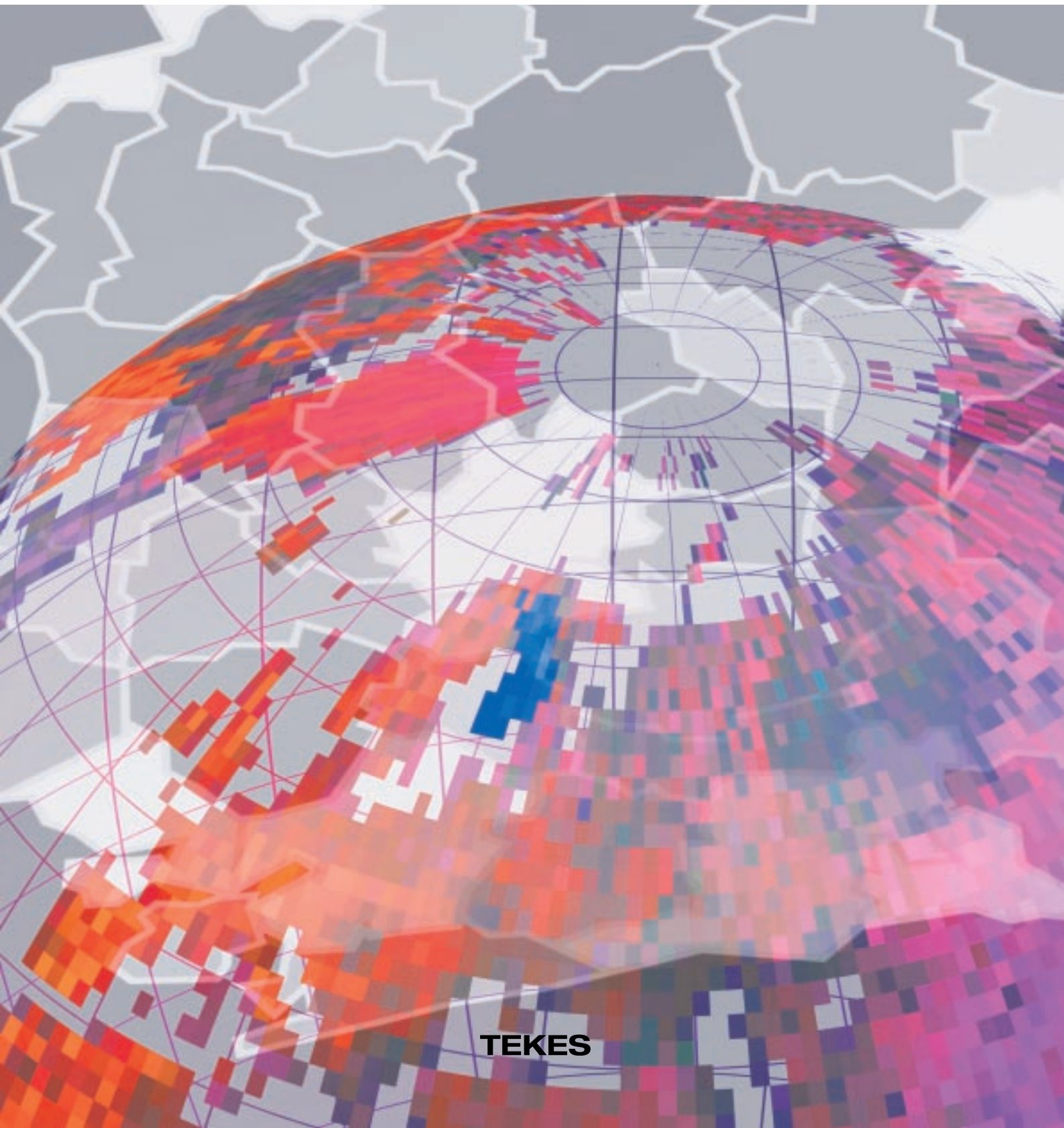
Innovations generate regional vitality

Knowledge, specialisation and networking determine success in international competition



TEKES

Contents

The graphics used in this publication are available on Tekes' website *www.tekes.fi/eng/publications/B_tekes/Reg-vitality.ppt*

Innovations generate regional vitality

Knowledge attracts knowledge – companies seek environments of excellence

The vitality of a region depends on the success of its companies in international markets.

A small country can only support a limited number of internationally competitive centres of excellence. Individual companies can also prosper outside the centres if they can access the knowledge and skills they need through networking.

Knowledge, specialisation, and networking are vital for regional development

Regions need an innovation-driven strategy that draws on knowledge, specialisation and networking, and is based on the shared vision and commitment of the parties involved.

Knowledge creates the basis for regional development. The region must specialise in fields of knowledge that have growth potential.

Growth can be based on renewing the traditional industrial structure of the region, on applying the region's accumulated knowledge to new areas, or on totally new knowledge. It is not necessary, or indeed possible, for all regions to possess all the competences required. The competence lacking should be acquired through networking.

The growth of the region can also be built on business activities that are based on factors other than technological innovations.

More strong and specialised growth centres

Finland has a metropolitan area surrounding its capital, Helsinki that represents the best in international knowledge and skills, as well as four other strong, knowledge-based growth centres.

The knowledge and skills of both the Greater Helsinki area and the strong growth centres in the regions must be further strengthened. A further option is to increase the number of strong growth centres.

In addition to its strong growth centres, Finland also has a number of growth centres based on specialised knowledge and skills. These also need to be strengthened and their numbers increased.

In order to diversify their knowledge and skills, it is essential for all the growth centres to network – irrespective of regional borders.

Strengthening growth centres benefits everybody

Growth centres are crucial for creating economic growth and welfare throughout the country. By utilising their strong knowledge base and innovation activities, the growth centres also serve companies both inside and outside their own and other growth centres. Growth centres generate job opportunities and growth while also increasing the opportunities for success in the surrounding regions. They create wealth that can also be transferred to less developed regions through wealth redistribution systems.

Universities and VTT form a national network of knowledge serving different regions, polytechnics and technology centres are important mediators of knowledge and skills

Universities and the Technical Research Centre of Finland (VTT) should be developed as national producers and distributors of high-level knowledge and skills. These bodies serve companies and the public sector, both regionally and nationwide.

Knowledge must be produced and distributed in close collaboration with companies, universities, research institutes, polytechnics, and organisations specialising in technology transfer. Stronger cooperation and networking is also needed between universities, polytechnics and other regional operators for regions to develop.

Finland has a network of universities and polytechnics that in geographical terms covers the entire country, and it is not sensible to decentralise this network further by establishing new educational institutions. Establishing satellite units calls for a sufficient knowledge base both at the host universities and at the satellite units.

The objective for polytechnics is – in addition to building up competence in the workforce – to transfer the knowledge of universities so that companies in the vicinity can use it, in close cooperation with both. Polytechnics must acquire national and international expertise by networking with universities and research institutes.

Technology centres and other technology transfer organisations function effectively as mediators of technology and knowledge, and as promoters of new business activities within the regions. Their basic financing must be secured. They provide start-ups and small technology companies with the services they need and create an environment that promotes business activities, innovation and networking.

Funding and services should prepare for international competition

Various forms of financing play their own roles in regional development.

The objective of regional financing is to strengthen the innovation framework. The prime objective for financing research and development, which – like Tekes' financing –

is open to national competition, is to increase expertise and strengthen networking irrespective of regional borders. Financing should prepare companies for international competition, thereby creating the basis for economic growth in the region.

Companies face the same international competition regardless of the region they are located in. Project financing should be open to national competition since this is the only way to ensure national and international networking on an adequate scale. Subjecting financing to national competition places all companies in an equal position – irrespective of region. This avoids market distortions, makes projects adequately challenging and ensures that financing decisions are based on sound principles that maximise the socio-economic impact of a project.

Activation of research and development activities should be strengthened in all regions. Investments in regions that are developing more weakly can be gradually increased as expertise grows and local companies develop. This requires systematic long-term work aimed at activating companies and promoting networking through flexible financing criteria. Tekes' technology programmes strengthen the interaction between companies and the research field regionally, nationally and internationally. Activation boosts demand for financing, and this demand should be met.

Industrial and technology policy should ensure that companies receive versatile, high-calibre innovation services regardless of their geographical location. This is where TE-centres play an active role. The availability and visibility of Tekes' financing and expert services should be strengthened, both in the regions and in TE-Centres.

Public financing that is focused on industries, such as financing from the EU's structural funds, should be more clearly targeted at innovation activities. Financing from the EU's structural funds should provide a means of encouraging cohesion between regions. The activities of regional capital funding should be integrated into a larger framework.

The Science and Technology Policy Council of Finland recommends strengthening the framework and funding for innovation activities

Technology policy can be used to exert a pronounced influence on regional development. This requires sufficient resources. The Science and Technology Policy Council of Finland recommends strengthening the framework for innovation activity and increasing the financing of research and innovation. According to the Council, public financing should increase faster than the estimated growth in GDP.

examples of regional effects of Tekes' funding and expert services

Over the last two decades Tekes has financed the R&D projects of some 17,000 companies and some 12,500 research projects in the public sector. For this publication we have selected a group of typical development paths, and research and development projects, to serve as examples of the widespread regional impact of Tekes' funding and expert services.

Knowledge attracts knowledge – companies seek environments of excellence

The vitality of a region is dependent on the success of its companies in international markets. Innovations are an important source of production, productivity, economic growth and wellbeing. Innovation creates a framework that encourages existing companies to develop and new companies to start up.

At the international level, decisions on where to locate companies are determined by the price of production factors, the proximity of the market and the availability of knowledge. Finland's competitive edge is knowledge.

In Finland, the location of companies is mainly determined by the availability of skilled personnel, the quality of transport connections and the proximity of customers, as small and medium-sized companies (SMEs) are subcontractors or strategic partners for larger companies.

A low-population country like Finland can only succeed internationally if it can offer companies knowledge, skills and a good innovation and business environment. A small country can only support a limited number of internationally competitive centres of excellence.

The role of universities, polytechnics and secondary education institutions as providers of a skilled workforce is crucial.

Individual companies can also flourish outside the centres of excellence if they have the tools for acquiring the knowledge and skills they need through networking.

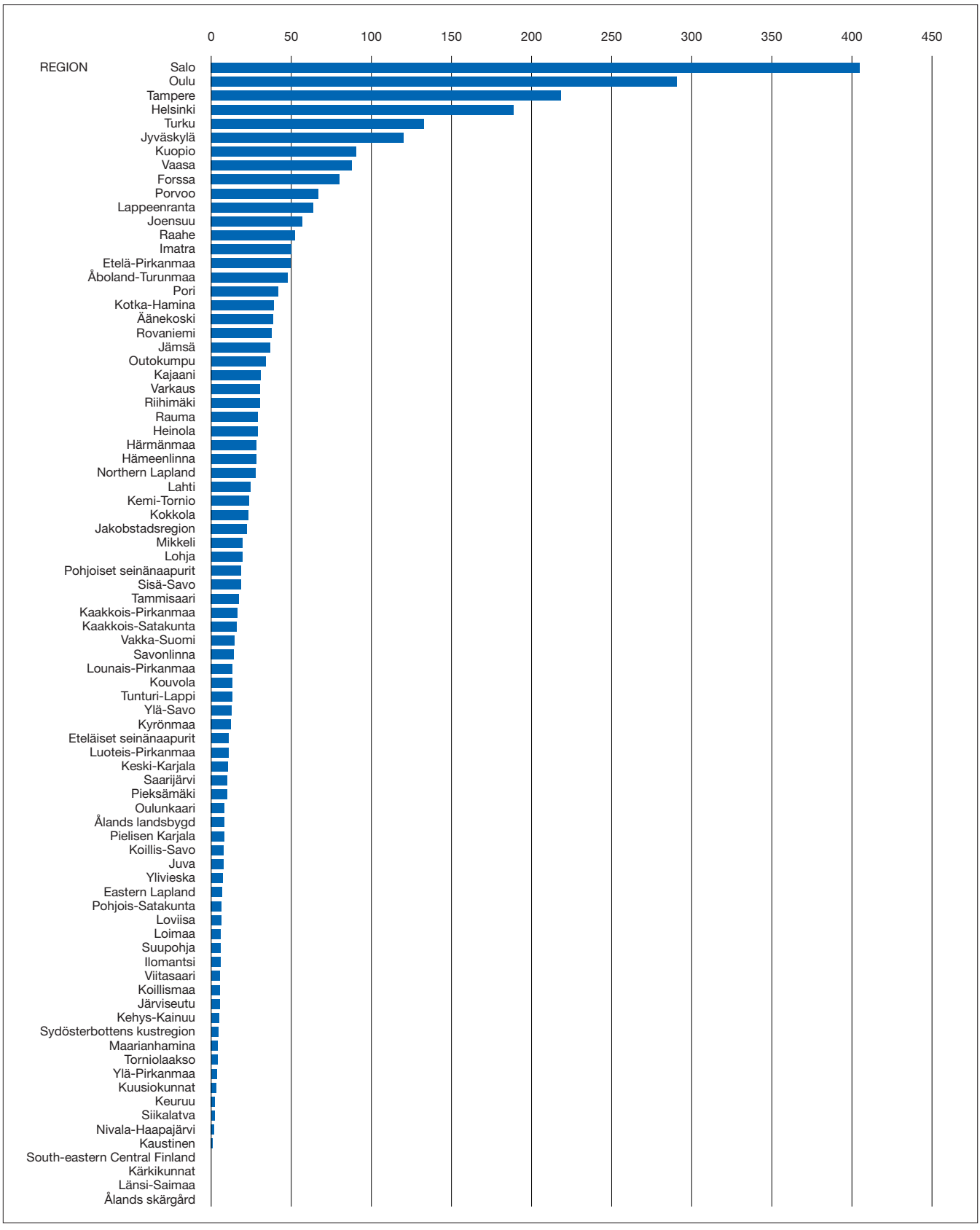
Finland is one of Europe's medium-sized regions

A region is a variable concept in the European context. The targets of the regional policy of large EU member countries – such as Germany, France, Great Britain and Spain – are regions that, in terms of population and GDP, are the size of Finland. Compared to these regions, Finland as a whole is at the most a medium-sized region.

To achieve meaningful significance as a region in innovation policy, Finland must have a number of different kinds of resources. Resources for innovative activities include universities, polytechnics, corporate research units, centres of expertise and technology centres.

Industry's networks extend across regional borders. The crucial factors for networking are business logic and logistics, not administrative borders.
An industrial centre is not confined to a region but it is always at least national, and often international.

MATIAS UUSIKYLÄ



R&D activites by region

Research and development activities are centralised both in Finland and elsewhere. The figures show research and development expenditure by region in relation to the size of the population in Finland in 2002, where the level for the entire country is 100. In 6 regions in Finland expenditure on research and development is above the national level, in 8 regions the level is 50–100 per cent of the national level, and in the remaining 70 regions the level is below half the national average.

Knowledge, specialisation and networking are vital for regional development

Regions need an innovation-driven strategy that draws on knowledge, specialisation and networking, and is based on the shared vision and commitment of the parties involved. The strategy should focus on the skills and strengths of the region. An atmosphere that encourages innovation and an effective framework are also needed. This means that all parties operating in the region are committed to the mutually selected strategy.

To provide an effective and competitive framework for innovation activities it is not necessary – and except for its strongest growth centres, not even possible – for the region to include all the structures of an innovative environment. The production structure of the regions has an influence on what kind of structure is the most effective for the innovative environment in each case. The innovative environment is formed by the regional players, activities and structures, as well as by national and international players, activities and structures operating in the region.

