry barometer in the spring of 2001, about 30% of the enterprises expect their personnel to increase during the following quarter. The expectations regarding the development of the personnel are more cautious compared to the situation the previous autumn (Ministry of Trade and Industry 2001).

Due to the fact that the plastics industry is based largely on parts suppliers and dependant on their client industries, networking is a central factor in the success of the industry. The tendency is to give the subcontractors bigger responsibility units so that the wide and varied expertise of the parts supplier is emphasised. A successful plastic parts supplier is expected to invest repeatedly in top technology and development of production methods. Aside from a comprehensive know-how, specialisation is also a success factor (Ministry of Trade and Industry 2001).

There is room for improvement in the co-operation among the suppliers themselves. The enterprises have also had difficulty in marketing and finding competent personnel (Ministry of Trade and Industry 2001).

Amount of entrepreneurship and employment creation

As of Sept. 30, 2000, there were 60 industrial units in the Lahti Region engaged in the production of rubber and plastics (Statistics Finland). Of all the industrial units, this industry accounted for 3.8% of all the industrial units while the national average was 2.5%, so proportionately there are more places of business in this industry in the Lahti Region than there are nationwide. There were 1,978 people working in the plastics industry in 1999 in the Lahti Region, or 8.6% of people employed in industry. In the whole country, the plastics industry personnel represented 3.5% of people employed in industry (Statistics Finland).

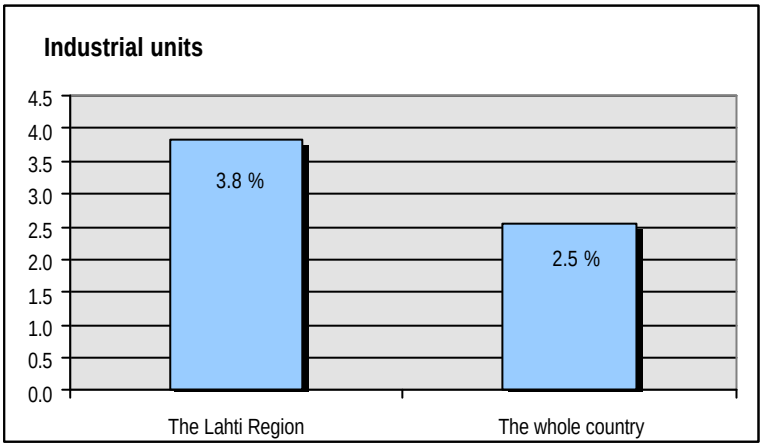

***Figure 4**. The proportion of the industrial units of the rubber and plastics industry of all industrial business places in the Lahti Region and in Finland in 2000.*

Structure of entrepreneurial activity

In the plastics industry in the Lahti Region, 59% of all enterprises employ less than 10 people, 23% employ 10–49, 13% employ 50–249, and 5% employ 250, that is two companies (Lahti Region Business Centre Ltd 2001).

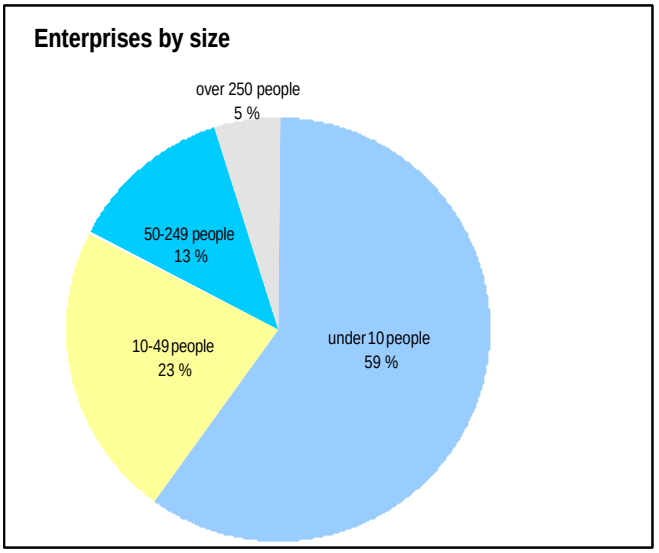

Figure 5. *The plastics industry enterprises by size in the Lahti Region 2001.*

Information intensity / innovative capability of the industry

The plastics industry is a research-intensive industry. The plastic products industry in Finland holds a leading position in the world in technology (Ministry of Trade and Industry 2001).

In the area of work methods (to which the plastics industry belongs in the international patents classification), 29 patents were applied for in the Lahti Region in 2000, which represents over half of all patents applied for in the Lahti Region. The amount is considerable in light of the general average in Finland, where the patents in this industry accounted for only 20% of all patent applications (Statistics Finland)

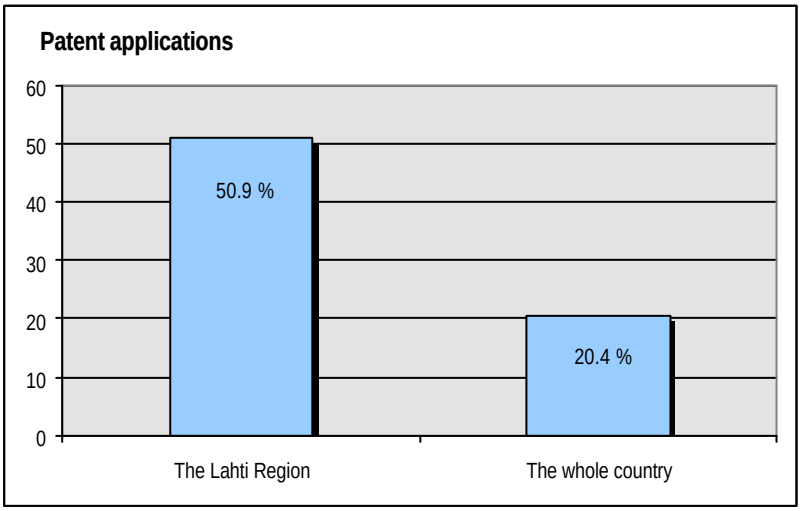

Figure 6. *Patent applications for work methods and the transport industry of all patent applications in the Lahti Region and Finland in 2000.*

Value of production

In 1999, the value of production of the plastics industry was 117.3 million euros in the Lahti Region, representing 11.8% of the value of production of all industry in the region. In the whole country, the share corresponding to the plastics industry was only 3.0% of the industrial value of production (Statistics Finland).

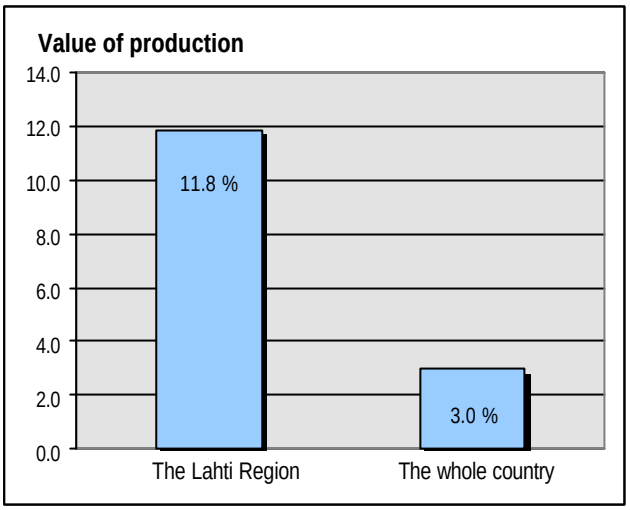

***Figure 7**. The share of the plastics industry of the value of production of the whole industrial production in the Lahti Region and in Finland in 1999.*

Internationality of entrepreneurial activity

The value of the exports of plastic products manufacture in the Lahti Region in 1999 was 121.7 million euros, which was 11.8% of the whole industrial export value of the Lahti Region. In Finland plastic product exports were only 1.7% of industrial products.