The region should both specialise and network with regions and companies that complement each other irrespective of geographical or administrative borders. An overly restrictive regional focus inhibits development as it does not exploit the advantages of networking, and the dispersion of knowledge and skills to too many locations raises a barrier to international expansion.

The region's growth can also be based on business activities other than corporate activity deriving from technological innovations. In these fields, too, it is important that companies maximise the opportunities that technology offers.

Innovations originate from knowledge

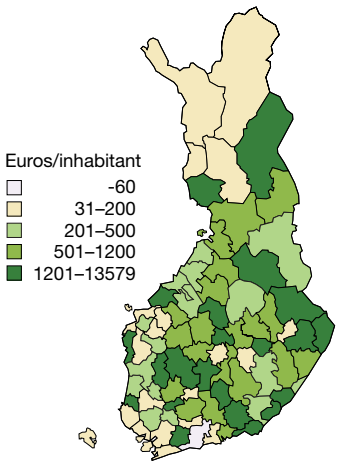
Knowledge is a sound footing for the development of the region. The region must specialise in skills that offer growth potential. Growth can be based on renewal of the traditional industrial structure, on applying the region's accumulated knowledge and skills to new fields, or on completely new knowledge and skills.

New knowledge is created in innovative environments where there are diversified skills and collaboration between a wide range of experts, developers and users. The innovative environment can also be a virtual concentration, since the results of research and development will in any case be utilised everywhere.

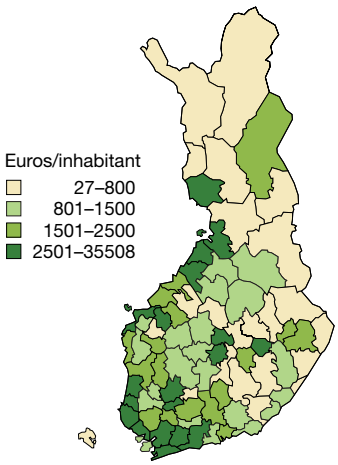
The mechanisms for utilising results are the key to regional development. These mechanisms are technology transfer, networking and cooperation that is based on sub-

Value added by forest industry, metal industry, radios, televisions and IT equipment, chemical industry and food industry per person by region in 2001.

Source: Statistics Finland



The forest industry (sawn timber, wooden products, pulp, paper and paper products) traditionally holds a strong position in the regions of South Karelia, Kymenlaakso, Lapland and Central Finland. The forest industry is important to these regions and the income it generates also benefits less developed regions. Maintaining the competitiveness of Finland's technology-based forest industry at its current high level is crucial.



The metal industry (metals and metal products, machinery and equipment, the electrotechnical industry – including electronics – and vehicle manufacturing) is the largest industrial sector in Finland. This is reflected in the value added per inhabitant in all regions with a strong growth centre as well as in many other regions. Large, international companies generate over half the industry's added value and employment. Most companies are small.

What is innovation?

A technological innovation is a new or improved product, production method or service with substantially different or unique technological properties. Technological innovations that have been deployed are new products launched (product innovations), new production methods adopted (process innovations) or new services made available.

contracting, strategic partnership and risk-sharing. Regions containing companies that succeed in these fields achieve a significant competitive advantage.

Continuous renewal revitalises traditional industry

The vitality of traditional industrial regions requires continuous renewal. Generally, their success is based on the knowledge and skills of medium-sized or large industrial enterprises. Continuous renewal, specialisation, enhancement of added value and improved productivity are essential to retaining production in the region.

The demerging of a company's business unit to a spin-off company or the winding down of an old business unit can create new opportunities for growth that are based on the knowledge and skills the region has accumulated over time. Business based on new knowledge requires networking and the transfer of both knowledge and technology.

Regional specialisation a strength

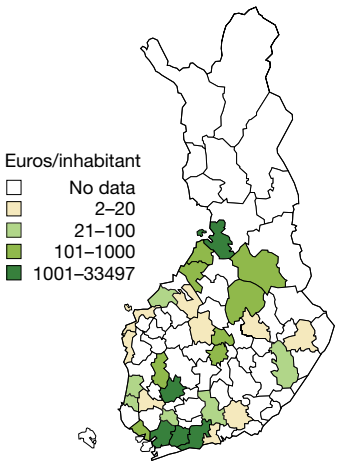
The business structures of different regions differ widely and are specific to the individual region. It is the competitiveness of these structures that is decisive to the success of the region, not whether they are based on high-technology or conventional technology, or whether they are an industrial or service component. This is why regions' innovation environments also have different and individual development needs. The needs for regional development using technology are derived from both the existing business structures and knowledge and from new future strengths.

The regional innovation environment does not have to, and in fact cannot, include all the elements that the national innovation environment contains. Development must address the entire regional, national and international system. Choices must be made – all regions do not have the same strengths and priorities, and the regions may not be ideal from the standpoint of the focus selected – but the choice made should be the best feasible option.

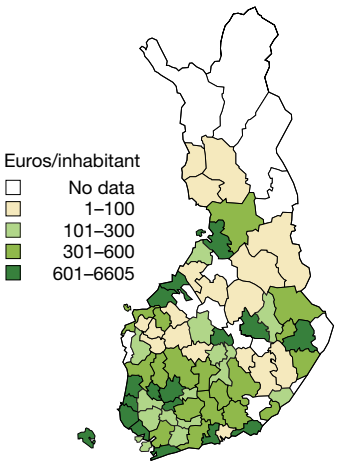
The specialisation of regions is often built on strong industry and its continuous ability to renew within its own business area or its flexible ability to enter new business areas. A systematic focus on constructing the regional innovation system and on encouraging research and business networking helps regions specialise and strengthen their competitiveness. Improved collaboration between universities, regional university units, research institutes and polytechnics creates strong local players that can offer companies innovation services.

Innovation activity draws on technical sciences, life sciences, economic sciences and also social sciences and art.

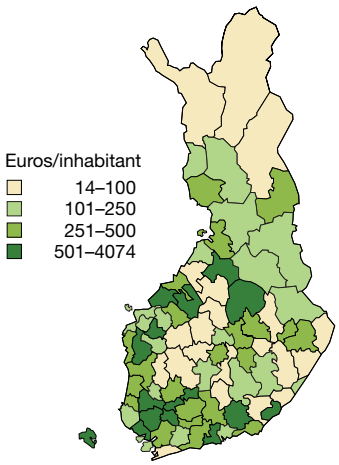
Regional technology strategies, regional programmes and foresight are based on an analysis of the present status of the



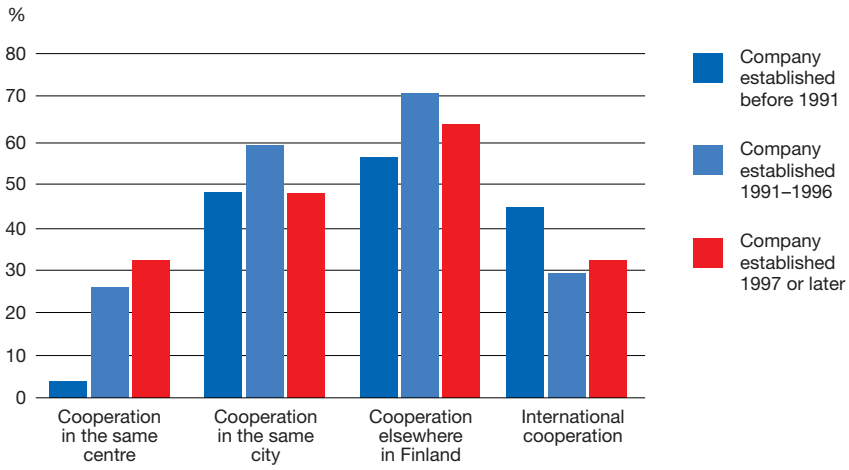
The geographical location of companies in the ITC cluster has had the most pronounced impact on the basic structures of Finnish industry over the last decade. The figure shows the value added by radios, televisions and telecommunication equipment per person in the region. Of the regions that have grown considerably, Uusimaa, Northern Ostrobothnia, Varsinais-Suomi and Pirkanmaa have grown most, largely because of the growth generated by IT and communications companies.



The chemical industry is concentrated in the regions of Eastern Uusimaa, Central Ostrobothnia and Satakunta. Business based on biotechnology has good potential as an engine of growth, particularly in the regions of Uusimaa, Varsinais-Suomi, Northern Ostrobothnia, Pirkanmaa and Northern Savo. Most biotech companies are located in these regions.



The food industry is strong in the regions of Varsinais-Suomi, Southern Ostrobothnia, Åland and Kanta-Häme.



Networking between biotechnology companies

Biotech companies have networked a large part of their research activities, regardless of whether the company is well established or a start-up. Older companies seek partners in the same biotech centre less often nowadays, and more often look for a foreign partner than younger companies. New companies and start-ups look for partners partly in their close proximity but mainly from further afield.

Source: Hermans, Raine and Luukkonen, Terttu (2002) Findings of the ETLA survey on Finnish Biotechnology Firms. ETLA Discussion Papers 819.

industry in the region, which is often supplemented with an analysis of the strengths of the innovative activity. Such strategies aim to find new core and spearhead technologies as the regional focus.

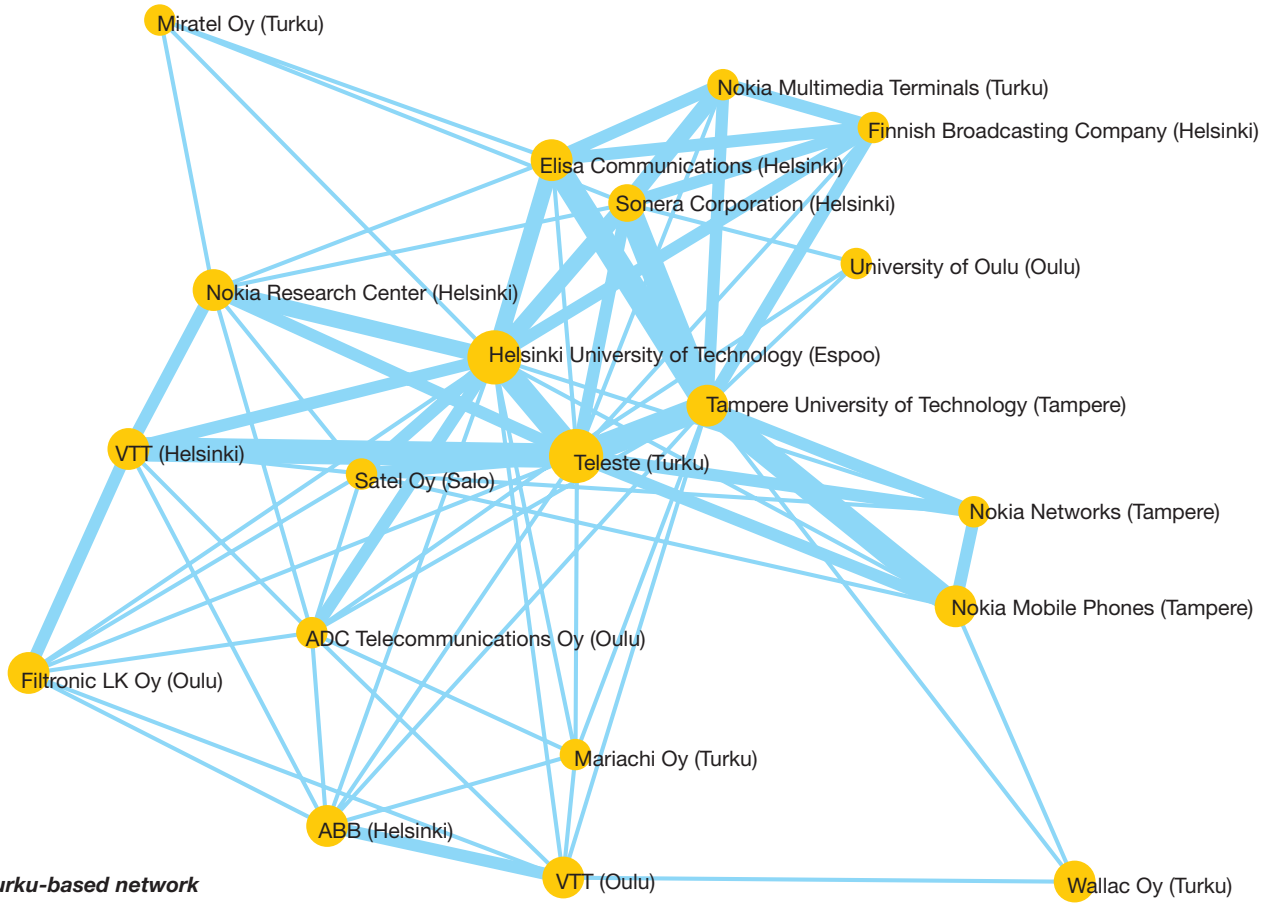
Networking essential for everyone

All regions cannot – and do not need to – possess knowledge and skills in all fields. The competence they lack should be acquired by networking.

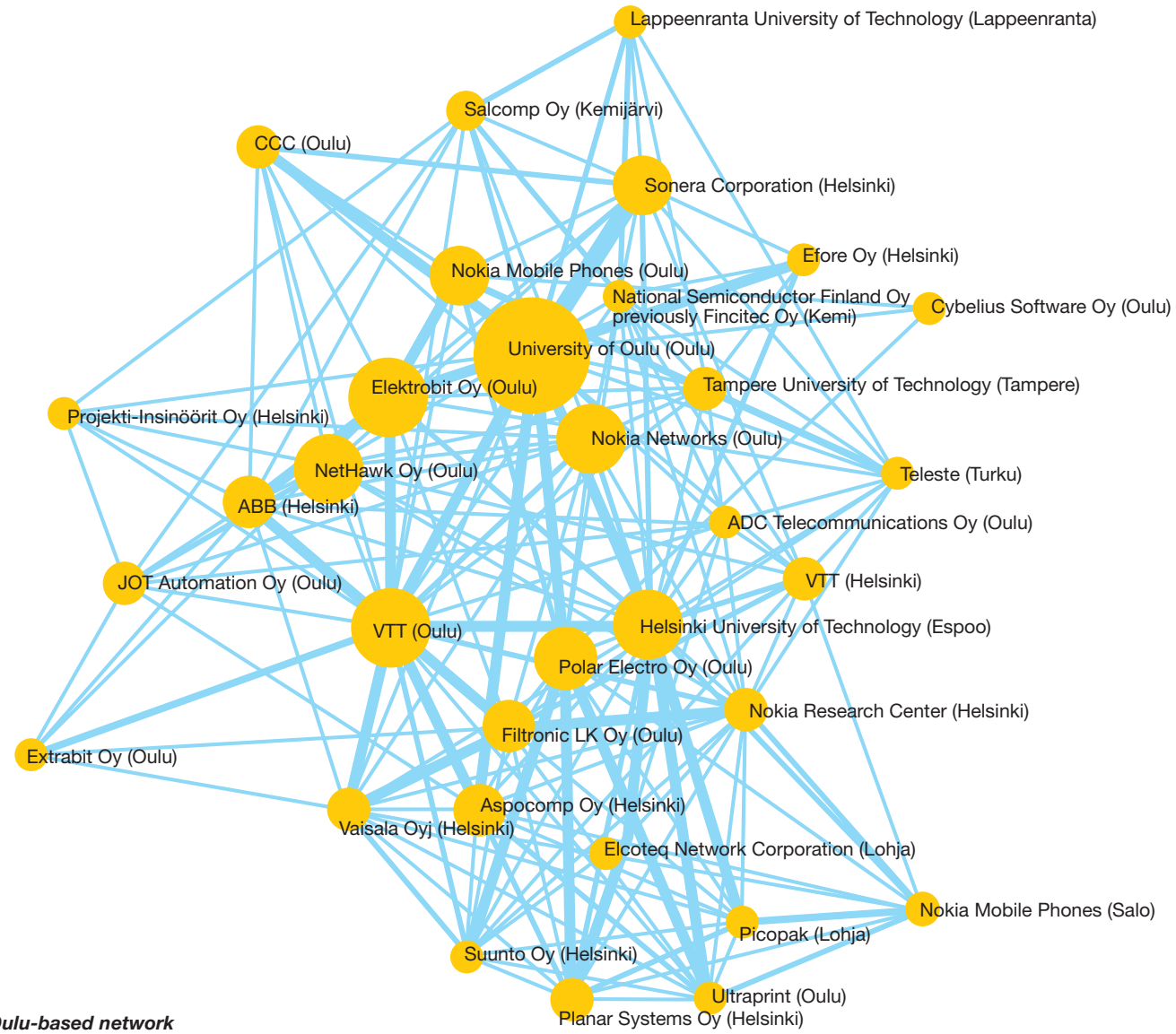
Networking is essential for everyone because it strengthens the regions and offers both the regions and organisations a means of acquiring expertise and quickly increasing their resources. Networking does not necessitate new institutions and is therefore easy and economical to initiate.