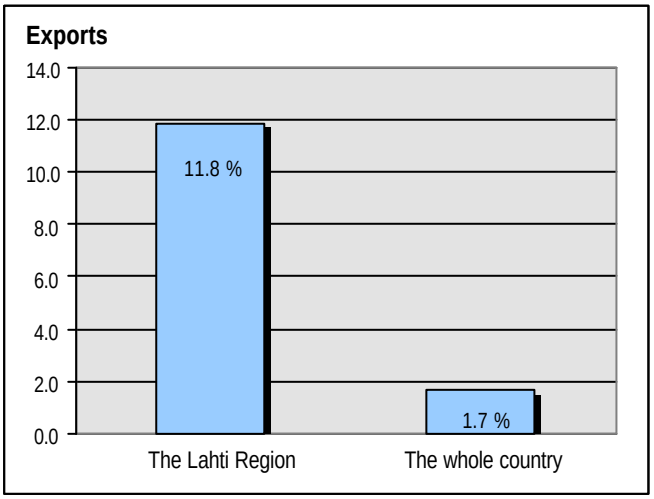

***Figure 8**. Plastics industry exports of all industrial exports in the Lahti Region and in Finland in 1999.*

Educational opportunities

In plastics and materials technology, The Plastics Development Centre trains both personnel of enterprises and new people for the industry. The training for the professional title of 'plastics mechanic' includes three lines: thermoplastic, thermosetting plastic, and plastic composites (Ministry of Trade and Industry 2001).

According to the prediction concerning starting places in studies in the plastics and materials technology industry in the Lahti Region for 2001–2005, an annual total of 45 students of higher education[1] and 30 students in secondary education will start their studies (Harmaakorpi 2000).

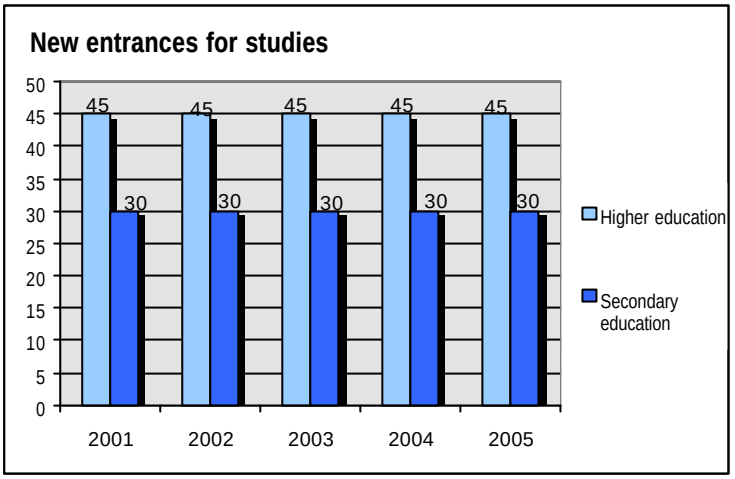

Figure 9. *New entrances for studies in plastics and materials technology in the Lahti Region for 2001–2005. (Harmaakorpi 2000.)*

Technology transfer activities and research

The Plastics Development Centre in Nastola was founded to support the development of the Finnish plastics industry. It produces support services that improve the competitive capability of the plastics industry. The Plastics Development Centre offers product development, training, export and laboratory services, as well as services for creating new entrepreneurial activity in the plastics industry.

Support industries

It is typical of the plastics industry that the companies work as subcontractors for other industries. The most important client industries are the foodstuffs and chemical industries (Ministry of Trade and Industry, industry barometer). For the producer of plastic products in the Lahti Region, the thriving, traditional metal and furniture industry and, for instance, Asko's household appliance manufacture, constitute a good local source for increasing orders (Petrola 2000). The motor industry is one of the biggest clients of the plastic parts industry. The Western European motor industry buys 1.4 billion tons of plastic in parts every year (Ministry of Trade and Industry, Industry Report, Production of Technical Plastic Products 2001).

[1] *Higher education includes the predictions for starting places at the Lahti University Network and the Lahti Polytechnic.*

4.2.3 Expert Panel

For assessing the industries and the areas of expertise in the region, three expert panels were organised with a total participation of 30 people. The idea was to assess the current situation of the industries, as well as the areas of expertise and the conditions they would offer for science park bases.The panels were given four tables, each with two dimensions (see Appendices 1-4). The panellists were asked to grade each industry and area of expertise from 1-10 according to each criterion. So, there were altogether 620 gradable factors. The panellists could resort to the background material in Chapter 4.2.2 as a basis for their evaluation work, and in the meetings with the panellists the aim was to form a common understanding of what was meant by each industry, area of expertise, and criterion so that all would have the same understanding of the concepts.

Assessment of the industries

The first task consisted of evaluating industries on the basis of certain criteria. The definition of the industries was based on the TOL95 classification by Statistics Finland, which was applied to the special needs of the Lahti Region by, for example, asking the panellists for suggestions of industries to be assessed. Most of the industries were traditional industries, but there were also newer industries, such as biotechnology and the media.

There were 15 industries to be assessed:

- Plastics
- Environment
- Biotechnology
- Construction
- Electronics
- Information technology
- Mechanical wood products
- Furniture
- Machine and metal
- Textiles and clothing
- Food products and beverages
- Media
- Tourism and culture
- Logistics
- Commerce.

The industries were assessed on the basis of ten criteria:

- Amount of entrepreneurial activity and employment capacity
- Growth potential
- Balance of the entrepreneurial structure
- Internationality of entrepreneurial activity
- Innovativeness of entrepreneurial activity
- Value of production / know-how intensity of entrepreneurial activity
- Capability of the leadership of top enterprises
- Regional adequacy of educational opportunities
- Regional research input
- Regional technology transfer activities.

On the basis of the point averages for different criteria given by the panellists, the plastics industry (7.72) and the machine and metal products industry (7.22) proved to be among the most important industries. The plastics industry scored best in the leadership capability of the top enterprises of the development platform (8.43) and in the internationality of the entrepreneurship (8.37). Also the growth potential of the industry (8.27) and value of production (8.20) were considered good in the eyes of the experts. In the machine and metal products industry, the highest points were given to the amount of entrepreneurial activity and employment capacity (8.70) and the balanced entrepreneurial structure (7.90).

The environmental industry also got an average score of almost seven (6.84), with the highest points being given to growth potential (8.17) and the regional adequacy of educational opportunities (7.50). The lowest points were given to the construction industry (4.75). See Appendix 1 for more detailed information.

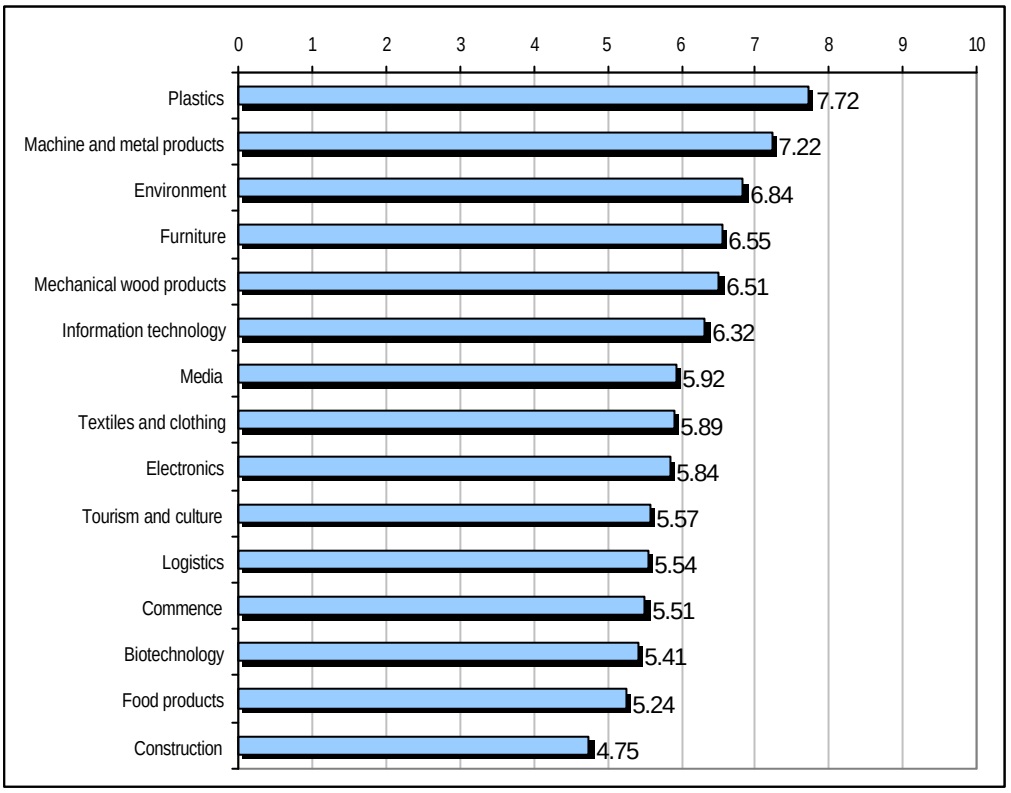

Figure 10. *Points averages for the various industries in ten different categories.*

According to the standard deviations of the answers, the experts agreed most on the plastics industry (standard deviation 1.58) and the machine and metal products industry (1.63), whereas the biggest deviation occurred regarding the biotechnology industry (2.72) and commerce (2.33). See Appendix 1 for more detailed information.

Assessment of the areas of expertise

Subsequently, the different areas of expertise were assessed. We define expertise in this study as expertise independent of the different industries, which is necessary or essential for many industries.

The thirteen assessed areas of expertise were:

- Design
- Quality
- Environmental technology and ecology
- Biotechnology
- Information technology
- Mechatronics
- Communication and content production
- Economy and administration
- Innovation management
- Wellbeing
- Assembly
- Marketing
- Internationalisation.

The criteria for assessing the areas of expertise were:

- Quantity and quality of entrepreneurial activity (Knowledge Intensive Business Services – KIBS)
- Regional pioneering quality / innovativeness in the area of expertise
- Regional and interregional networking in the area of expertise
- Regional adequacy of educational opportunities
- Regional technology transfer activities.

Among the areas of expertise, the top scores were received by design (average 7.40) and environmental technology and ecology (7.07). The regional adequacy of the educational opportunities was considered an especially strong point of both design and environmental technology and ecology, with the experts grading design on average 8.47 and environmental technology and ecology 7.40. The areas of expertise of quality and mechatronics were almost 6.5 points, with the regional adequacy of the educational opportunities again being considered the most important strength.

The weakest areas of expertise were biotechnology (4.25), internationalisation (4.55) and administration of innovations (4.64).

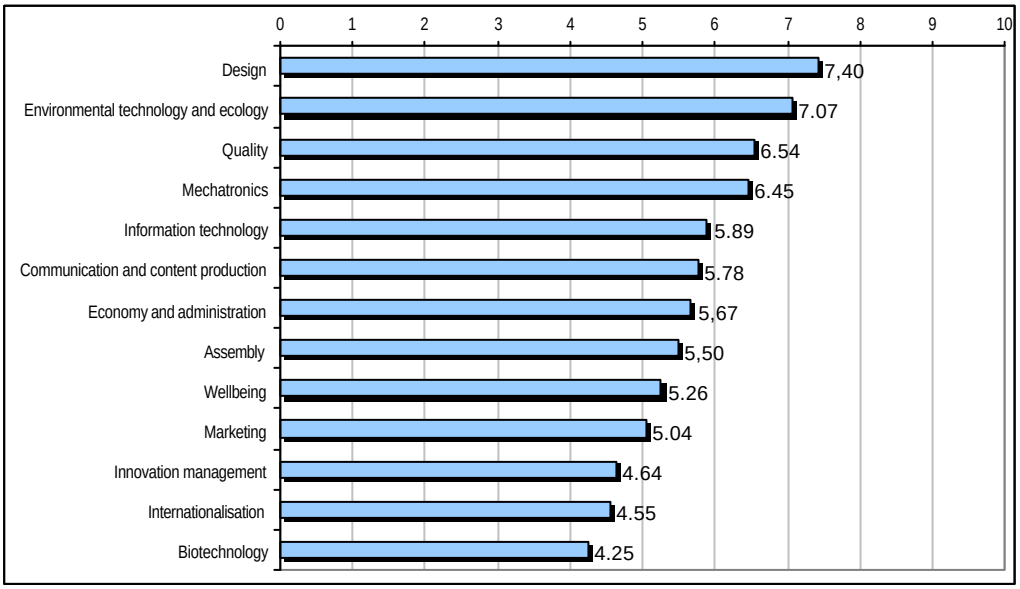

Figure 11. *Averages of five criteria points given by the panellists to the areas of expertise.*

The smallest deviation occurred in the evaluations of mechatronics (standard deviation of the answers 1.53) and in communication and production of contents (1.73), whereas in biotechnology the deviation was clearly the highest (2.50). This may partly be due to the fact that as a fairly new branch, biotechnology may still be understood in a number of different ways, at least with regard to environmental, pharmaceutical, genetic, and food products technologies. See Appendix 2 for more detailed information.

Significance of the areas of expertise for the industries

After the industries and areas of expertise had been assessed on the basis of different criteria, the panellists compared the industries and areas of expertise mentioned with each other. They were to assess the significance of each area of expertise for each industry, for instance, how the design expertise supported the plastics industry in the Lahti Region.

The experts considered plastics, machine and metal, and environmental industries to be the most prominent ones. From the point of view of the plastics industry, quality (8.13), design (7.73) administration of innovations (7.73), and internationalisation (7.63) were considered the most important areas of expertise. The areas of expertise that supported the plastics industry in the region the least were, according to the experts, wellbeing (4.37), communication and content production (4.67), and biotechnology (5.45).

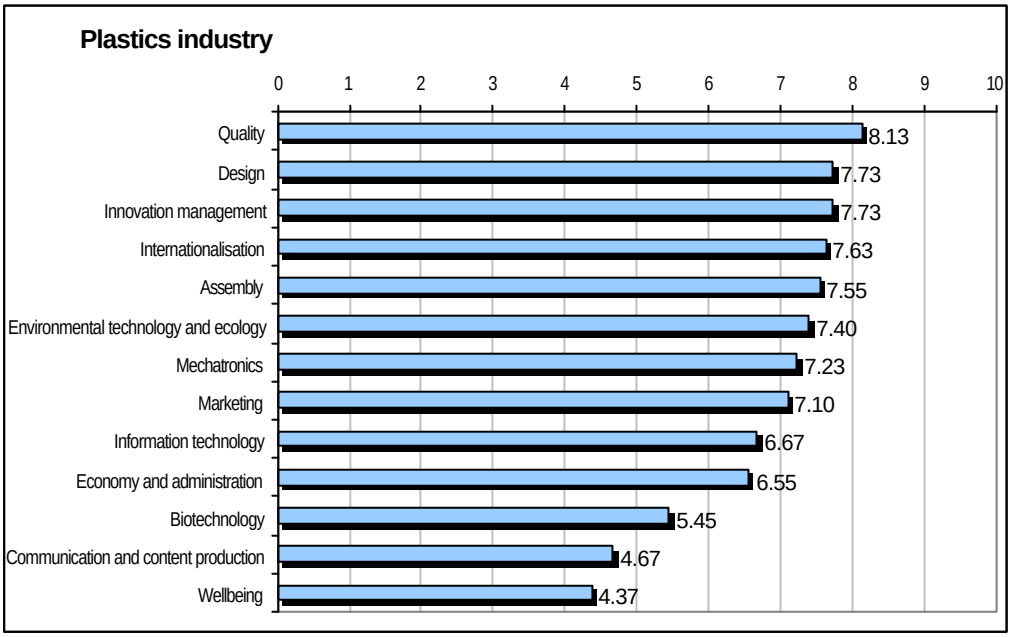

***Figure 12**. Score averages given by the experts to the different areas of expertise in the plastics industry.*

For the machine and metal products industry, mechatronics (8.23), quality (7.90), and assembly (7.83) were considered to be the most important areas of expertise. Biotechnology (3.44), communication and content production (4.63), and wellbeing (5.04) were considered to have the least importance for the machine and metal products industry in the region.