The smaller and less developed a region is, the more it gains from and needs networking. Knowledge and skills can be widely utilised through networking, to the benefit of all parties. Networking enables new, technology-based business and growth also in regions that have some, but not all, of the resources needed for growth. Business operations should also be networked.

Polytechnics and technology centres are important mediators of knowledge and skills. Polytechnics train skilled workers and transfer the knowledge of universities to their immediate vicinity. Technology centres offer technology start-ups and small technology companies an environment that encourages business and innovation activity, supports networking and provides the services needed by these.



Turku-based network



Oulu-based network

Electronics and IT technology programmes effective promoters of networking

Tekes' technology programmes strengthen networking between organisations in regions, as analyses of the ETX (Electronics for the Information Society) and TLX (Telecommunications – Creating a Global Village in 1997–2000) technology programmes have shown. Oulu's electronics and IT network was regionally the most self-sufficient. The networks acting as driving forces for the other regions were organised more or less at a national level. The Oulu-based network also included participants from the main locations of tertiary education in Finland. According to the study, the Turku region was also the most national because Turku does not contain all the training and research facilities for electronics and information technology. Nevertheless, analysts found that the Turku-based networks for technology programmes operated effectively.

The figures illustrate the regional cooperation for programmes based in Turku or Oulu. The proximity of the circles in the diagrams indicates how close cooperation within the network was and the thickness of the lines how much cooperation was involved. The size of the circles reflects the combined size of the projects. Included in the Oulu-based network are parties that participated in at least three projects and in the Turku-based network parties that participated in at least two projects.

Altogether some 230 companies and 80 research units participated in the ETX programme, and some 190 companies and 30 research units in the TLX programme.

MATIAS UUSIKYLÄ

Biotechnology bears fruit

The aim of Turku's biostrategy is to generate commercial manufacturing of useful products. Novatreat and Focus Inhalation were the first two biotech companies to locate their production facilities in the Turku BioValley. Novatreat is a business that started out as research and has since become established as a commercial manufacturer of products based on solid competence in immune milk technology and collaboration with leading experts in microbiology and infectious diseases. The first clinical trials have been very promising for the treatment and prevention of hospital infections. Another Novatreat product, which is used in cell culture to stimulate the growth of mammalian cells, is already available on the US market.

Focus Inhalation is a spin-off company manufacturing metered dosing inhalers. The company's first asthma treatment product already has a sales licence in ten EU countries.

Success etched in stone

The KIVI technology and development programme for the stone industry has united the extensive development needs of a very specialised industrial sector. The programme, launched by Tekes in cooperation with the Finnish Natural Stone Association, has financed not only the sector's technological development but also training and companies' international expansion. The regional concentrations of the natural stone industry – in North Karelia, Kainuu, Pirkanmaa, South Karelia, and Central Finland – have all benefited from the programme because it has enabled local companies in the stone industry to cooperate in a range of development projects. The participation of competing companies in such projects has stimulated the entire sector and encouraged it to network more efficiently and renew its internal structures. The number of links with research institutes has multiplied. The first research professorship for the sector has been established in the Geological Survey of Finland, and Stone Pole Oy, a development company, has been founded to pursue the advances set in motion by the KIVI programme. Stone Pole Oy is responsible for development of The Finnish Stone Center, a globally unique establishment based in Nunnanlahti, Finland.

Between 1998 and 2001, the stone industry's net sales increased by one-quarter, and the value of its exports grew by one-fifth. In 2001, net sales amounted to over EUR 215 million and the value of exports to EUR 76 million. The industry directly employs some 1,800 people.

From subcontractor to contracting partner

Traditional industry is increasingly outsourcing its production operations. This has fuelled the need for subcontractors to offer products and services that are more advanced and demanding. From the main contractor's viewpoint, production is now largely a matter of network management, since subcontractors now focus on superior expertise in a certain product, sector or production method.

Meconet Oy is a company traditionally known for manufacturing springs and sheet metal components. Increasing competition has forced the company to expand its competence to cover the manufacture of precision components, related mechanical design, and assembly. During this process the company has evolved from a subcontractor into a partner that customers can trust with a wide range of responsibilities – from the manufacture of components through to related logistics services.

Kajaani concentrates on measurement technology

The history of measurement technology in the Kajaani region stretches back to the early 1970s, when the Finnish electronics industry was still in its infancy. Kajaani Elektroniikka Oy created the foundation for the versatile group of companies that now operates in the region. The expertise of many companies operating in the Oulu region, such as Buscom and the CCC Group, derives from the Kajaani region's expertise. Oulu University's Kajaani Measurement and Sensor Laboratory (MILA) employs 38 people. The main focus of the laboratory's research is on optical measurement technology. Since

PEKKA TOLVANEN

VTT

1996, MILA has offered re-orientation courses culminating in an MSc (Technology) degree. MILA's courses and Kajaani Polytechnic's BSc (Technology) programme serve the needs of the region's electronics industry.

MILA cooperates with Kajaani Polytechnic, Elektrobit Oyj, Exéns Development Oy, Incap Oyj, Kajaanin Prosessimittaukset Oy, Kajaanin Puhelinosuuskunta, Metso Automation Field Systems, Ponsse Oyj Tietojärjestelmät and Sunit Oy.

The IT, electronics, and metal companies of the Kajaani region serve the forestry, logistics, telecommunications, defence and healthcare clusters. The expertise-based sectors directly employ over 2000 people.

Kuopio's focus on the healthcare software industry generates growth

The strengths of the Kuopio region include advanced healthcare research, expertise in modelling healthcare services, and the workforce's IT skills. The HYVIS-IT feasibility study, funded in 2000 by Tekes with European regional development funds, and R&D projects derived from it have helped to establish a nationally important concentration of expertise in the Kuopio region, which serves the research and training needs of healthcare software production. The PlugIT project, funded by Tekes, promotes interoperability of healthcare systems in line with the aims of Finland's national project to secure the future of health care. The project generates definitions of application program interfaces as well as related methodologies, and creates expertise for healthcare software companies and their customers. The project is implemented within the framework of Centek, the joint IT education and research centre set up by Savonia Polytechnic and the University of Kuopio. The project is of great importance to the healthcare software sector and is funded by fifteen of Finland's leading companies in that sector. Tekes' long-term financing has helped make Kuopio's Centek the most important research centre for healthcare software in Finland.

Vaasa's world-class competence attracts global corporations

In the Vaasa region, production related to energy technology employs nearly 10,000 people. The value of the cluster's industrial production exceeds one billion euros, of which exports generate 65%. The Ostrobothnian growth centre specialised in energy already accounts for one-fifth of the production of Finland's energy industry. Tekes' funding and insight have been crucial for the sector's development.

ABB and Wärtsilä are leading exporters in Finland's energy industry. The outsourcing of operations by these spearhead companies has expanded the network of subcontractors and made it an internationally competitive system. The markets of specialised subcontractor companies today are global, and business with main contractors is based on trust and flexibility.

MATIAS UUSIKYLÄ

In order to further develop the rapidly increasing trend of dispersing and decentralising the energy production business, companies and research institutes must cooperate internationally. The Merinova Centre of Expertise specialises in energy technology and supports companies in technology transfer and development activities.

LEILA KOISTINEN

North Karelia now Finland's largest centre for the manufacture of plastic products

Over the course of approximately two decades focused research, a clear regional strategy and Tekes' intensive support has created a centre of expertise in the Joensuu region that serves the international electronics, plastics and metal industries. The highly specialised centre of expertise focuses on modern optics, materials research and 3-D technology. The centre is founded on an effective and competitive network of innovation, and on a training spectrum that covers everything from vocational schooling to polytechnics to the University of Joensuu's high-level research. This network of training, research, and state-of-the-art companies is based in the Joensuu Science Park, which is home to the IMTEC Injection Moulding and Tooling Engineering Centre of Eastern Finland. The centre of expertise has attracted related industry to the region, making North Karelia Finland's largest manufacturer of plastic products in 2000, in terms of added value.

Tekes has supported the development of the region's expertise in many ways and has shared the challenges and risks of various development projects conducted by a number of companies. In 1989, Tekes initiated the launch of KPM 2005, an extensive North-Karelian development programme for the plastics industry. Since the 1990s, Tekes has invested funds of approximately EUR 7 million in developing IMTEC's expertise and Joensuu University's research into optics and materials.

Chemical industry's impact on the Kokkola region

An important concentration of Finland's industrial chemistry sector – and Scandinavia's largest concentration of expertise in inorganic chemistry – is located in the Kokkola-Pietarsaari region. The companies in this cluster employ some 4,300 people, representing 40% of the region's entire industrial workforce.

Kemira Fine Chemicals Oy, for example, one of the Kemira companies operating in the region, has undergone fundamental changes. Kemira

located in Kokkola in the mid-1980s to serve the Russian market. The collapse of this market forced Kemira to rethink its strategy and redevelop its range of products and services.

Today OMG Kokkola Chemicals Oy is the world's leading manufacturer of metal-based special chemicals and metals. OMG's current production and processing technology is based on research, which is concentrated in Kokkola.

Companies such as OMG serve as excellent examples of the region's renewal and the effect of industrial renewal on regional development. The appreciable impact that large enterprises have in the entire surrounding community should also be addressed.

Functional foods open doors to global markets

The success of Kaarina-based Bioferme Ltd springs from Yosa, a family of milk-and-lactose-free food products made of bran, fruits and berries. The company started developing a new, health-promoting product in 1994 in cooperation with the universities of Helsinki, Kuopio, and Turku. The wide-ranging cooperation of the Tekes network enabled all available research results and specialised knowledge to be incorporated into the project, and was thus crucial to the project's success. Bioferme employs 14 people in Finland and currently exports its products to Sweden. The company aims to further develop its product family with a view to expanding its export markets.

A network for national marine industries

ProBoat, a five-year programme to develop the marine industries, was launched in 1999 in Ostrobothnia and Central Ostrobothnia with funding from Tekes. The programme has since expanded into a national programme covering the entire industry. The aim of the programme has been to increase the net sales of companies in the industry and improve their competitiveness and resilience to business downturns. The strategic means for achieving these goals have included increasing the productivity of the handcraft-based sector by deploying technology and developing efficient networking methods.

Approximately 60 projects including product development, research, training and networking have been completed within the programme. The total budget of these projects amounts to some EUR 8 million euros. The development of the marine industries – one of the joint focuses of the Kokkola and Pietarsaari regional programmes – has made cooperation between marine industry companies and developers more tangible. The network that the programme has established promotes both national and international research and development. Tekes' influence has enabled this focus to be incorporated into the regional technology strategies of Ostrobothnia and Central Ostrobothnia.

LEHTIKUVA

SEA-KARI

Oulu strong in mobile networks

Elektrobit Group Oyj is an original design manufacturer (ODM) for the electronics and IT industry. Elektrobit manufactures measuring devices, in particular a radio channel simulator. When Elektrobit merged with JOT Automation, the company's range of expertise expanded to include production automation, development, manufacture and logistics. The company is global, with units in a number of countries as well as in different locations in Finland. Elektrobit's innovative concepts are attracting increasingly more customers and opening the door to further success in international markets. The company employs some 1,200 people and its development has been very important to the Oulu region – and, in fact, to all of Finland. The company has collaborated extensively with Tekes and through intensive networking has contributed substantially to the development of the Finnish telecommunications cluster's expertise.

NetHawk Oyj offers testing services and products for testing mobile phone networks. Users of NetHawk products include manufacturers of equipment for mobile phone networks, network operators, service providers, providers of installation services, and developers of mobile phone applications. NetHawk's products are used globally, and the company's key markets are Europe, Asia, and North America. The company has developed rapidly and employs over 200 experts, both in Finland and abroad. The company's investment in development has had an appreciable influence on the Finnish telecommunications cluster.

Leading-edge technical knowhow and expertise bring global responsibilities to Finland

In 1993 the American company Tellabs, Inc. acquired Martis Oy, a Finnish company founded in 1976, in order to strengthen its position in international markets and supplement its product range with innovative high-quality telecommunications network systems. In this acquisition, Tellabs gained a product family called Tellabs® 8100 Managed Access System (formerly known as MartisDXX). The Tellabs 8100 system helps over 250 service providers in more than 80 countries to provide carrier-class voice, data and video services.

In autumn 2003 Tellabs launched a new product family, the Tellabs® 8600 Managed Edge System, developed from the beginning in world-class R&D facilities at Tellabs Oy in

Finland. The Tellabs 8600 system is an IP/MPLS-based system designed for environments with stringent requirements for network availability and operational efficiency. It enables provision of end-to-end managed carrier-class services with real and measurable Quality of Service to end-customers.

In Finland Tellabs Oy has approximately 600 employees and facilities in Espoo and Oulu. All Tellabs Oy's business functions are conducted in Finland, including R&D and global customer services.

A global software company built on specialisation and commercialisation

Tekla Oyj, founded in 1996, is one of Finland's oldest software product companies. The company develops solutions that enhance the efficiency of its customers' core business operations in the construction, energy sales and energy distribution sectors and of local authorities. At the end of the 1990s, the company started growing rapidly after developing a superior software product suitable for the global market. Encouraged by this export success, the company went public and was listed on the Helsinki stock exchange in 2000. In 2002, the company's net sales amounted to some EUR 41.5 million, more than half of which were generated by exports and foreign operations. Tekla's products have thousands of users in over 60 countries. The company has a subsidiary or unit in more than eleven countries.

The company has systematically invested approximately 25-35% of its net sales in research and product development. As a result of these investments, the company has recently launched a new software product for multimaterial construction design and analysis. The company expects this product to become its next global success and a driving force for new growth.

Strength through networking

Selmic Oy, operating in Kemi and Oulu, Finland, as well as in Wiernsheim, Germany, is a prime example of successful networking in Northern Finland. The company focuses on the development, research, design and manufacture of micro modules. Selmic's history of expanding into industrial activity through research, development and acquisitions is very characteristic of a cutting-edge company in the microelectronics industry. Cooperation with major stakeholders has also helped Selmic along the road to success.