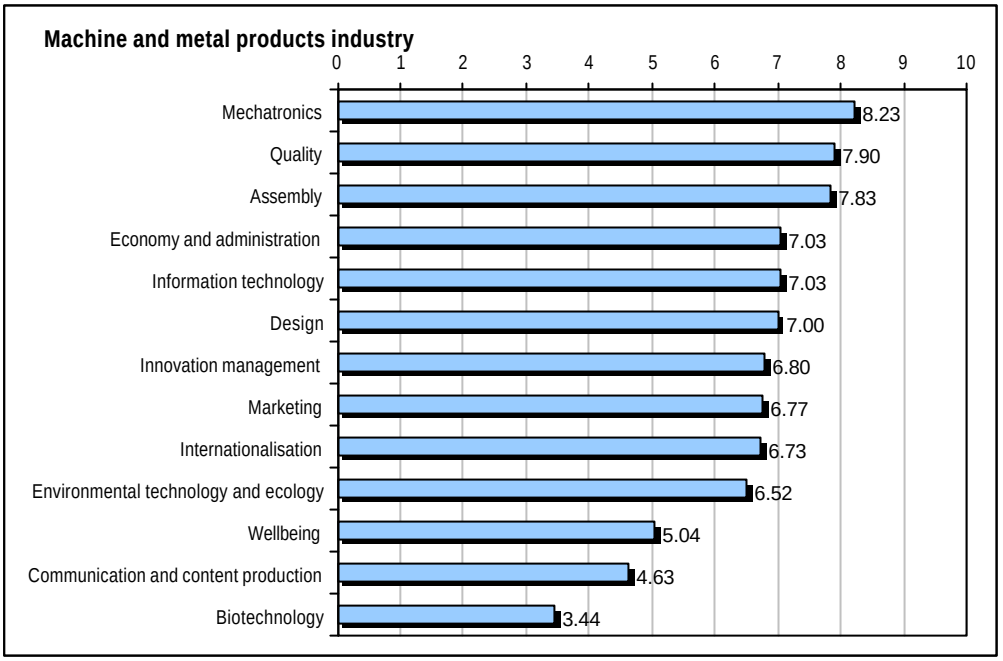

Figure 13. *Score averages given by the experts to the different areas of expertise in the machine and metal products industry.*

For the environmental industry, environmental technology and ecology (8.83) and biotechnology (7.67) were considered to be the most important supporting areas of expertise. The innovation management (7.60) and internationalisation (7.07) areas of expertise were also considered to be relatively significant and well mastered in the environmental industry. The design (4.61) and assembly (5.00) areas of expertise were considered to have the least importance.

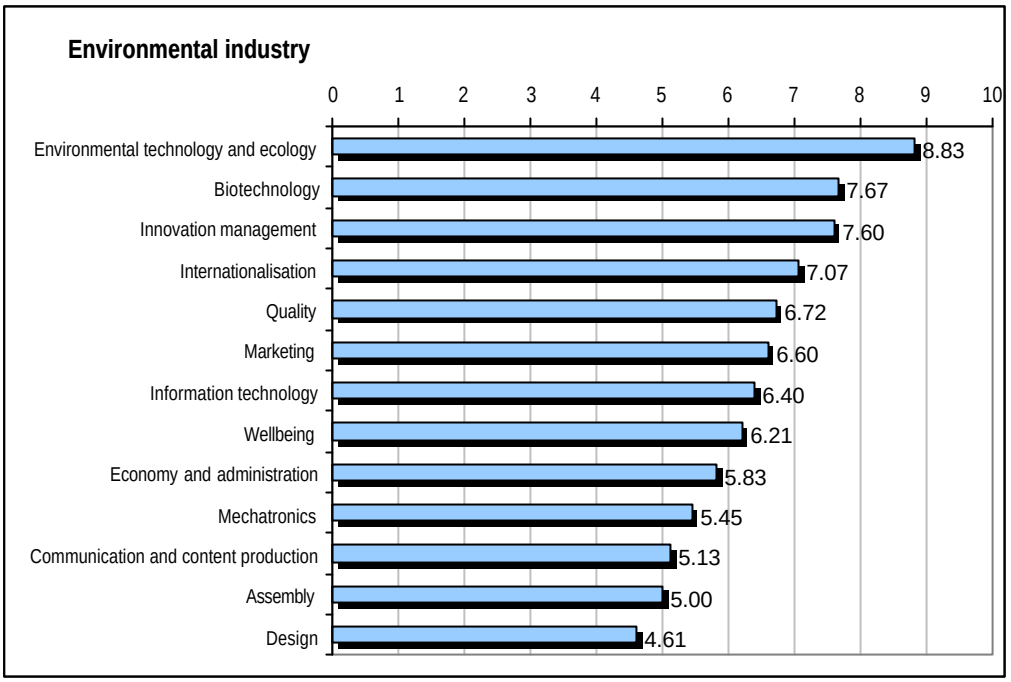

Figure 14. *Score averages given by the experts to the different areas of expertise in the environmental industry.*

See Appendix 3 for more detailed information on the relations between the industries and areas of expertise as assessed by the panellists.

Mutual significance of the industries

Finally, the panellists compared the different industries with each other evaluating the mutual significance of the regional industries. The questions were formulated in a bidirectional way so that, for example, the support given to the environmental industry by the plastics industry was assessed, and by the same token, the support given to the plastics industry by the environmental industry.

In general terms, the experts saw no significant connections between many of the industries. The highest points were scored by the support given to the electronics industry by the information technology industry (8.23) and vice versa (7.67). The score average of seven points was also bettered by the support given to the media industry by the information technology industry (7.57) the support given to the furniture industry by the mechanical wood products industry (7.57) and vice versa (7.43); the support given to the commerce industry by the logistics industry (7.53); the support given to the biotechnology industry by the environmental industry (7.43) and vice versa (7.27); the support given to the machine and metal products industry by the electronics and information technology industry (both 7.20); and the support given to the food products industry by the logistics industry.

The least connections were deemed to exist, for example, between the foods products industry and the mechanical wood products industry, between the textile and clothing industry and the mechanical wood products industry, and between the tourist and cultural industry on the one hand and the metal products industry on the other, where the averages were around two points.

The mutual connections between all the industries on the basis of the points given by the panellists can be seen in Appendix 4.

4.2.4 Assessment of Future Technological Trajectories

The analysis of statistical and expertise material sheds light on the status of the industries and the areas of expertise and on their mutual significance in the Lahti Region. New scientific innovations and international markets, however, will change the traditions of production in the region. The scientific and technological development, exerting influence on the production of goods and services, is simultaneously advancing on two levels. Firstly, the most prominent research fields are: a) information and communication technology, b) biotechnology, c) materials and nanotechnology, and d) energy technology. Secondly, these research fields are integrating with each other in many ways in concrete products and in the markets.

Thus, the results and expertise of different scientific fields are combined. For example, most scientific fields use information technology, and it is increasingly applied in society. In the same manner, in the materials technology, the materials being planned require a combination of expertise in chemistry, physics, and biology.

This starting point provides the framework for the criteria for choosing future development platforms and work methods. In a development platform, scientific expertise is needed, on the one hand, and on the other, the desire to integrate into other areas of expertise with ease. Innovative development platforms are, at best, quite different from a mere expert organisation of the industry. The platform for entrepreneurial activity does not require becoming part of the industry but rather means sharing the common business idea of multiple industries in the chain of value processing by enterprises. The chaining of value processing also means that value is consciously created by increasing the degree of service.

In this paper, we shed light on this phase of the analysis by showing the information prepared for the future of material and nanotechnologies.

Material and nanotechnologies

The new development in materials produces new material combinations for health care, information transfer, everyday objects, machines, equipment, and production of energy. The new materials to be developed can be divided into groups in accordance with Table 1. The Lahti Region's important resource is wood, one of the most important materials in sustainable development. We will, however, not discuss wood here, because it has already been taken into account in the strategies for the expertise centre programme and the province strategies. Instead, we will only consider plastic.

Photonic materials	'Light talk'
Materials for saving information	'Perfect memory'
Intelligent materials	'Smart talk'
Biomaterials	'Natural life'
Biomedicine materials	'Spare body parts´
Clean energy materials	'Full steam'
Porous materials	'Tubular vision and respiration'
Diamond and hard materials	'Hard work'
New polymers	'Chain reactions'

***Table 1**. Development trends materials technology. (Ball 1997.)*

The new materials will also change conceptions about plastic. Plastic will replace many materials, such as metals. The plastics industry is producing in the Lahti Region - as is the case elsewhere - mainly so-called intermediate products (about 85% of the production), that is to say, the intermediate products are used as parts of other products or product sets.

The application of the product, the use it is designed for, will serve more and more as a basis for choosing the materials, not the material in and of itself. Therefore, the plastics industry will participate even more actively in the planning of product concepts. This leads to the fact that there is a demand in the Lahti economic region for special plastics and their manufacturers.

The competitiveness of the plastic product industry depends most of all on three areas of expertise:

- Grasp of modular strategy: expertise in chemistry, physics, and biology and their integration with each other. Getting possession of expertise in the Lahti Region presupposes, for the development platform, a modular-strategic networking with the industry's research institutes.
- Special expertise of the process industry: special expertise in injection and casting techniques, and production development. In the future, a new casting technique can be used not only for plastic products, but also for other materials.
- Environmentally based pricing: environmental soundness and recyclability will be an important competition factor for the plastics industry in international markets. The expertise of environmental biotechnology and environmental technology will carry more weight in the plastics industry.

The plastic products expertise will become increasingly part of a modular strategy, in which the plastics engineers will discuss with chemists (molecules), physicists (order of atoms), and biologists (combining materials on a microscopic level). By integrating these areas of expertise, the plastic product will acquire new characteristics. For The Plastics Development Centre and for the enterprises dedicated to plastics, it will be even more challenging to create connections with national and international institutes that study materials.

Converting the material into a commercial product, that is, the processing route, is as important as the qualities of the plastic. The crucial resource is the processing method carried out industrially. In the plastics industry, it is simply a question of the technique of mould casting. Casting special plastic products requires a developed processing technology that works with the different characteristics of plastic. Developing such a technology receives special protection from the regional enterprises and areas of expertise.

The manufacture of plastic products has its economic and environmental price. Producing the raw material for plastic uses energy, and hazardous chemicals are used in the production process. Moreover, handling used plastic products places a burden on the environment. The chemical industry produces about 70% of the hazardous wastes. Industrial ecology concentrates on developing industrial systems that would use less natural resources, use energy optimally, and make use of its own residues. The environmental value will be increasingly more closely integrated into the economic price of plastic products. The product development of the biotechnology and environmental technology in the Lahti region can co-operate with the plastics industry.

4.2.5 Analysis of Statistical and Empirical Information

The analysis was concerned with comparing the statistical data with the empirical data gathered at the expert panels. The regional statistical data of every industry was compared with the national data. The available statistical data consisted of the number of industrial units and personnel and the values of production and export in each industry in the Lahti Region and nationwide.

With these criteria, the share of each industry was compared to the whole industry in the Lahti Region and in Finland to define the ratio of each industry. When the ratio of each industry was compared to the median of the ratios of all industries, it was possible to divide the industries into two categories by their position in regard to the median. The same procedure was repeated when considering the different industries on the basis of the points given by the experts. Thus, it was possible to see if the statistically promising industries also seemed to have potential from the point of view of the experts. A weakness of the study is the lack of sufficient statistical data on all the industries thus making it necessary to exclude some industries.

In Figure 15, X-axis represents the statistical data and the Y-axis the empirical data (panellists' opinions). In all four fields, the value of X-axis is described by the first sign (+ or -) and the value of Y-axis by the second sign (+ or -). The field with two plus signs shows the industries in the Lahti Region which both statistically, and from the point of view of the panellists, are above the median of all the industries. The field with +- describes the industries that statistically seem to be above the national level, but which from the point of view of the regional panellists have not enough credibility. In this study, no industry could clearly be defined in this field. The field with two minus signs is below the median both statistically and from the point –of view of the panellists, whereas the industries with -+ are statistically below the median, but which the regional panellists, however, set higher.

On the basis of the above, the positions of the industries in the four tables are as follows:

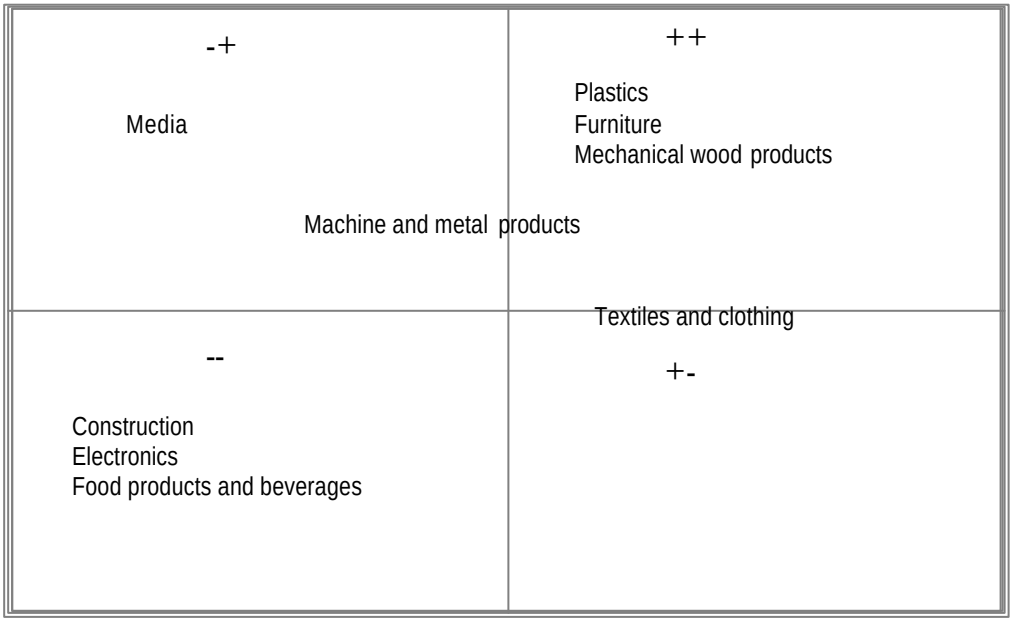

***Figure 15**. The analysis of the statistical and empirical information.*

The study indicates that according to both the statistical and empirical information, the industries of plastics, furniture, and mechanical wood products are above the median. Textiles and clothing are statistically above the median and empirically on the median level. Biotechnology, tourism and culture, logistics, and commerce are from the point of view of the panellists below the median, but as there was insufficient statistical data on these industries, they were excluded from the four tables. Construction, electronics, as well as food products and beverages, are both statistically and empirically below the median. In the media industry, it is interesting to see that statistically it is below the median but the panellists valued it above the median. Machine and metal products are statistically on the same level as the median, and above the median according to the panellists. It is perhaps slightly surprising that the food products and beverages industry is both statistically and empirically below the median, as there are notable companies in this industry in the Lahti Region.