Networking provides a good footing for international expansion

Valtra's systematic and focused programme for developing its products and production processes has won the company a strong position in the highly competitive international market. The cornerstone of the company's success is wide-ranging networking with research organisations and production sectors in the Jyväskylä region and also elsewhere in Finland.

Valtra demands top-quality expertise of all its subcontractors, thereby encouraging subcontractors to develop their products. To be competitive in the manufacture of components, subcontractors must adopt a strategy of constantly developing and introducing new technologies. In cooperation with Valtra, subcontractors have developed advanced systems for tractors, in particular for cabins, engines and drawbars. In 2002, Valtra manufactured over 18,000 tractors for more than 70 countries. Some 9,700 of these were manufactured in Finland and the rest in Brazil. The share of export sales was about 75% of the total volume manufactured in Finland. Combined with Sisu Diesel, a subsidiary, Valtra employs over 1,500 people in Finland directly and 4,000 people indirectly through its networking activities.

Oulu's success the result of focused strategy

A wide range of factors has contributed to the success and world-class quality of the Oulu region's expertise. The simultaneous convergence of these factors has been essential. Establishment of the University of Oulu and of a VTT (Technical Research Centre of Finland) unit paved the path for the region's development and encouraged many electronics companies to locate in the region – including Nokia's radiophone factory in the 1970s. Technopolis (the "Oulu technology village") was founded in 1982 and became the main driving force for the region's development. A couple of years later the "Oulu city of technology" strategy was launched with the goal of developing Oulu into a key national hi-tech centre of international standing. In 1991, the municipalities in the Oulu region started systematically cooperating in industrial policy and began to jointly craft a new strategy for industrial development. In 2002, eleven municipalities participated in formulating and refining the strategy in close cooperation with local businesses, the University of Oulu, VTT, educational institutions, the chamber of commerce, sponsors, trade associations, the region's Centre of Expertise programme, and public authorities. Working teams formed by companies, the university, and other educational institutions, as well as the individual strategies of different business sectors, also support implementation of the strategy.

Tekes' financing and technology programmes have contributed to the region's growing expertise and close networking. Tekes' investments in the region's R&D have increased almost thirty-fold over the course of two decades.

ARI MÄKELÄ

More strong and specialised growth centres

Finland has a metropolitan area surrounding its capital, Helsinki that represents the best in international knowledge and skills as well as four other strong, knowledge-based growth centres: the Turku, Tampere, Oulu and Jyväskylä regions. The knowledge base of the metropolitan area and the other growth centres must be further strengthened. Finland has the option of increasing the number of its strong growth centres. Some regional centres, such as Kuopio possess the potential needed for developing into strong growth centres.

Strong growth centres are typically the location for the research units of internationally successful companies, universities and research institutes with a high international ranking, and challenging research, training and innovation activities. Strong growth centres are largely responsible for maintaining a national pool of knowledge and skills and for its interfaces with international networks of high-calibre knowledge and skills. The whole of Finland's development depends on the success of strong growth centres.

It is essential that strong growth centres network, irrespective of regional borders, both to diversify their own knowledge base and to offer their own knowledge and skills for others to use.

In addition to strong growth centres, Finland has centres that are based on specialised, in-depth knowledge and skills, such as the Salo region. These should also be strengthened. The success of specialised growth centres is based on accumulated knowledge and skills that are internationally competitive although narrower in focus than the strong growth centres. It is essential for specialised growth centres to strengthen their knowledge base by broad-based networking with both strong growth centres and other specialised growth centres.

Specialised growth centres are drivers of regional growth and play an important role in offering knowledge and skills to both local companies and companies outside their region. Finland can support more specialised growth centres. Regions with universities and regions containing the research unit of an internationally successful company, technology centre or centre of expertise – or some other such concentration of knowledge and skills – have good resources for developing into specialised growth centres.

Results of recent studies of regions and innovations

Although there have been numerous studies on regional development, there has been surprisingly little research over the same period into the importance from the regional viewpoint of innovations, technology development, social capital and networking. Recent studies have made the following observations:

- **Finland has actively** endeavoured to develop ways to reflect the success of the urban regions at the national level. Of the Nordic countries, Finland has most inhabitants eligible for regional subsidies, and Nordic subsidies per inhabitant are highest in Finland. In Finland some 40% of the population live in regions subsidised under regional policy, in Iceland 38%, Norway 25%, Denmark 18% and Sweden 16%. Regional policy allocates EUR 335 per inhabitant in Finland, EUR 259 in Sweden, EUR 165 in Norway (excluding regional tax relief), EUR 140 in Iceland and EUR 83 in Denmark.
(Hanell et al. 2002)

- **The regional competitiveness index** is derived from the region's accessibility, concentration of resources, innovation and human capital. The index enables assessment of development opportunities in the regions over the long term. The most competitive regions, urban regions and particularly regions with universities, generally perform well in all sectors. The same regions generally perform well financially also. The competitiveness index correlates very well with regional GDP and earnings per inhabitant, and describes the regions' prospects for success over the long term.
(Huovari et al. 2001)

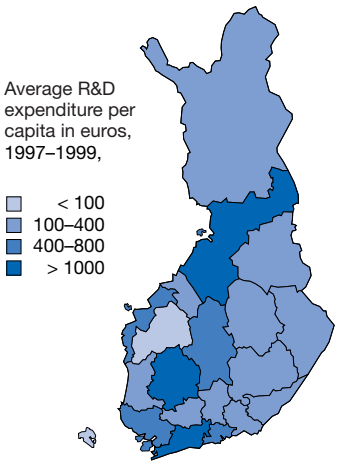
- **The most important** cooperation partners in corporate research and development are often knowledge-intensive companies that provide corporate services and are located nearby.
(Kautonen and Tiainen 2000)

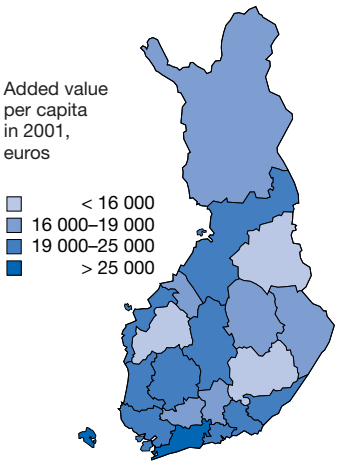
- **Public financing** does not displace corporate R&D investment. One unit of growth in public financing increases corporate R&D investment by one unit. A 10% increase in public R&D funding at the business location level (ie, an increase of approximately 0.5% in public funding overall compared to the business location's R&D investments) increases the business location's overall R&D investment by 2%. The R&D activities of other companies operating in the same region have a positive effect on a company's own R&D investments, and growth in other companies' R&D activities raises a company's overall productivity (spill-over effect).
(Lehto, 2000)

- **Developing human capital** is important from the viewpoint of regional innovation policy, as also is (often local) interaction between companies, universities and research institutes, and other mediating organisations. Geographical proximity enables the intensive exchange of tacit knowledge and close customer-supplier relationships while also increasing the probability of random meetings that result in some form of cooperation. Synergies can be built on shared cultural, psychological or political viewpoints and motives that are based on being located in the same region.
(Kautonen, Kolehmainen and Koski, 2001)

R&D expenditure per inhabitant by region, and added value three years later

Investments in R&D boost economic growth. Regions that invest a lot in technological R&D also have the highest growth in GDP per capita.

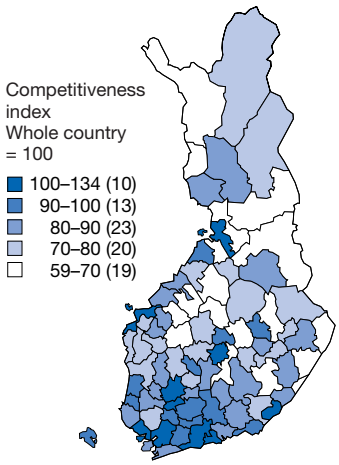




Source: Statistics Finland

Competitiveness by region

Competitiveness clearly correlates with earnings growth, growth in employment, net migration and economic development. Human capital, innovation and innovation-driven R&D contribute most to competitiveness.



Source: Huovari, Janne, Kangasharju, Aki and Alanen, Aku (2001): Competitiveness of Regions (Alueiden kilpailukyky), Pellervo Economic Research Institute's report No. 176.

● **Locally-based** players and innovation networks possess tacit knowledge that is difficult to transfer between regions. The region's dynamism and entrepreneurship is also an important driving force and enabler of new opportunities. Regional innovation environments are not national innovation systems on a smaller scale. Innovation types differ between central regions and the other regions that surround them: bordering regions mostly contain supplier-dependent SMEs and large-scale companies and production units. Central regions, on the other hand, have attracted a substantial number of knowledge-intensive service companies (KIBS, or Knowledge Intensive Business Services) and, if the central region has a university, science-intensive companies. *(Kautonen, Kolehmainen and Koski, 2002)*

● **Differences between the efficiency** of regions grew between 1988 and 1999. Whereas the difference between the strongest and weakest regions was some 30% at the end of the 1980s, at the end of the 1990s this had grown to 40%. During the recession, the weakest regions fell further behind the leading region, and they have not reduced this lead since. The regions whose relative position changed most were generally small. In small economic areas, relative changes can be quicker because there are fewer balancing factors and a small base of companies. *(Susiluoto and Loikkanen, 2001)*

● **Urban regions** now face a new operating environment that features, for example, global competition over the location of companies and skilled workforces and the increased importance of knowledge, expertise and innovations as driving forces for economic growth. This compels urban regions to continuously find new ways of enhancing their own competitiveness. *(Kostiainen, 2002)*

● **Living environments** are classified into three basic types: cities, rural areas surrounding cities, and sparsely populated rural areas. The population of rural areas surrounding cities, and therefore exposed to the influence of growth centres, enjoyed the best general psychological wellbeing, and these areas had fewer psychosocial problems. *(Kainulainen et al. 2001, Heikkilä et al. 2002)*

● **From the viewpoint** of regional development, it is important to link structures and resources to a dynamic force that produces tangible results. The four essential components are:

1. Players:
Identity, a feeling of belonging and charisma

2. Networks:
Connections, trust and mutual dependency

3. Knowledge management:
Information flows and communication

4. Timing:
Awareness of the situation and the courage to act

These factors form the self-renewing system of an innovative operating environment. *(Sotarauta and Ståhle, 2003.)*

Research is regionally concentrated everywhere in the world

The geographical concentration of R&D activities is a global phenomenon, which is just as visible in Finland as in Europe and California. Concentration is an inherent feature of research and development, in fact. Critical mass is not a cliché but an essential facet and a necessary component of R&D activities. The main reason for concentration is the desire to be located close to other expertise.

An EU report in 2002 ranked 211 EU regions by GDP per capita and by the ratio of R&D investment to GDP. Of the top ten regions in this ranking, 6 are German, 2 French and 2 Finnish.

The regions are listed here with their ratios of R&D investment to GDP.

Region	Ratio of R&D investment to GDP
Braunschweig	4.84%
Stuttgart	4.79%
Oberbayern	4.38%
Tübingen	4.05%
Northern Finland	3.82%
Greater Uusimaa	3.73%
Midi-Pyrénées	3.70%
Rheinhessen-Pfalz	3.50%
Ile de France	3.43%
Berlin	3.41%
Finland	3.37%
EU average	1.88%

Expertise boosts Jyväskylä region's growth

The Jyväskylä region has rapidly developed into a strong growth centre, largely through systematically investing in expertise, developing the innovation environment and creating new knowledge-based business opportunities.

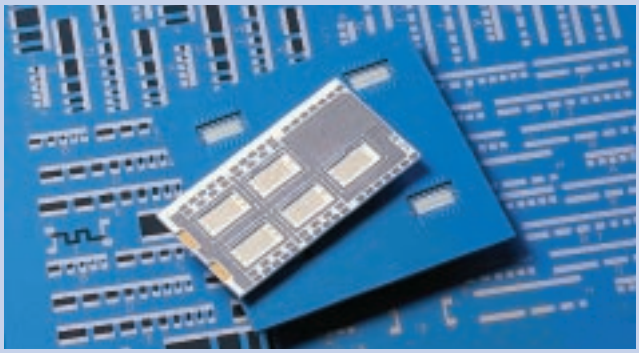
Jyväskylä has resolutely pursued this long-term policy since the 1960s. Jyväskylä University was founded in 1965. A professorship in information technology and the Finnish state's computer units were transferred to Jyväskylä at the end of the 1960s. Jyväskylä established a Technology Centre, launched a technology policy programme for Central Finland and started providing tertiary education in applied natural sciences at the end of the 1980s. After the City of Jyväskylä refined its strategy, the region started to focus on utilising the EU's structural funds to promote development. The Faculty of Information Technology and the Nokia Group located in Jyväskylä.

The objective is to make Central Finland a region that invests in its future through knowledge, expertise and entrepreneurship and, with the Jyväskylä region, grows and prospers as a result. Technology focusing on wellness and human activities is now concentrating in Jyväskylä, also, alongside the already established concentration of expertise in environmental and ICT technologies. The Jyväskylä region is adding to the positive impact of high-calibre research and training by strengthening research that promotes business competitiveness, by operating business incubators that foster competitive local start-ups, and by attracting companies to the region that can benefit from the cutting-edge expertise already concentrated in Jyväskylä.

Tekes' technology programmes have promoted collaboration and nationwide networking between the Technical Research Centre of Finland, University of Jyväskylä and companies based in the region. Tekes has cooperated with public authorities, private companies and other organisations in the Jyväskylä region in promoting the creation of new technology-based companies and the rejuvenation of traditional industry.

The Helsinki metropolitan area offers cutting-edge knowledge and skills to the whole country

The Helsinki metropolitan area is one of the ten most R&D-focused regions in Europe. Of all corporate R&D activities in Finland, over 40% are located in the Helsinki metropolitan area, compared to only one-quarter of industrial production. Finland's knowledge-intensive services are also strongly concentrated in the region, in order to be closely located to this diversified expertise and R&D. The Helsinki metropolitan area contains a number of concentrations of world-class expertise, such as the Otaniemi cluster and the Helsinki Science Park in Viikki. These concentrations of expertise produce and deliver expertise and research services to the whole country through the networks formed by top-level university research, research institutes and private companies.



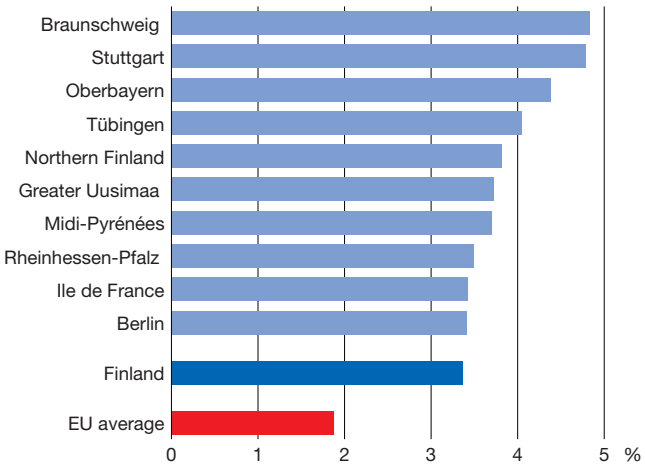
VTT

Salo – a growth centre specialised in information technology

Salo has developed from an agricultural region with a well-connected commercial centre into an industrial centre focusing on information and communications technology (ICT), and become the dynamo for a region containing over 62,000 inhabitants. Salo's success is built on specialised expertise, most of which was generated by local companies. Salo's focus on ICT started with the manufacture of crystal receivers and radios, which shifted to the manufacture of televisions and later phones. One milestone in the region's development was Salora's decision to locate the design and manufacture of mobile phones for the Finnish Defence Forces in Salo. The expertise and knowhow that this generated attracted the Nokia Group to the locality.