No doubt, there are notable weaknesses in the study, such as the insufficient statistical data for some industries, which means that the results are only suggestive. Additionally, the results are somewhat skewed by the fact that the panellists based their own evaluation on the aforementioned statistics. Notwithstanding this, there appears to be some differences in the statistical and empirical information.

4.2.6 Defining the Science Park Concept in the Lahti Region

The science park concept is by definition part of the regional innovation system. It is made up of the higher education services of the Lahti Region and of the technology and expertise centres located in the region. The development environment of the regional innovation system and the role of the science park concept in it have been depicted in Figure 16.

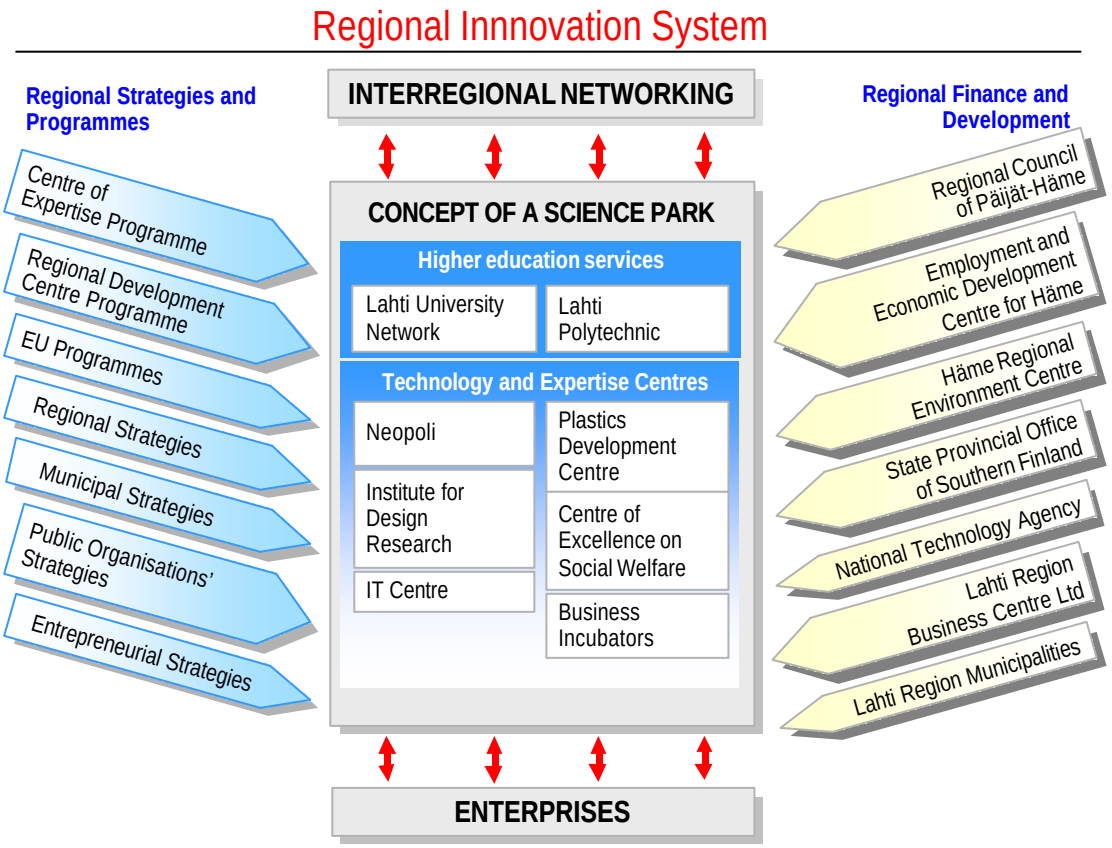

***Figure 16**. The science park concept as a part of the regional innovation system.*

The higher education services constitute the most important part of this science park concept. The higher education services include the Lahti University Network made up of the University of Helsinki, Palmenia Centre for Research and Continuing Education, University of Helsinki, Department of Ecological and Environmental Sciences; Lappeenranta University of Technology, Lahti Unit, and the Helsinki University of Technology Lahti Center, together with the Lahti Polytechnic.

The expertise and technology centres constitute the second part of the science park concept. Currently, they are Neopoli Oy, The Plastics Development Centre, IT-Centre, Institute for Design Research, business incubators, and Centre of Excellence on Social Welfare that is currently being built. As the science park concept develops and its core processes take shape, there may be an increase in the number of expertise and technology centres.

In the science park concept, Neopoli Oy has two roles. On the one hand, it is a technology centre of its own defined substance area, but on the other, it is a coordinator of the whole science park concept. Neopoli Oy is best suited for this role, because the majority of its stock is owned by the City of Lahti. Neopoli Oy is also a member of the International Association of Science Parks (IASP) and the Finnish Science Park Association (TEKEL).

Different strategies and programmes contribute to the development of the science park concept. They include the Centre of Expertise Programme, the regional development centre programme, the EU's Structural Funds Objectives 2 and 3, the regional programme, the EU's research and development (R&D) programmes, and the regional and the regional organisation strategies.

In Figure 16 on the right are the regional general development organisations and the funding organisations of the regional innovation system, whose support for the science park concept is indispensable. They include the Employment and Economic Development Centre of Häme, the state provincial office of Southern Finland, the Regional Council of Päijät-Häme, the Häme Regional Environment Centre, Lahti Region Business Centre Ltd, the National Technology Agency (TEKES), ministries, and the municipalities of the Lahti Region.

Aside from a spontaneous production of information, an important task of the science park concept is to forward and process research work carried out elsewhere. Therefore, its different actors must be integrated in a network with the foremost experts worldwide. The essential idea is to spread information.

The science park concept is a regional conglomeration of scientific and technological actors that are not located in one place but are domiciled all over Lahti. From the point of view of the concept, several domiciles cannot be considered a critical factor. The locations are reasonably near each other, and the concept's level of activity depends less on the location factor and more on the quality of the co-operation between the actors .

Making a trade mark out of the science park concept and developing a brand for the concept is a must. You have to create an interesting brand and a clear structure, understood by all the important actors. Product and brand making are, first and foremost, a means of internal and external communication. Choosing a name for the concept poses a great challenge. In this report, the suggestions for the name of the science park concept are: "Lake Finland Science and Technology Alliance" or "Lake Finland Science Park".

Figure 16, gives a rough idea of the actors of the regional innovation system and the science park concept's role in the system. In order for the science park concept to gain a soul, you have to develop action models and set clear strategic goals for it. This must be carried out through

the joint strategy process of the science park concept actors. In the process, a future vision will be defined for the science park concept, joined with the visions of the different actors, taking into account the present competencies. In the process, the role of each actor in the science park concept will have to be defined, and strategic goals must be set for the concept and the actors.

In the study, a framework for the science park concept has been created as well as for its function model and contents. The real start-up of the science park concept and its further development requires, however, several measures:

- Having the basic principles of the concept approved by the most important actors
- Choosing a name for the concept
- Making a product and a brand out of the concept
- Going through the strategy process of the concept
- Having the vision and the strategy approved by the most important actors
- Developing a networking action mode in order to create a learning region
- Continuous negotiations with the most important financiers about development measures
- Future-oriented research aiming at continuous development of development platforms
- An annual assessment and reorientation of the science park concept.

4.2.7 Defining Core Processes

The development platform analysis helps to understand the business potential existing in the Lahti Region. On the basis of both the statistical and the expert analyses, the great importance for the region of the plastics, furniture, environmental, machine, and metal product, as well as mechanical wood product, industries becomes apparent, with the plastics industry being the ”star industry”. The region should indeed emphasise the outlining and starting future-oriented core processes that rest on the strong industries and areas of expertise as part of a science park concept.

The core processes must fulfil certain conditions:

- Important regional enterprises must be among the exploiters of core processes.
- The core process must be able to create new business activity.
- There must be strong enough actors for each sector of the core process.
- It must be possible to name responsible organisations and people for each sector of the core process .
- The actors of the core process must be able to agree on common goals and procedures.

This paper uses as an example the opportunities given by the ageing of the population for the innovation system of the Lahti Region. In Figure 17, a core process is depicted, through which the opportunities given by the ageing of the population can be exploited in producing welfare products and networking enterprises.

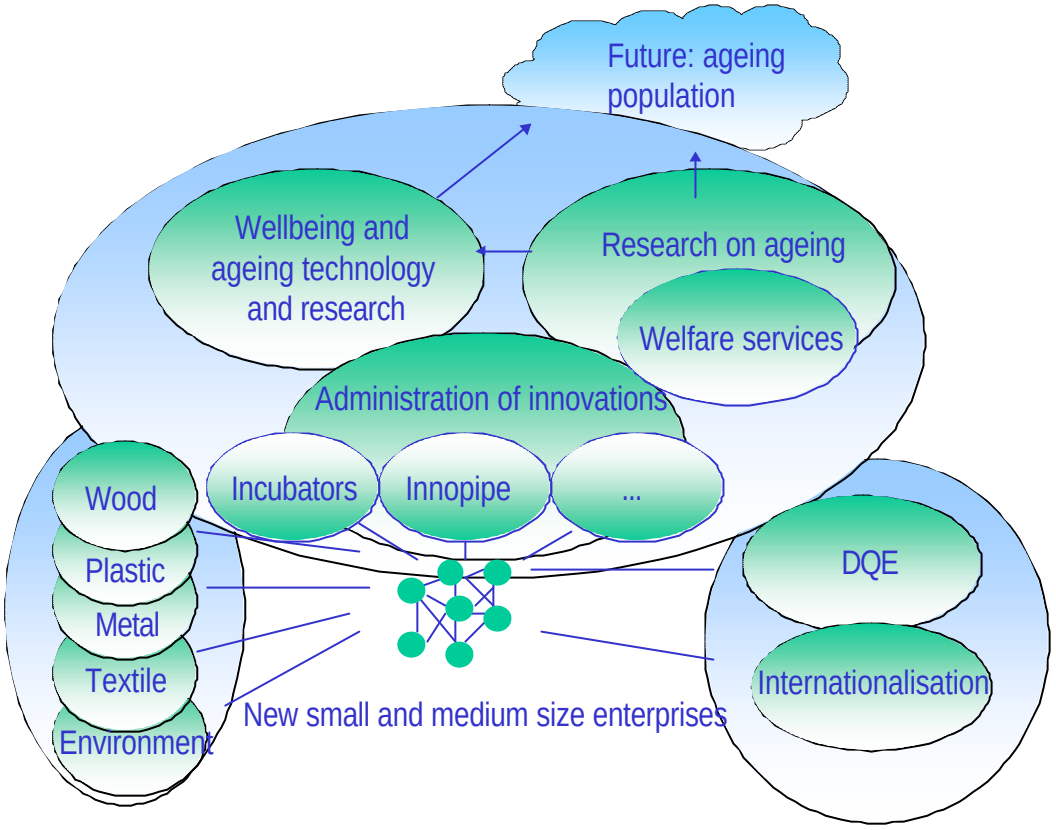

***Figure 17**. An example of the core processes of a science park concept.*

The enterprises working in the strong industries of the region, which in Figure 17 are represented by the wood, plastics, metal, and textile industries, should be interested in the opportunities offered by the core process for developing their businesses. Thus, the question the strong enterprises of strong industries should ask themselves is: ”are there any foreseeable development opportunities in my business through products manufactured for the elderly and can the described core process help my enterprise to exploit such opportunities?’ If the answers to the questions are affirmative, the chances of success of the defined core processes as a part of the regional science park concept are good. The natural task of a core process is to create new business aside from supporting existing business.

The opportunities offered by the ageing of the population have been used in this paper only by way of example. However, other development trends that could be exploited in the future, might, for instance, be:

- Change in materials technology
- Urbanisation
- Environmental orientation
- Changes in energy production
- Intensification of biotechnology
- Change in production systems and methods
- Virtualisation and digitalisation
- Wireless communication.

Each of these megatrends should reflect in the regional entrepreneurial activities and the expertise of the science park actors for creating possible core processes. A closer analysis of the core processes is not included in this analysis.

5 Conclusions

Even though knowing the status of the methodology of the Regional Development Platform Analysis is incomplete, it has proved to be a useful tool for developing a regional innovation system in the Lahti Region. Different phases of the analysis have enabled the significant actors of the innovation system to become familiar with the main problems and opportunities in developing the regional system further.

This paper is written at a time when the regional decision-makers are becoming familiar with the new conceptual model of a science park concept and the definition of the core processes is just beginning. However, the reception has been nearly unanimously very positive. The work has also been evaluated by a group set up by the Ministry of Education as part of the overall evaluation of the education and research system of the Lahti Region. The evaluation group stated "The Helsinki University of Technology Lahti Center has done valuable work producing the first concept of a science park. The evaluation group strongly supports the further specification of the concept." (Katajamäki *et al*. 2002)

The method can be seen as a tool for defining the most important platforms, where the scarce regional resources will most probably give the best results. But even more it is a tool for co-operation in the region. It helps to create, if not a shared vision, at least creative tension (Sotarauta 2001) among the main players of the regional innovation system. Therefore, it might decrease friction and build up trust between the actors.

We see a great deal of potential for developing the methodology further. It also offers interesting opportunities for additional research. It will be studied, in particular, in the near future as a tool for regional network leadership. It will also be studied as a method for helping the interactive learning process towards the possible future of a region. In this context, we are considering using methods of cognitive anthropology to reach the set goals.

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Appendix 1.
Assessment of the industries

Industries →

The criteria for assessing the industries ↓

		1 Plastics	2 Environment	3 Biotechnology	4 Construction	5 Electronics	6 Information technology	7 Mechanical wood products	8 Furniture	9 Machine and metal	0 Textiles and clothing	1 Food products and beverages	2 Media	3 Tourism and culture	4 Logistics	5 Commerce	Average	Standard deviation
1	Amount of entrepreneurial activity and employment capacity		5.90	3.23	6.27	5.00	4.57	7.70	8.87	8.70	6.83	6.27	5.07	5.87	5.67	7.37	6.34	2.18
2	Growth potential	8.27	8.17	7.20	5.23	6.30	7.27	6.50	6.43	7.30	5.00	5.40	6.97	6.97	7.47	6.57	6.74	1.96
3	Balance of the entrepreneurial structure	6.10	5.62	3.63	6.10	5.66	4.93	6.93	7.00	7.90	5.66	5.48	5.40	5.34	6.15	6.86	5.94	2.07
4	Internationality of entrepreneurial activity	8.37	6.00	5.52	2.87	6.00	5.90	6.97	6.07	7.80	7.47	4.34	4.60	6.13	6.30	3.79	5.88	2.41
5	Innovativeness of entrepreneurial activity	8.03	7.03	6.88	4.27	6.10	6.77	5.47	5.00	6.53	5.41	4.76	6.63	5.79	5.31	4.17	5.87	2.20
6	Processing value / know-how intensity of entrepreneurial activity	8.20	7.23	6.86	4.45	6.23	7.13	6.27	6.20	7.33	6.00	5.33	6.57	5.20	5.28	5.15	6.24	2.13
7	Capability of the leadership of top enterprises	8.43	7.07	6.50	5.62	6.38	6.70	7.00	6.97	7.43	6.97	6.52	6.61	5.79	6.31	6.46	6.73	1.76
8	Regional adequacy of educational opportunities	7.13	7.50	4.83	5.07	5.79	6.83	7.03	7.73	7.10	6.60	5.59	7.00	6.37	4.64	6.62	6.40	2.13
9	Regional research input	7.63	7.03	5.29	3.80	5.37	6.37	5.83	5.77	6.27	4.57	4.63	5.11	4.20	4.17	4.27	5.36	2.25
0	Regional technology transfer activities	7.29	6.76	4.33	3.86	5.59	6.72	5.38	5.45	5.76	4.25	3.89	5.28	3.89	4.00	3.74	5.10	2.30
1	0																	
2	0																	
3	0																	
4	0																	
5	0																	
	Average	7.72	6.84	5.41	4.75	5.84	6.32	6.51	6.55	7.22	5.89	5.24	5.92	5.57	5.54	5.51		
	Standard deviation	1.58	2.00	2.72	2.15	2.10	2.15	1.94	2.00	1.63	2.08	2.10	2.01	2.12	1.92	2.33		