Reorganisation of Nokia's factory in Salo raised productivity to the level needed to succeed in international markets. A strong subcontracting network of SMEs developed around Nokia, some of which also achieved international success themselves.

The value added by industrial production in the Salo region



Measured in ratio to GDP, Uusimaa and Northern Finland rank among Europe's most active regions in terms of R&D. Northern Finland's position in the ranking is largely due to the Oulu region's dynamism in R&D activities, which combined with the region's relatively low population places the whole of Northern Finland among the top ten regions.

These ten regions generate almost 25% of all the euro-zone's investment in research and development. This is a clear indication of how regionally concentrated R&D activities are overall. A mere 28 of the 211 regions in the European area account for some 50% of all European R&D investment.

has increased almost six-fold, R&D investment has almost tripled and the region's GDP per capita is almost double the national average.

The City of Salo is continuing its strategy of accumulating expertise, with the University of Turku, Turku Polytechnic, institutions of secondary education and the adult education centre supplying the workforce for local industry. Cooperation between the University of Turku and Turku Polytechnic enables students to acquire masters' and doctoral degrees.

Tekes has helped Salora and Nokia develop their expertise with funding. Nowadays Tekes acts as a distributor of risk for many SMEs based in the region. Nokia's Salo facility networks in projects aimed at jointly developing expertise and knowhow.

Leading-edge competence in sensor technology for the paper industry located in Kuopio and Varkaus

In testimony of Varkaus' and Kuopio's expertise in automation and measuring technology, Honeywell decided last year to locate a new centre for developing sensor technology for the paper industry in these two cities, after conducting a global feasibility study. The decision was based on the world-class expertise that the region has accumulated over many years.

Research and development of process automation and measuring technology began in the 1960s at A. Ahlstrom's pulp and paper mill in Varkaus. In 1979, these operations were hived off into a company named Altim Control. Puumalaisen Tutkimuslaitos Oy was founded in Kuopio in 1977, and Roibox Oy was incorporated as a subsidiary in


TEKES

1984. Honeywell acquired Ahlstrom Automation in 1992. Measurex, an American company, bought Roibox in 1994 and Honeywell acquired the entire capital stock of Measurex in 1997. Varkaus has now become the world centre for Honeywell's paper and printing automation business, thanks to the region's large pool of leading expertise, entrepreneurship and dynamism.

At the end of 2002, some 400 people in Varkaus and around thirty in Kuopio worked on developing process and production automation systems. New sensors for the paper industry have been widely adopted, and have opened up new international markets. Honeywell has two state-of-the-art automation centres for the pulp, paper and graphics industry. The automation centre in Finland and the global products that it owns is by far the biggest. The other centre is located in Vancouver, Canada.

Vaasa region has a solid knowledge base in frequency converter technology

Frequency converter technology is the most rapidly growing segment of electric power technology. Finnish expertise in frequency converter technology was strengthened in 1993 when Vacon Plc was established. The company grew quickly from the outset. In 2002 Vacon generated net sales of EUR 97.5 million and the group employed 426 people. The company has accumulated a large pool of expertise in its sector and for its subcontractors, thereby strengthening the region's business structure. Vacon and its chains of subcontractors have had a decidedly positive impact on employment, particularly in the Vaasa region but also more widely in Finland.


VACON

Production, collection and utilisation of bioenergy stimulate employment throughout Finland

Technology for collecting and using bioenergy has long been a focus for R&D. This technology must address the prevention of climate change as well as employment aspects. Bioenergy, the collection and use of bioenergy, and the companies supplying equipment for these activities are located in different parts of Finland – and, in fact, much bioenergy is often collected and used in sparsely populated areas. These activities employ thousands of people and have created hundreds of jobs in power plants, district heating plants and heat distribution centres in both large and small urban localities. The 200, or so, heating plant entrepreneurs who supply heat in sparsely populated areas – often part-timers – form a special group. The production, design and project work for power plant and boiler technology is concentrated in Tampere, Varkaus, Karhula and Kiuruvesi. The manufacturers of processing technology, small boilers and furnaces are located in different parts of Finland. The equipment industry is mainly export-driven and employs several thousand people.

Wood collection chains have generally been operated and developed through networking between forestry companies, local energy companies, manufacturers of forest harvesters, fuel supply companies and machinery contractors. The research for this network is conducted by the Finnish Forest Research Institute in various parts of Finland, the Technical Research Centre of Finland (VTT) in Jyväskylä and the University of Joensuu. The suppliers of operating equipment comprise networked forest and energy companies, their chains of subcontractors, and R&D units, such as VTT in Jyväskylä and Åbo Akademi University in Turku.

The region's expertise, knowledge and commercial activities are underpinned partly by the expertise created through Tekes technology programmes. The Bionergy, Wood Energy and LIEKKI 1 and 2 Combustion and Gasification Technology programmes, for example, have created expertise, commercial chains and equipment technology for biomass collection and bioenergy usage for both domestic and export markets.

Improving competence enhances profitability

At the beginning of the 1990s, Mar-Con Oy, a manufacturer of simple rubber products such as mud-flaps for vehicles, was an Äetsä-based company with poor profitability. The company drafted a plan for enhancing its expertise in order to safeguard its future. The plan focused on new materials and the company started to systematically develop its knowhow in materials technology and production processes in close cooperation with the Technical Research Centre of Finland (VTT) and Tampere University of Technology. Now the company performs well financially and is one of Finland's leading manufacturers of thermoplastic elastomer components, with customers that include major Finnish electrical and electronics companies.

Speakers for the whole world

Companies located outside growth centres can also flourish, as demonstrated by the Iisalmi-based Genelec Oy. The company has built up an international reputation, becoming the market leader in its field. Genelec has managed to turn its monitoring systems into a highly acclaimed brand product sold around the world. This success is the result of 25 years of hard work marketing top-class products with an extensive distribution network. Innovative research and product development are paramount in building loudspeakers for the professional market, requiring experts specialising in acoustics, electronics and mechanical design. The company employs over 80 people.

Genelec Oy has participated in Tekes' ETX (Electronics for the Information Society) and VÄRE (Control of Vibration and Sound) technology programmes. In the field of research, in particular, Tekes has managed to ferment collaboration between very differing major Finnish electrical and electronics companies.

Rejuvenation creates new business opportunities

In recent years the Finnish footwear industry has shrunk progressively and transferred much of its production to countries with cheap labour. The Pomarkku-based company Pomarfin Oy has started collaborating with Tekes with a view to developing an entirely new business concept for the industry – mass customisation. Industrialised under the name left® foot company, the concept means that the footwear the customer wants can be manufactured directly from measurements of the wearer's foot. The concept has proved successful and has expanded into the EU area. left® foot company will enable Pomarfin to continue operating in Pomarkku, rejuvenate the company's business operations and pursue substantial growth in business.

The Orivesi-based company Laitosjalkine Oy participated in Tekes' STAHA technology programme for managing static electricity, which developed a personal protection concept for cleanrooms. The aim was to produce hi-tech products for traditional industry, thereby ensuring the competitiveness of the company, safeguarding existing jobs and creating new jobs where possible. The project was very successful and the cleanroom concept will be marketed internationally under the Laja Clinigo brand name. Laitosjalkine Oy is now networked with other companies and research specialists in the footwear sector as a result of the project. The project safeguarded jobs in a highly competitive sector.

TIMBERJACK

Strengthening growth centres benefits everybody

Growth centres play an important role in achieving economic growth and wellbeing in Finland. They generate wealth, which can be transferred to less developed regions through income redistribution systems.

Because of their strong pool of knowledge base, growth centres serve not only the companies in their immediate regions but also companies located outside growth centres. The knowledge and skills that growth centres possess spreads throughout Finland via diversified research, innovation and business networks.

Growth centres mean jobs, growth and better opportunities for success in their proximity and in neighbouring localities. The overall regional effect of growth centres is significantly wider than their administrative boundaries. The more networked a growth centre is, the greater the spill-over effects it projects.

Most of Finland's knowledge base, and the innovation activities based on it, is located in growth centres. This is also a necessary state of affairs because Finland needs internationally competitive centres of knowledge and skills to succeed in world markets. Finland's knowledge base is mainly located in strong and specialised growth centres. These form a network of knowledge and skills that enables companies located outside growth centres to succeed against foreign competition also.

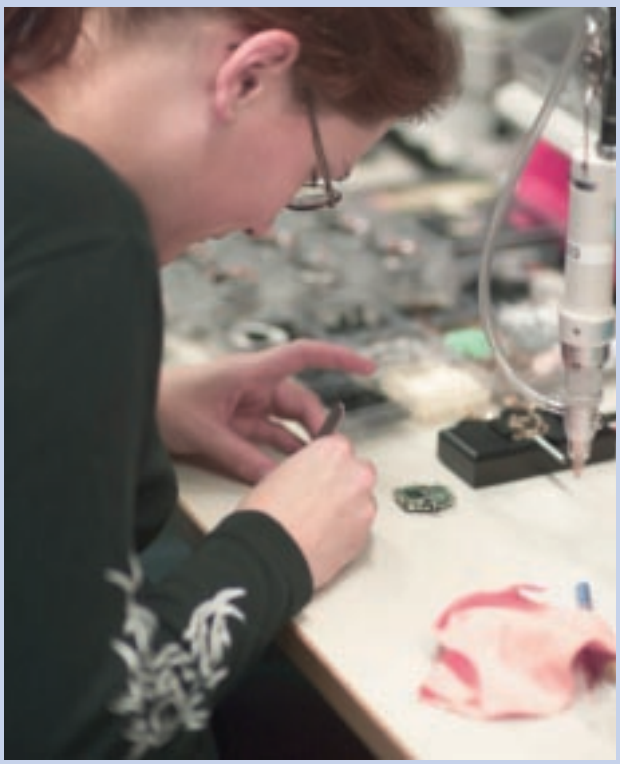
In strong growth centres technology policy is particularly focused on interaction between experts in different fields (cross-disciplinary skills, cross-technology engineering, inter-organisational cooperation) and on developing high-calibre knowledge and skills through national and international networks.

The aim of technology policy for specialised growth centres is to safeguard the region's international competitiveness in its key fields of knowledge and skills, and closely related fields, and acquire other leading knowledge and skills for the growth centre through networking.

The growth and wellbeing of regions outside growth centres is ensured mainly by other means, rather than through technology policy. The aim of technology policy is to network players located in these regions with national networks of knowledge and skills, which are mainly based on growth centres.

Over the long term technology policy has borne fruit in those regions that have selected a strategy based on core competencies. Technology policy has supported change in the business structures of many regions as well as the rejuvenation of traditional industry.

examples of regional effects of Tekes' funding and expert services



PATRIK RASKI

Knowledge from technology programmes widely utilised

In 1994, Tekes launched the SIM-SAVO project to meet the development needs of private companies in North Savo. Eight companies in the metal industry participated in the project, which serves as an excellent example of the benefits of sharing knowledge gained in technology programmes through regional networks and of encouraging companies to develop their operations.

The model for cooperation crafted during the project was further developed within the TEKOPAL project funded by the European Social Fund, and is being applied in various cross-sector joint projects in eastern Finland. The most extensive of these is the "Ideal Factory Project of Eastern Finland" (Itä-Suomen Ideaalitehdasprojekti), in which some 40-50 companies are participating. These companies share the goal of increasing their combined net sales from some EUR 600 million in 2000 to roughly EUR 850 million by 2005. The purpose of this operating model is to find solutions for companies' development needs by applying operating models and resources that have proven to be effective in earlier technology programmes and international projects. Through cooperation, and by observing other companies' development projects, companies can learn from one another, network effectively and enhance the competitiveness of their entire chain of operations.

Universities and VTT form a national network of knowledge; polytechnics and technology centres are important mediators of knowledge and skills

Universities and VTT should be developed as national producers and mediators of leading-edge knowledge and skills. They serve private companies and the public sector, both in their surrounding regions as well as in the whole country.

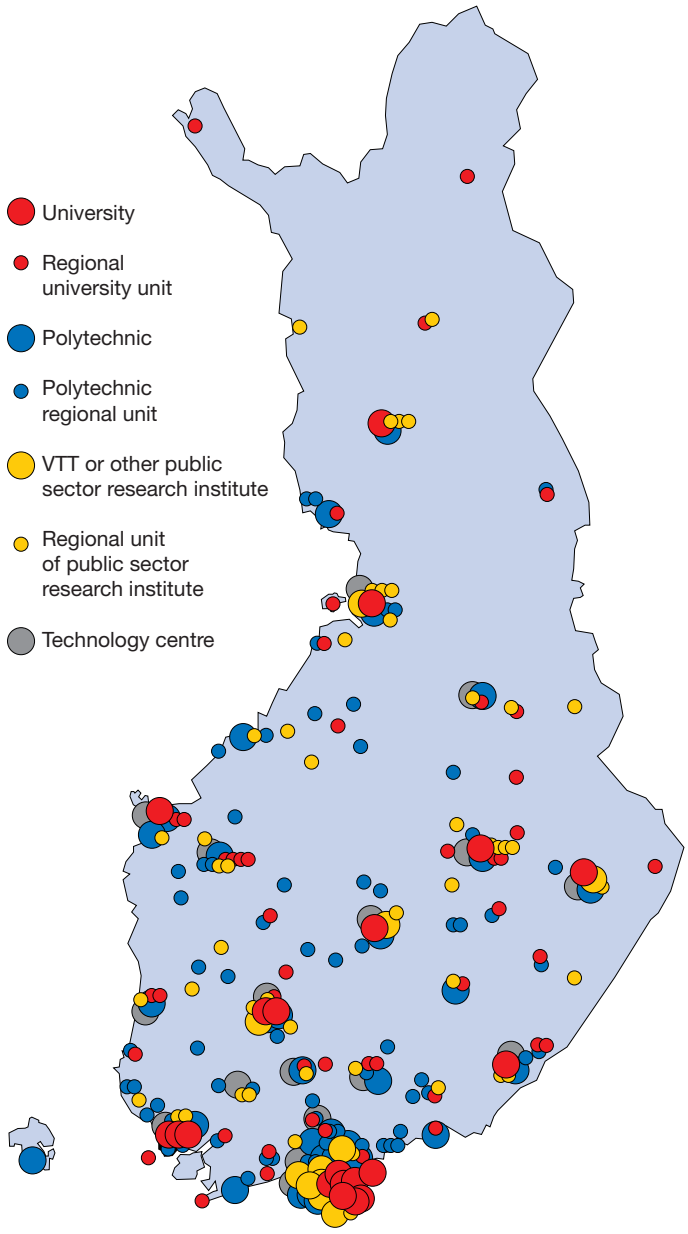
Knowledge must be produced and disseminated to the economy and other sectors of society as a process of close collaboration between companies, universities, research institutes, polytechnics and organisations that specialise in technology transfer. This ensures that research results can be deployed and that knowledge and skills is distributed to all potential beneficiaries. Only some of the beneficiaries can easily locate in the immediate geographical vicinity of a university.

Universities and VTT have an appreciable impact on the development of the regions, especially if their research and training focuses particularly on the region's core competences and supplementary skills. Regions containing a university, VTT unit, or strong polytechnic plus corporate research facilities are well positioned for developing into specialised growth centres. To achieve development, clear choices that support the region's strategy need to be made.