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Appendix 2. Assessment of the areas of expertise

Areas of expertise

The criteria for assessing the areas of expertise

		1 Design	2 Quality	3 Environmental technology and ecology	4 Biotechology	5 Information technology	6 Mechatronics	7 Communication and content production	8 Economy and administration	9 Innovation management	0 Wellbeing	1 Assembly	2 Marketing	3 Internationalisation	4 0	5 0	Average	Standard deviation
1	Quantity and quality of entrepreneurial activity (Knowledge Intensive Business Services - KIBS)	6.37	5.63	6.37	3.67	5.27	6.53	5.80	6.48	4.83	5.21	5.90	5.57	4.77			5.57	2.01
2	Regional pioneering quality / innovativeness in the area of expertise	7.87	6.90	7.13	4.63	5.10	6.27	5.77	4.79	4.50	4.83	5.57	4.66	4.50			5.58	2.06
3	Regional and interregional networking the area of expertise	6.80	6.13	7.14	4.52	5.93	6.31	5.59	5.04	4.71	4.93	5.69	4.59	4.79			5.56	2.04
4	Regional adequacy of educational opportunities	8.47	7.20	7.40	4.23	6.67	6.93	6.17	6.97	4.27	6.62	5.23	5.97	4.60			6.21	2.21
5	Regional technology transfer activities	7.66	6.86	7.34	4.22	6.52	6.17	5.54	5.04	4.90	4.62	5.10	4.36	4.07			5.59	2.21
6	0																	
7	0																	
8	0																	
9	0																	
0	0																	
1	0																	
2	0																	
3	0																	
4	0																	
5	0																	
	Average	7.43	6.54	7.07	4.25	5.89	6.45	5.78	5.67	4.64	5.26	5.50	5.04	4.55				
	Standard deviation	1.87	1.81	1.85	2.50	1.96	1.53	1.73	1.92	1.89	1.93	1.84	1.95	1.88				

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Appendix 3. Significance of the areas of expertise for the industries

Industries →

Areas of expertise ↓

		1 Plastics	2 Environment	3 Biotechnology	4 Construction	5 Electronics	6 Information technology	7 Mechanical wood products	8 Furniture	9 Machine and metal	0 Textiles and clothing	1 Food products and beverages	2 Media	3 Tourism and culture	4 Logistics	5 Commerce
1	Design	7.73	4.61	3.64	5.71	5.60	4.55	5.69	8.47	7.00	8.34	4.93	5.93	5.03	3.39	5.18
2	Quality	8.13	6.72	6.21	6.31	7.47	7.03	7.48	7.70	7.90	7.34	7.55	6.38	6.11	6.18	6.55
3	Environmental technology and ecology	7.40	8.83	7.70	6.14	5.66	5.21	6.37	6.53	6.52	6.24	7.28	4.37	6.37	5.83	6.13
4	Biotechology	5.45	7.67	8.63	3.50	3.54	4.07	4.41	3.89	3.44	4.15	7.21	2.96	3.33	2.77	4.22
5	Information technology	6.67	6.40	6.62	5.28	8.53	9.00	6.55	6.20	7.03	5.97	6.03	7.57	5.17	6.73	6.43
6	Mechatronics	7.23	5.45	4.68	4.86	7.40	6.43	6.97	6.80	8.23	5.52	4.93	3.77	2.36	4.79	3.67
7	Communication and content production	4.67	5.13	4.38	4.32	5.10	6.60	4.17	5.53	4.63	5.97	5.10	8.50	7.07	5.00	6.33
8	Economy and administration	6.55	5.83	5.50	6.71	6.62	6.90	6.59	7.14	7.03	6.82	6.79	6.39	6.10	6.69	7.62
9	Innovation management	7.73	7.60	7.29	5.07	7.48	7.57	6.43	6.47	6.80	6.07	5.52	6.21	5.59	5.14	5.00
0	Wellbeing	4.37	6.21	5.34	5.34	4.76	5.24	4.48	5.97	5.04	6.07	6.32	4.52	6.30	4.19	5.50
1	Assembly	7.55	5.00	4.11	6.39	7.71	5.71	6.55	7.97	7.83	5.50	4.28	3.19	2.75	5.12	4.32
2	Marketing	7.10	6.60	5.55	5.86	6.27	6.33	6.77	7.87	6.77	7.62	7.07	6.90	7.20	5.87	7.60
3	Internationalisation	7.63	7.07	6.17	4.41	6.23	6.70	6.77	7.23	6.73	7.52	5.48	5.60	6.83	6.30	5.34
4	0															
5	0															

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Appendix 4.
Mutual significance of the industries

Industries →

Industries ↓

		1 Plastics	2 Environment	3 Biotechnology	4 Construction	5 Electronics	6 Information technology	7 Mechanical wood products	8 Furniture	9 Machine and metal	0 Textiles and clothing	1 Food products and beverages	2 Media	3 Tourism and culture	4 Logistics	5 Commerce
1	Plastics		5.83	4.69	5.73	6.93	5.34	3.62	6.17	5.70	4.03	6.13	3.03	2.24	3.69	4.83
2	Environment	6.30		7.43	6.30	5.23	4.55	5.90	5.67	5.73	5.20	6.73	3.25	5.55	4.97	5.24
3	Biotechnology	5.07	7.27		2.89	3.93	3.96	3.86	2.71	3.36	3.32	6.93	2.64	2.46	2.39	3.31
4	Construction	5.72	5.80	3.21		4.10	4.00	7.30	6.00	5.70	2.93	2.93	2.97	3.90	4.52	5.33
5	Electronics	6.70	5.47	4.97	4.90		7.67	4.97	4.66	7.20	4.03	4.10	5.00	3.24	4.57	4.93
6	Information technology	6.40	6.17	5.83	5.33	8.23		5.87	5.77	7.20	5.40	5.37	7.57	5.13	6.40	6.50
7	Mechanical wood products	3.17	4.76	3.43	7.30	4.04	4.29		7.57	5.14	2.29	2.21	2.86	3.07	4.68	3.43
8	Furniture	5.25	4.36	2.70	6.00	4.00	4.43	7.43		4.82	4.21	2.00	3.61	3.46	5.43	5.29
9	Machine and metal	5.33	5.27	3.10	6.50	6.37	5.68	6.23	5.90		3.48	3.90	3.41	2.41	5.45	4.45
0	Textiles and clothing	3.57	4.00	3.21	3.04	3.22	4.11	1.96	5.33	3.11		2.04	3.83	3.76	4.61	5.83
1	Food products and beverages	4.72	5.00	6.41	2.70	3.00	4.25	1.93	2.57	3.74	2.11		4.00	4.54	5.55	6.66
2	Media	3.50	4.17	3.25	3.59	4.79	6.55	3.27	4.30	3.43	4.37	4.10		6.80	3.82	6.07
3	Tourism and culture	2.04	4.70	2.34	4.37	2.54	4.11	2.61	3.59	2.15	3.79	4.66	5.71		4.61	6.24
4	Logistics	5.63	4.93	3.25	6.66	5.03	5.34	6.07	6.63	6.48	5.87	7.07	3.69	5.38		7.53
5	Commerce	4.93	4.55	3.10	4.63	4.00	5.00	4.52	5.97	4.93	6.30	6.77	5.34	6.24	6.34	