Finland has a network of universities and polytechnics that in geographical terms covers the entire country, and it is not sensible to decentralise this network by establishing new educational institutions. Establishing satellite units calls for a sufficient knowledge base both at the host universities and at the satellite units. The research activities of universities should be more closely networked with polytechnics, research institutes, technology transfer companies and other bodies conducting applied research.

In addition to building up competence in the workforce, the objective for polytechnics is to transfer the knowledge of science polytechnics so that companies in the vicinity can use it in close cooperation with both the science polytechnics and the recipient companies. Polytechnics must acquire national and international knowledge and skills by networking with universities and research institutes.

Technology centres and other technology transfer organisations function effectively as mediators of technology and knowledge, and as promoters of new business activities within the regions. Their basic financing must be secured. They provide technology start-ups and small technology companies with the services they need and create an environment that promotes business activities, innovation and networking.



Network of universities, polytechnics, public research institutes and technology centres

Finland has a network of universities and polytechnics that in geographical terms covers the entire country. Polytechnics can act as a channel for the regional transfer of knowledge and deployment of expertise. Polytechnics already collaborate with local private companies – and this collaboration can be increased. The results of technology programmes can be more effectively deployed in the regions. Regionally targeted programmes that are adequately interlinked at the national level could also supplement national technology programmes.


PESMEL

Simulation in Seinäjoki Polytechnic

Seinäjoki Polytechnic has developed its simulation expertise in a wide range of applied research projects, which many companies can now benefit from. Simulation means the imitation of a certain product, process or essential parts of a system. A simulation model can help to predict an object's behaviour. Changing the parameters of the model, or the environment affecting it, allows experts to observe and analyse the way different factors influence an object's behaviour.

Seinäjoki Polytechnic's customers include the Finnish metal, wood, paper and food industries. Simulation projects have helped to develop systems for managing production material flows, planning work cells, and designing workplaces and ergonomics as well as to boost development of NC-simulation, robot simulation and online simulation. Seinäjoki Polytechnic has trained people to use simulation software, in addition to conducting projects implemented within companies. Seinäjoki Polytechnic is one of the national simulation clinic's service providers.

Tekes has played a crucial part in the development of Seinäjoki Polytechnic's simulation expertise. Challenging projects have helped the Polytechnic's knowhow to progressively grow into a key national field of expertise.

University Consortium and Satakunta Polytechnic produce knowledge and skills for the region's companies

The technology strategies of Satakunta Polytechnic and the Satakunta region emphasise the roles of education and research in ensuring an adequate supply of industrial knowledge and skills. Tekes has played an important role in the development of these strategies and in the development of the Pori University Consortium's technological research.

The polytechnic's strategic focuses are automation, telecommunications technology, electronics, energy and the environment. The polytechnic has participated in seven Tekes technology programmes and been in charge of numerous projects. Research conducted in energy and construction technology, and in automation and infrared technology, for example, has created internationally competitive added value for the region's industries.

These strategies have produced more than fifty knowledge-intensive companies to enrich the region's business community.

The Pori University Consortium is a centre of five universities operating as a networked multidisciplinary environment with about 1,200 students and 160 experts (of whom roughly one-third are research staff). Research projects funded by Tekes and participation in Tekes' technology programmes have cast the foundation for an entire research culture and a culture of cooperation between companies and researchers. The expertise gained from projects, combined with training, has created a range of services available to the region's companies. Experts trained by the Pori University Consortium together with the consortium's research services have significantly contributed to the creation of ITC start-ups and the location of established ITC companies in the region.

University Consortium networks the Lahti region

A University Consortium has been established in Lahti over the course of the last twenty years. The University of Helsinki, Helsinki University of Technology, Lappeenranta University of Technology and, more recently, Tampere University of Technology have centres operating in the consortium. The consortium is home to 12 professorships, 200 experts and approximately 5,000 students each year. The consortium's operations are networked internally as well as with Lahti Polytechnic and the host universities of the centres operating in Lahti. This has produced the IDBM Pro (International Design Business Management) course, which won an award from the Finnish Ministry of Education and is jointly arranged with Helsinki School of Economics and Helsinki University of Art and Design.

Networking has paved the way to a wide range of expertise services, which are already clearly visible in the development of the regional system of innovation services. The participants of the University Consortium have developed various projects with Tekes' assistance. Such project work supports the product development of the region's companies in many ways, and the results achieved through such projects include the networking of SMEs with large-scale enterprises, and the development and expansion of the business operations of SMEs. Tekes' DESIGN technology programme and certain smaller projects, in particular, have helped build the region's expertise in industrial design into an important national field of expertise. The close cooperation between the University Consortium, the Lahti Centre of Expertise programme and Tekes resulted in the establishment of a Science Park in Lahti at the beginning of 2004.


SEINÄJOEN AMMATTIKORKEAKOULU

Funding and services should prepare for international competition

Different forms of financing play different specified roles in regional development. These roles should always be clear and unambiguous.

The purpose of regional financing is to strengthen a region's innovation framework. Regional financing should also build links to national and international networks of knowledge and innovation services, while also creating and maintaining interaction between the region's active organisations.

The prime objective for financing research and development, which – like Tekes' financing – is open to national competition, is to increase knowledge and skills and strengthen networking irrespective of regional borders. Financing should prepare companies for international competition, thereby creating the basis for economic growth in the region.

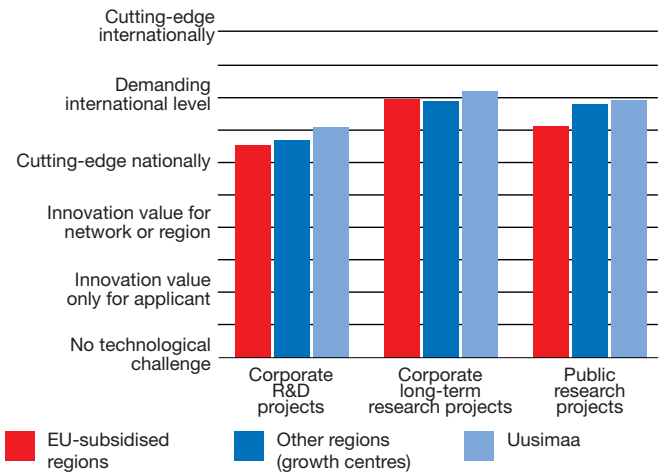
Companies face the same international competition irrespective of the region they are located in. Project financing should be open to national competition since this is the only way to ensure national and international networking on an adequate scale. Subjecting financing to national competition places all companies in an equal position – irrespective of region. This avoids market distortions, makes projects adequately challenging and ensures that financing decisions are based on sound principles that maximise the socio-economic impact of a project.

Activation of research and development activities should be strengthened in all regions. Investments in regions that are developing more weakly can be gradually increased as knowledge and skills grow and local companies develop. This requires systematic long-term work aimed at activating companies and promoting networking through flexible financing criteria. Activation boosts demand for financing, and this demand should be met.

International regulations permit higher public R&D funding to be granted to corporate projects implemented in regions that are more weakly developed, and Tekes uses this possibility. This is reflected in the fact that in recent years Tekes has spent a higher proportion of financing on projects in EU-subsidised regions even if these projects were less challenging than projects in other regions.

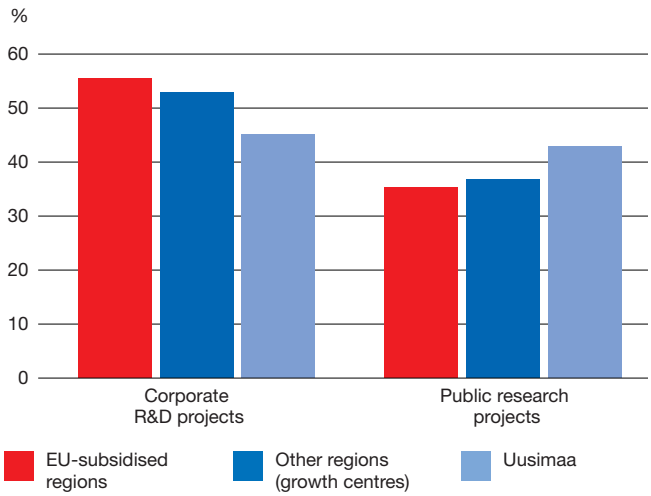
TE-Centres must ensure the availability of diversified, high-calibre business and innovation services. The availability and visibility of Tekes' financing and expert services must be enhanced in the regions and in TE-Centres. Companies must have the same opportunities, irrespective of their geographical location, for receiving the innovation services they

The level of challenge in projects funded by Tekes by region



Although the financing of regions outside growth centres has, in comparison to other financing, been more focused on less challenging projects than the average, these projects are also competitive at the national level. Financing has been granted to enable companies to enhance their technological capabilities and reach the international level in later projects. The diagram shows the level of challenge in 2003.

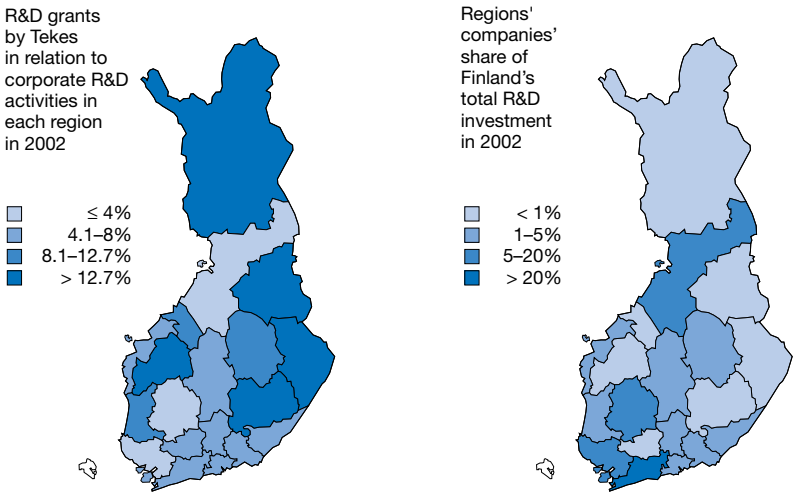
Funding granted by Tekes in relation to applied funding by region



The ratio of financing granted by Tekes to financing applied for by companies is, in comparative terms, highest in EU-subsidised regions and lowest in Uusimaa. The ratios are reversed in the case of public projects. The diagram shows the average for 2000–2003.

R&D grants paid by Tekes in relation to corporate R&D activities in each region

Tekes' financing of corporate projects in regions outside growth centres has been relatively higher than the companies' share of Finland's total investment in R&D. Tekes' financing of individual projects outside growth centres has also been higher compared to average financing. Tekes has used flexible funding criteria that become progressively stricter to encourage many companies to develop in preparation for global competition.



Sources: Statistics Finland and Tekes

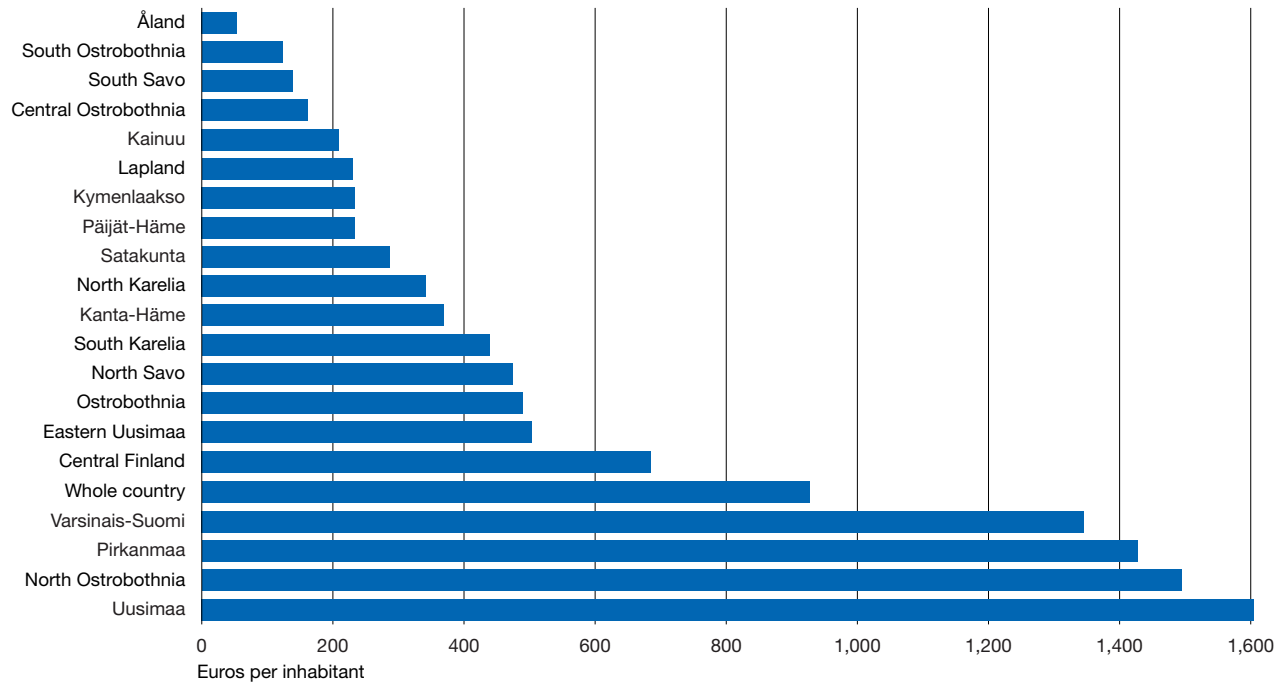
need. The task of TE-Centres is to ensure the availability of these services in all the regions and to guide the region's companies to the services, financing and partners that they need. TE-Centres operating near companies must be able to identify and activate those companies in the region that possess the necessary resources for systematic, long-term research, development and innovation activities. The activation of innovation processes must be integrated more extensively into the operations of TE-Centres and adequate resources must be provided to enable this.

Public financing targeted at businesses and entrepreneurial activity, such as the EU's structural funds, should be more focused on innovation activities. Investing in knowledge and skills has a more distinct long-term impact on the region's development, and prerequisites for development, than short-term investment in tangible assets. Moreover, financing innovation activities does not distort competition.

The administration of the structural funds should be simplified and small region-specific or problem-specific entities should be merged. The administration should be organised in a way that encourages the creation of large entities that are common to different regions, which can therefore exert more influence as a result of their size.

The main purpose of competitive funding is to encourage private companies and public organisations to develop innovative products, services and processes. Competitive funding

R&D expenditure per capita by region



R&D expenditure per capita by region in 2002.

Source: Statistics Finland

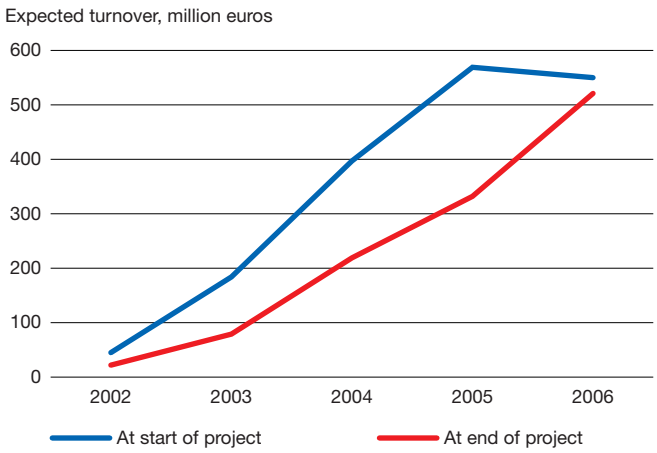
R&D expenditure and Tekes R&D funding by region

	Corporate R&D expenditure in 2002, million euros	Public research expenditure in 2002, million euros	Tekes' R&D financing to companies in 2003, million euros	Tekes' research funding to universities and polytechnics in 2003, million euros
Åland	0.6	0.8	-	-
Central Ostrobothnia	7.0	4.5	1.4	0.2
Kainuu	10.1	8.1	1.0	1.2
South Savo	10.7	11.9	3.1	1.9
Lapland	17.7	25.5	1.4	0.7
South Ostrobothnia	19.2	4.7	2.7	1.7
North Karelia	20.9	37.2	3.5	1.5
Häme	29.7	31.5	4.2	0.7
South Karelia	35.8	24.3	2.5	4.1
Kymenlaakso	41.5	2.1	4.7	1.8
Päijät-Häme	42.1	4.2	4.3	1.0
Eastern Uusimaa	45.5	0.4	2.2	-
North Savo	50.0	69.7	14.8	8.3
Satakunta	59.5	7.8	6.5	2.3
Ostrobothnia	74.2	10.7	3.7	0.7
Central Finland	106.6	74.9	8.4	5.3
North Ostrobothnia	420.4	132.5	19.3	15.3
Varsinais-Suomi	466.3	140.6	27.3	11.4
Pirkanmaa	480.1	167.9	29.6	23.1
Uusimaa	1,437.3	696.0	96.1	74.2
Total	**3,375**	**1,455**	**230**	**162**

Tekes' R&D financing has been defined by the location in which the project is implemented. Sources: Statistics Finland and Tekes

Expected turnover for business R&D projects conducted by SMEs and completed in 2003

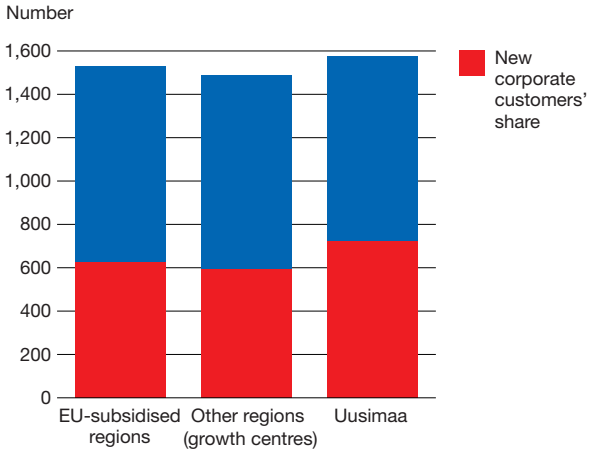
The figures cover 169 business R&D projects conducted by SMEs and completed in 2003, on which Tekes spent 38 million euros. Some of these are long-term projects that will not generate any net sales by 2006. For clarity, minimum figures for growth expectations have been included. The probable turnover that will be generated is higher. Comparison of the curves shows that expectations for completed projects were achieved much as expected, but with an average one-year delay.



should also prepare companies for international competition. This will best be achieved by closely interlinking funding and expert services, and by restricting competition to the national level. Tekes' national technology programmes stimulate interaction between companies and research organisations regionally, nationally and internationally. Precisely targeted problem-specific regional activation can boost the regional impact of national technology programmes. This means that TE-Centres would need adequate and suitable resources to perform this activation work. Activation work needs business and marketing skills in specific technologies, sectors and clusters. These skills can only be created and maintained through continuous and extensive interaction with companies and research bodies. Expert financing of technology start-ups and special activities for creating new technology companies is concentrated where there is a strong knowledge base for generating new business ideas. Tekes' Research into Business programme, TULI, and Tekes' joint programme with the Finnish National Fund for Research and Development Sitra for providing start-ups with seed money, Liksa, are channelled into the regions though technology centres. The technology clinics launched by Tekes play a special role in disseminating the new knowledge, skills and technologies generated in technology programmes, and elsewhere, to existing SMEs.

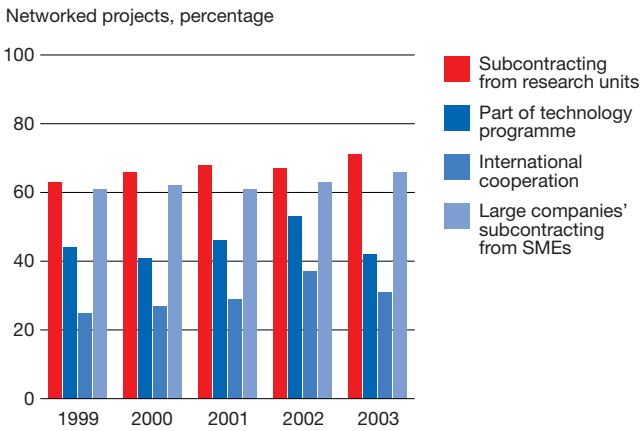
Tekes' corporate customers by region

Tekes' new corporate customers and total number of corporate customers in the period 2000–2003. Tekes actively encourages project launches in less developed regions, which is why the EU-subsidised regions also contain large numbers of new customers. Activation can be boosted, but this requires larger financing opportunities than currently.



Networking of corporate R&D projects

In 2003, almost all large companies' projects and 79 per cent of all corporate R&D projects financed by Tekes were networked. Of these, 72 per cent contained subcontracting of research services from universities, polytechnics and research institutes, 42 per cent were part of a technology programme and 28 per cent consisted of international cooperation. Of large companies' projects, 66 per cent included subcontracting from SMEs. The figures include corporate R&D projects, but not smaller feasibility studies.

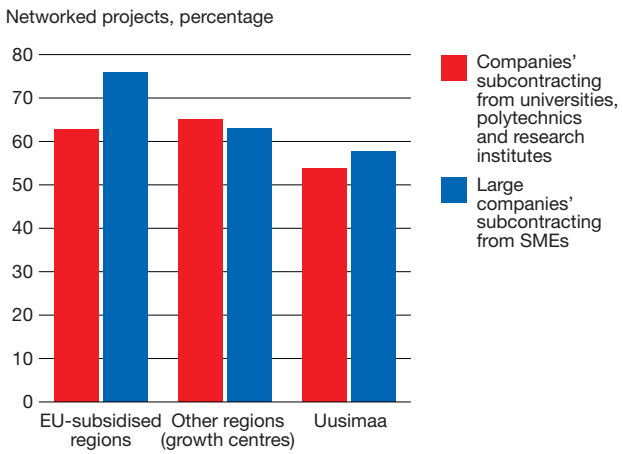


Networking in corporate R&D projects by region

Tekes' funding principles encourage networking. In practice, large companies can only receive financing for networked projects, and networking is highly important for SMEs. Extensive and diversified networking is a central feature in all technology programmes.

In projects financed by Tekes, some 50-60% of the financing granted was linked to cooperation. Networking between large companies and SMEs is most extensive in EU-subsidised regions. Networking between companies and research units is most extensive in growth centres.

The diagram shows the percentage of networked projects in the period 2000–2003.



The activities and operations of regional venture capital funds should be integrated and combined into a larger entity. This would strengthen the knowledge base and risk-taking competencies of the funds, and prevent municipal borders from being a barrier. Finnish Industry Investment Ltd and Finnvera plc have an important role in forming the funding entity and in financing start-ups. Finnvera also plays an important regional role in providing special financing for companies. Sitra still fulfils an important national need in the venture capital funding of technology companies in the seed and start-up phases. Services for supporting the international expansion of companies, such as Finpro's services, should also be brought close to customers. The services of organisations offering public technology financing and services to develop knowledge and skills are described on page 29.

The operations of the centres of expertise network and interlink spearhead companies and organisations in knowledge concentrations both regionally and, whenever necessary, nationally. Most of the research, development and innovation activities of the centres of expertise are financed with funds that are competed for at a national level. The activities of the centres of expertise should be linked more closely to form a coherent entity within Finland's industrial policy.

Coatings and corrosion protection win international renown

The Mikkeli-based Savcor Group Ltd Oy has been one of Finland's most rapidly globalising technology companies over the past few years. The company has cooperated with Tekes in research and product development since the 1980s. In recent years, Savcor's most successful products have included coatings for mobile phone covers that minimise the harmful effects of electromagnetic radiation. The company has built and commissioned several production lines abroad – in China, Brazil, Hungary, the USA – and, of course, in Mikkeli. Employing some 300 people, Savcor has become one of the Mikkeli region's largest employers.

The anti-corrosion treatment of infrastructure, such as concrete structures, bridges, pipelines, buildings and harbour facilities – especially in oceanic coastal areas – is another potential growth area for Savcor. This is because of the strong expertise that the company has accumulated in systems and services for preventing corrosion in industrial facilities and plants. Savcor ART Oy focuses on this business area, especially in the Nordic Countries, Japan, Eastern Europe, the USA and Australia. The company is building a growth strategy based on the business partnership model, which resembles franchising – a relatively unknown concept in Finland, and has acquired several companies towards this end. The company has also bought some business operations in Australia.

TEKES

International expansion boosts building engineering exports

Olof Granlund Oy is Finland's leading consulting firm for building engineering systems. The company began to develop its services and software, and to expand internationally, at the beginning of the 1990s. Networking with both Finnish and foreign companies, and – mainly through Tekes' connections and agreements – with top foreign universities (such as Lawrence Berkeley National Laboratory, Massachusetts Institute of Technology, and Stanford University), has greatly contributed to the Granlund Group's development, raised the company's expertise to world-class level and enhanced profitability.

The parent company, operating in Helsinki, and its subsidiaries in Tampere, Vaasa, Lahti, Kuopio and Tallinn, form a group that has doubled the number of its employees and more than tripled its net sales, to EUR 17 million, over the past ten years. The company forecasts considerable growth in exports.

SAVCOR

Advanced timber processing stimulates exports

The Vierumäki Group is a family business that has shifted its focus from the production of bulk timber to the further processing of timber. This has enabled the company to continually increase its net sales, expand its export business, create new jobs and improve employment opportunities. Further processing of timber has generated roughly one-third of the company's net sales over the past five years, mostly derived from exports to the European Union, Japan and the Middle East. Tekes has participated in projects resulting in new and durable structural solutions based on glulam (glued & laminated) beams. Tekes also contributed to a study that helped the company locate the state-of-art technology needed to develop and build Europe's most efficient production line for glued & laminated timber solutions.

Bombardier Ski-Doo and Lynx snowmobiles made in Rovaniemi

Rovaniemi has invested considerable amounts of time and effort in the snowmobile industry by promoting and supporting the development of snowmobile technologies and by educating and training college and university graduates to apply their knowledge in this field of expertise. These investments, combined with carefully focused financing of product development, have given Bombardier-Nordtrac specialised expertise and enabled the design and manufacture in Finland of professional snowmobiles sold throughout the world under the Ski-Doo and Lynx brand names. Bombardier-Nordtrac's manufacturing plant is located right next to an extensive and varied network of snowmobile trails that provides an ideal testing environment. In addition to its specialised development and manufacturing activities, Bombardier Recreational Products Inc has centralised its European distribution of Ski-Doo snowmobiles and other recreational products in Rovaniemi because of the city's excellent location as a gateway to Europe's winter market.

The Science and Technology Policy Council of Finland recommends strengthening the framework and funding for innovation activities

Technology policy can be used to exert a pronounced influence on regional development. This requires sufficient resources. The Science and Technology Policy Council of Finland recommends strengthening the framework for innovation activity and increasing the financing of research and innovation.

The Council believes that the framework for innovation activities should be strengthened by securing the basic financing of universities, polytechnics and research institutes and by improving the Academy of Finland's and Tekes' opportunities for developing new growth sectors, research-based innovations and innovation environments. The Council lists three central development targets: to enhance education, research careers and the utilisation of research findings; to boost social and technological innovation; and to ensure flexible expert development of innovation funding.

According to the Council, public funding should increase faster than the estimated growth in GDP.

In the case of research, this will mean an increase of 300 million euros from the 2002 level by 2007. The Council recommends an increase of 120 million euros in funding for Tekes and an increase of 70 million euros for the Academy of Finland. The recommendation was the Council's proposal for the spring 2003 discussions on the government's programme.

What impact does public funding have on corporate R&D activities?

According to a study by the Research Institute of the Finnish Economy (ETLA), public R&D funding supplements and boosts companies' R&D activities. A publicly financed investment of 100 units gets a company to increase its own R&D investment by 114 units.

ETLA's study, published in February 2003 and focusing on the metal and electronics industries, show that public R&D funding does not displace companies' internally-funded research activities, but instead increases a company's R&D investment during the following year.

According to ETLA's 2002 report, those companies whose operations depend on external financing more than the average invest more in R&D activities and are more growth-oriented when more public funding is available to them. The results of the study are economically important, and statistically beyond dispute, and confirm the view that an increase in companies' investments is the consequence of public investments, and not vice versa.

Public service providers help companies transform an idea into a profitable business

Tekes (National Technology Agency of Finland)
www.tekes.fi
Funding and expert services for technological R&D projects.

TE-centres (Employment and Economic Development Centres)
www.te-keskus.fi
Financing for investment and development projects, plus advice, training and consultancy services for companies.

Finnvera plc
www.finnvera.fi
Loans and guarantees to assist companies to develop and grow. Export guarantees to protect against export financing risks.

Technology centres (Finnish Science Park Association)
www.tekel.fi
Facilities and a wide range of support services for technology companies' different stages of growth.

Sitra (Finnish National Fund for Research and Development)
www.sitra.fi
Capital funding for technology start-ups.

Finnish Venture Capital Association
www.fvca.fi
Venture capital investments for developing and growing companies.

Finnish Industry Investment Ltd (TESI)
www.industryinvestment.com
Capital investments in private equity funds, venture capital funds and selected target companies.

Foundation for Finnish Inventions
www.innofin.com
Advice, assessment, financing and commercialisation services to help private individuals and entrepreneurs develop and exploit invention proposals.

SME Foundation
www.pkt.fi
Consultancy and expert services for small- and medium-sized enterprises.

Finpro
www.finpro.fi
An expert and service organisation whose mission is to speed up the internationalisation of Finnish businesses.

Invest in Finland
www.investinfinland.fi
Promotes direct foreign investment in Finland.

European Commission
www.cordis.lu
European financing and expert services.

Sources used for this publication

Ali-Yrkkö Jyrki, Pajarinen Mika: Julkinen t&k-rahoitus ja sen vaikutus yrityksiin. Analyysi julkisen t&k-rahoituksen vaikutuksista metalli- ja elektroniikkateollisuuteen (Public R&D financing and its impact on companies. Analysis of the effects of public R&D financing on the metal and electronics industries), ETLA discussion papers No. 846, 2003.

Country Specific Practical Guides to Regional Foresight, Finland, EU, European Research Area, 2002.

Arnold Erik, Luukkonen Terttu, Joerg Leonhard, Oksanen Juha, Thuriaux Ben, Whitehouse Shaun, Crean Gabriel, Hogrefe Dieter, Liang Yung Chii, Steel Raymond: Evaluation of Finnish R&D programmes in the field of electronics and telecommunication (ETX, TLX and Teletronics), Tekes, Technology Programme Report 2/2002.

Asiakastiedon aluekatsaus 2001, Asiakastieto.
Benchmarking of National Policies: Public and Private Investments in R&D, Final report, Expert group, EU, June 2002.

Böckerman Petri, Työpaikkojen syntyminen ja häviäminen Suomessa – alueellisia näkökohtia. (Job creation and loss in Finland – regional viewpoints) Publication No. 2000/7 of the Prime Minister's Office.

Böckerman, Petri (2002): Understanding regional productivity in a Nordic welfare state: Does it matter? ETLA Discussion papers, No. 798.

Hanell, Tomas, Aalbu, Hallgeir & Neubauer, Jörg: Regional Development in the Nordic Countries 2002. (Nordregio Report 2002:2).

Heikkilä Matti, Rintala Taina, Airio Ilpo and Kainulainen Sakari, (2002): Hyvinvointi ja tulevaisuus maalla ja kaupungissa (Wellbeing and the future in town and country), STAKES manuscript No.126.

Hermans, Raine and Luukkonen, Terttu (2002), Findings of the ETLA survey on Finnish Biotechnology Firms. ETLA Discussion Papers 819.

Huippuosaamisesta alueille kilpailukykyä, osaamiskeskusten väliarviointi 1999–2002, (Regional competitiveness from leading expertise, interim assessment of centres of expertise 1999-2002) Finnish Ministry of the Interior, 4/2003.

Huovari, Janne, Kangasharju, Aki and Alanen, Aku (2001): Alueiden kilpailukyky (Competitiveness of the regions), Pellervo Economic Research Institute's report No. 176, Helsinki.

Hyytinen Ari and Toivanen, Otto (2002) Do Financial Constraints Hold Back Innovation and Growth? Evidence on the Role of Public Policy, ETLA discussion paper No. 820.

Kainulainen Sakari, Rintala Taina and Heikkilä, Matti (2001): Hyvinvoinnin alueellinen erilaistuminen 1990-luvun Suomessa (Regional variation in wellbeing in the 1990s in Finland). STAKES manuscript No. 114.

Kautonen Mika, Kolehmainen Jari and Koski Pasi (2002): Yritysten innovaatioympäristöt, Pirkanmaa ja Keski-Suomi (Corporate innovation environments, Tampere Region and Central Finland) , Technology Review 120/2002, Tekes.

Kautonen Mika, Kolehmainen Jari and Koski Pasi, (2001) Verkostot, innovaatioympäristöt ja alueet (VIA) (Networks, innovation environments and the regions), Tampere.

Kautonen, Mika and Mari Tiainen (2000): Regiimit, innovaatioverkostot ja alueet (Regimes, innovation networks and the regions), Working Report No. 59/2000, University of Tampere, Research Institute for Social Sciences, Work Research Centre, Tampere.

Korkeakoulujen alueellisen kehittämisen työryhmän muistio (Work group's report on the regional development of universities and polytechnics), Report of Ministry of Education work group No. 28:2001, Helsinki 2001. www.minedu.fi/julkaisut/julkaisusarjat/ 2801kkalue/kuvailu.html

Kostiainen, Juha and Sotarauta, Markku (ed.), Kaupungit innovatiivisina toimintaympäristöinä (Cities as innovative operating environments), Finnish Association of Graduate Engineers (TEK), Helsinki 2002.

Kostiainen, Juha: Urban economic development policy in the network society (Doctoral Dissertation), Finnish Association of Graduate Engineers (TEK), Tampere 2002.

Kotitalouksien aluetilit 1995–2000 (Regional accounts of households 1995-2000), Statistics Finland, National Economy 2002:2.

Kuitunen, Soile and Oksanen Juha, Mikä rooli EU:n rakennerahastoilla on alueiden innovaatiotoiminnassa ja innovaatiopolitiikassa? (What role do the EU structural funds have in innovation activities and innovation policy?), Ministry of Trade and Industry 10/2002.

Lehto, Eero (2000): Regional impacts of R&D and public R&D funding, Labour Institute for Economic Research, Research study No. 79, Helsinki.

Leskinen Jari, Alueellisen yhteistyön kehittämishanke (Regional cooperation development project), Labour Administration publication No. 274, Ministry of Labour, Helsinki 2001.

Liiketoiminnan ja teknologian linjaus 2010 (Business and technology policy 2010), Federation of Finnish Metal, Engineering and Electrotechnical Industries (FIMET), 2003.

Littunen Hannu and Tohmo Timo, KTM:n hallinnonalan EU-hankkeiden suhde maakuntastrategioihin, Ohjelmakauden 1995–1999 toimialakohtainen tarkastelu (Relationship of the Ministry of Trade and Industry's administrative EU projects to regional strategies, review of the period 1995-1999 by sector) University of Jyväskylä, Department of Economics, 2002.

Maakunnallinen teknologiastrategia (Regional strategy), Satakunta, SWOT Consulting Group, 12.9.2001.

Marja Toivonen, (2001) Osaamisintensiivisten liikeelämän palvelujen tulevaisuudennäkymät (Future prospects of knowledge-intensive business services), ESR publication 83/01, Edita 2001.

Myrskylä, P., Niemi, E., Vartiainen, P. (1999) Menestys kasaantuu – alueet erilaistuvat. Aluekehityksen suunta 1990-luvulla (Success accumulates – regions differ. Regional development trends in the 1990s), Association of Finnish Local Authorities 1999.

Nilsson Jan-Evert, Uhlin Åke (2002) Regionala innovationssystem. En fördjupad kunskapsöversikt (Regional innovation system. An in-depth overview of expertise) VINNOVA Rapport VR 2002:3.

OECD, Science, Technology and Industry Outlook 2000.

Osaamisintensiivinen Suomi 2012-menestysklustereita, osaamista ja koulutusinnovaatioita (Knowledge-intensive Finland 2012 – success clusters, expertise and training innovations), interim report 2, Confederation of Finnish Industry and Employers, December 2002.

Oulu growth agreement 2006.
www.ouka.fi/kasvusopimus

Palmberg, Christopher, Niininen Petri, Toivanen Hannes and Wahlberg Tanja (2000): Industrial innovation in Finland – First results of the Sfinno project, VTT Group for Technology Studies, Working Papers, 47.

Pekonen Osmo, Pulkkinen Lea, (2002): Sosiaalinen pääoma ja tieto- ja viestintätekniikan kehitys (Social capital and the development of information and communications technology), Committee for the Future's Technology Assessment No. 11, Secretariat of Parliament publication No. 5/2002.

Pirkanmaan teknologian suunta 2001-ohjelma Tulevaisuudesta kilpailuetua (Future competitive advantage, Tampere region's technology policy 2001 programme), Council of Tampere Region publication No. B69.

Pohjois-Savon teknologiastrategia (North Savo's technology strategy), CI City Image Oy, 28.11.2001.

Porter, Michael (1990). The Competitive Advantage of Nations, Macmillan, Great Britain.

Ministry of the Interior's website: www.intermin.fi

Sotarauta Markku, Kautonen Mika and Lähteenmäki Tomi, Tulevaisuustiedosta kilpailuetua, teknologian ennakointikonsepti Pirkanmaalla (Pitenna) (Competitive advantage from future knowledge, predicting technological trends in the Tampere region), University of Tampere, Centre for Urban and Regional Development Studies (Sente), Sente publication No. 14/2002.

Ståhle Pirjo, Sotarauta Markku, Alueellisen innovaatiotoiminnan tila, merkitys ja kehityshaasteet Suomessa (Status, importance and development challenges of regional innovation activities in Finland), Committee for the Future's Technology Assessment No. 13, Secretariat of Parliament publication No. 8/2002.

Ståhle Pirjo, Sotarauta Markku, Alueellisen innovaatiotoiminnan tila, merkitys ja kehityshaasteet Suomessa (Status, importance and development challenges of regional innovation activities in Finland), Final Report, Finnish Parliament's Committee for the Future, Technology Assessment No. 15 (draft 12.2.2003).

Suomen kilpailukyky ja sen kehittämistarve (Finland's competitiveness and the need to develop it), Ministry of Finance 2002.

Susiluoto Ilkka and Loikkanen Heikki A.: Seutukuntien taloudellinen tehokkuus 1988–1999 (Economic efficiency of the regions 1988-1999), City of Helsinki's Department of Urban Facts, research study No. 2001:9.

Finland 2015: Balanced Development, Report on the Future by the Council of State to Parliament, Prime Minister's Office publication No. 2001/7.

Tavoite 6 -ohjelman vaikuttavuus Pohjois-Karjalassa (Impact of Target-6 programme in North Karelia), Ministry of Trade and Industry's administrative project). North Karelian TE-Centre, Corporate Department, 2002.

Statistics Finland, AlueOnline.

Statistics Finland, www.stat.fi/index_en.html

Annual Reports 1998–2003, Tekes.

Ylihuomisen kilpailukyky ratkaistaan tänään, Teknologiarahoituksen tulokset ja vaikutukset, (Future competitiveness is decided today, results and impact of R&D funding), Tekes 2002.

Contacts

Tekes
National Technology Agency

Headquarters
Kyllikinportti 2, Länsi-Pasila
P.O. Box 69, 00101 Helsinki, Finland
Tel. +358-105 2151
Fax +358-9-694 9196
www.tekes.fi

Customer service:
Tel. +358-10 521 5050
tekes@tekes.fi
General information about Tekes' services and project financing

All email addresses at Tekes:
firstname.lastname@tekes.fi

Publication orders:
www.tekes.fi/eng/publications/julkaisuluettelo.asp

Overseas offices

China
Tekes – National Technology Agency
Embassy of Finland
Kerry Center, South Tower, Level 14
1 Guanghua Road, Chaoyang District
Beijing 100020, P.R. China
Tel. +86-10-8529 8625
Fax +86-10-8529 8654

EU Liaison Office, Brussels
Tekes – Embassy of Finland
Finnish Liaison Office for EU R&D
Av. des Arts 58
B-1000 Brussels, Belgium
Tel. +32-2 287 1239
Fax +32-2 287 1279

Japan
Tekes
Embassy of Finland
3-5-39 Minami Azabu, Minato-ku
Tokyo 106-8561, Japan
Tel. +81-3 5447 6000
Fax +81-3 5447 6046

USA, San Jose
Tekes – National Technology Agency of Finland
111 West Saint John Street, Suite 500
San Jose, CA 95113, USA
Tel. +1-408 971 7303
Fax +1-408 971 7277

USA, Washington, D.C.
Tekes
Embassy of Finland
3301 Massachusetts Avenue, NW
Washington, D.C. 20008, USA
Tel. +1-202 298 5837
Fax +1-202 298 6040

Regional Technology Units

Technology Units at the Employment and Economic Development Centres (TE Centres) provide Tekes' services and international networks to customers in the region.

TE Centre for Häme
Technology Unit
Rauhankatu 10, FI-15110 Lahti
Tel. +358-10 521 5340
Fax +358-10 521 5349

TE Centre for Varsinais-Suomi
Technology Unit
Ratapihankatu 36
P.O. Box 523, FI-20101 Turku
Tel. +358-10 521 5330
Fax +358-10 521 5339

TE Centre for Satakunta
Technology Unit
Pohjoisranta 11 E
P.O. Box 266, FI-28101 Pori
Tel. +358-10 521 5290
Fax +358-10 521 5299

TE Centre for Pirkanmaa
Technology Unit
Kauppakatu 4
P.O. Box 467, FI-33101 Tampere
Tel. +358-10 521 5310
Fax +358-10 521 5319

TE Centre for Central Finland
Technology Unit
Cygnaeuksenkatu 1
P.O. Box 44, FI-40101 Jyväskylä
Tel. +358-10 521 5220
Fax +358-10 521 5229

TE Centre for South Savo
Technology Unit
Mikonkatu 5
P.O. Box 164, FI-50101 Mikkeli
Tel. +358-10 521 5270
Fax +358-10 521 5279

TE Centre for Southeastern Finland
Technology Unit
Snellmaninkatu 10
FI-53100 Lappeenranta
Tel. +358-10 521 5260
Fax +358-10 521 5269

TE Centre for South Ostrobothnia
Technology Unit
Huhtalantie 2
FI-60220 Seinäjoki
Tel. +358-10 521 5300
Fax +358-10 521 5309

TE Centre for Ostrobothnia
Technology Unit
Hovioikeudenpuistikko 19 A
P.O. Box 131, FI-65101 Vaasa
Tel. +358-10 521 5363
Fax +358-10 521 5369

TE Centre for Ostrobothnia
Kokkola Service Unit
Ristirannankatu 1
P.O. Box 240, FI-67101 Kokkola
Tel. +358-6-832 6500
Fax +358-6-832 6592

TE Centre for North Savo
Technology Unit
Käsityökatu 41
P.O. Box 2000, FI-70101 Kuopio
Tel. +358-10 521 5240
Fax +358-10 521 5249

TE Centre for North Karelia
Technology Unit
Kauppakatu 40 B
P.O. Box 8, FI-80101 Joensuu
Tel. +358-10 521 5210
Fax +358-10 521 5219

TE Centre for Kainuu
Technology Unit
Kalliokatu 4
FI-87100 Kajaani
Tel. +358-10 521 5230
Fax +358-10 521 5239

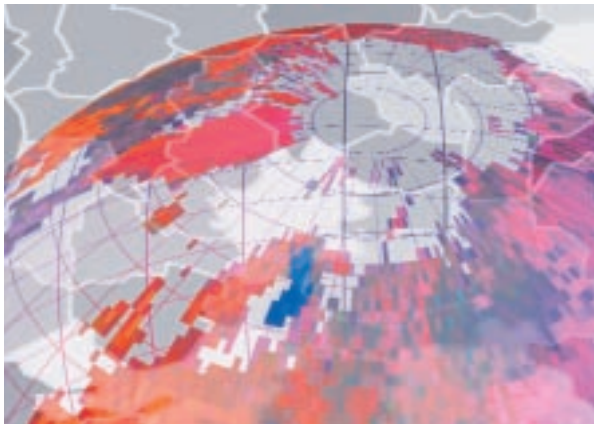
TE Centre for Northern Ostrobothnia
Technology Unit
Viestikatu 1
P.O. Box 86, FI-90101 Oulu
Tel. +358-10 521 5280
Fax +358-10 521 5289

TE Centre for Lapland
Technology Unit
Ruokasenkatu 2
FI-96200 Rovaniemi
Tel. +358-10 521 5250
Fax +358-10 521 5259

TE Centre for Lapland
Kemi Service Unit
Asemakatu 19
P.O. Box 128, FI-94101 Kemi
Tel. +358-10 521 5254
Fax +358-16-368 7419

TE Centre for Uusimaa
Maistraatinportti 2
P.O. Box 15, FI-00241 Helsinki
Tel. +358-9-2534 2111
Fax +358-9-2534 2400

March 2004



Innovations generate regional vitality

Knowledge, specialisation and networking determine success in international competition

Knowledge attracts knowledge, thus becoming concentrated, because companies seek environments of excellence. Finland has room for more strong, specialised centres of knowledge and skills – ie, growth centres whose knowledge, specialisation and networking should be strengthened. Companies located outside growth centres can also prosper if they can access the knowledge and skills they need through networking.

Over the last two decades, Tekes has financed some 17,000 research and development projects in the companies and some 12,500 research projects in the public sector. For this publication, we have selected a group of typical development paths, and research and development projects, to serve as examples of the widespread regional impact of Tekes' funding and expert services.

TEKES

NATIONAL TECHNOLOGY AGENCY
Kyllikinportti 2, Länsi-Pasila
P.O. Box 69, FI-00101 Helsinki, Finland
Tel. +358 105 2151, fax +358 9 694 9196
Customer service: tekes@tekes.fi
www.tekes.fi

March 2004 / Oddball Graphics / Markprint