

# **Making Finland a leading country in innovation**

*Final report of the Competitive Innovation Environment Development Programme*



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## Preface



World-class innovation activity is a crucial competitive factor in the global economy. Substantial investments in the advancement of research and development activities and in the innovation system have been made in Finland. Several reports on innovation activity and on its development needs have also been published lately (Report on Finland in the Global Economy, the strategy for reforming the seed capital and service system for start-up innovation companies prepared by Anssi Paasivirta, also known as the AISP strategy, and the reports of the Science and Technology Policy Council of Finland). It is important that the recommendations presented in these are implemented effectively. If the time span under review is extended further, the worldwide development trends would seem to require even more daring measures and reforms. In order to survey these, Sitra carried out the Competitive Innovation Environment Development Programme, running from the end of 2004 into 2005. Twenty-four people important to the development of innovation activity were invited as participants from public administration, businesses and research institutions. Senior Advisor, Professor Juhani Kuusi, served as the Chairman of the development programme. The programme took place in five stages, two of which were carried out abroad, in San Diego and Dublin. The objective of the sessions abroad was to become acquainted with exceptionally challenging innovation environments.

This report is the final report of the development programme. It is divided into two parts, the first of which provides an overview of Finland's situation, changes in the environment and innovation activity. The latter part contains the actual action programme. The report examines the future development

of innovation activity. Our challenge in the long run will be that in order to secure its future success, Finland will have to become a leading country in innovation. We need a dynamic innovation environment that will attract experts and investments. In order to build such an environment, it is not enough to invest in know-how and in research and development. We must also be able to create an encouraging and inspiring innovation culture where enterprise is desired and accepted.

With a view to the future, the programme had to produce a selected number of concrete measures that can be used to substantially increase the competitive ability and attractiveness of the innovation environment over a longer time span. The report and its proposals for action are not intended to be an all-inclusive programme. The programme has taken earlier reports into consideration, and the actions presented in them that are appropriate as such have not usually been repeated. Many proposals can only be carried out as cooperation between several actors, and many of them will even require legislative changes. The parties with the main responsibility for the implementation or preparation of each proposal are mentioned at the end. For its part, Sitra is going to seize the proposals and promote them in its Innovation Programme. The preparation of several proposed actions has already begun.

This report is intended to be used by the actors and decision-makers of the innovation system. However, the analyses and proposals for action included are probably interesting to all parties involved in developing Finland's future.

We want to thank all parties that participated in the development programme and were responsible for its successful implementation, both in Finland and abroad.

Helsinki, 23 March 2005  
Innovation Programme  
Finnish National Fund for Research and Development SITRA

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***I***

***Finland in the global economy***

## Finland's paradox



By hard work and determination, the Finns have been able to make Finland one of the most successful countries in the world. One of the most significant achievements is the Nordic-type affluent society with free general education, social and health-care services available to everybody, small income disparities, little poverty and the wide participation of women in working life. Finnish values, such as an appreciation of education and work, an ambition to attain equality for women, and technology optimism have also supported our success. Our innovation system is one of the world's best if contributions to research and development and the share of high technology in Finland's industrial production and exports are used as indicators.

A large number of indicators place us among the top performers. However, we have serious problems in Finland. There are about 280,000 people unemployed, the labour force is decreasing and the dependency ratio is weakening. Ageing causes a permanent change in the availability of labour, which will particularly hamper the offering of services. Unemployment will decrease with ageing, but a part of unemployment is structural and therefore it is probable that there will be simultaneous unemployment and a labour shortage in Finland.

A downward trend is currently in sight. Our country attracts neither immigrants nor investments. Industry is looking at expanding markets and is moving the focus of production abroad. We are about to face a fundamental question. How can we maintain and finance an affluent society given an ageing population and intense global competition? The Finns' standard of living and the preconditions for a good life have been improving for decades. The depression of the 1990s was an unpleasant experience but after it our economy improved again. However, unemployment has continued at a high level. Despite good development, our standard of living is not on par with the best countries: measured by GDP per capita, we are in 15th position. We pay high taxes and cannot purchase services on the market. Entrepreneurial activity is low in Finland, which is linked to the lack of tax incentives, among other things.

It is reasonable to talk about *Finland's paradox*, given that a very competitive and skilful nation does not attract investments, is not in the pole position in the race for a high standard of living and is not able to eliminate large-scale unemployment. Finland's paradox does not auger well for its competitive ability

and for the prospect of it becoming wealthy.

The basic message of the report is that in order to achieve constant success and good competitive ability within 5 to 10 years, we must substantially improve the effectiveness of innovation activity. It is not enough for Finland to be good, we must be at the level of the best countries and more – at the leading edge of innovation. This is quite possible and we have a good platform from which to take-off. However, we can only become a leading country through a bold policy of reform. If we allow ourselves to become complacent and content with small improvements, we will face the danger of a rapid decline and the closing-off of opportunities. Then we can say farewell to the affluent society.

Finland has substantial strengths with regard to competitive ability and innovation activity, the following of which are worth mentioning:

- The external balance of the economy and public finances are in good order so far
- The growth of the economy has been among the fastest in the world since the middle of the 1990s
- We use almost 3.5% of our GDP for research and development; this is the third highest figure in the world after Sweden and Israel
- Labour productivity has increased rapidly in industry, particularly in the electrotechnical industry, surpassing the level of the United States
- With regard to achieving the objectives of the Lisbon strategy, Finland is among the three best countries
- In comparisons of competitiveness conducted by the World Economic Forum (WEF) and the International Institute for Management Development, Finland has been ranked among the top countries for the last number of years
- The WEF Environmental Sustainability Index ranks us in first place
- Richard Florida's Creativity Index ranks Finland in position 2 after Sweden
- Finland holds position 5 in the eEurope index 2005 and position 3 after Singapore and Iceland in the WEF ICT listing
- Among the OECD countries, the number of people employed in information and communication technology in proportion to the total labour force is the highest in Sweden, followed by Finland and Denmark

- Among the younger age groups, the proportion of people with a higher education degree is one of the highest in the world
- The share of researchers and R&D staff among the employed is higher in Finland than in the other EU countries, the United States and Japan
- Finland is the least corrupt country in the world.

Professor Manuel Castells considers the successful combination of an affluent society and its competitive ability as the special characteristics of “the Finnish model”. In Finland, the development of an affluent society has supported economic growth.

However, everything is not perfect. The following aspects are worthy of special attention:

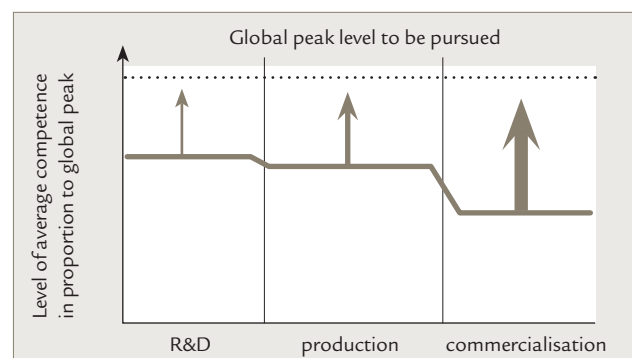
- Measured by GDP per capita, we are far from the vanguard of OECD countries in position 15
- The rate of employment in Finland is low (67.2% in 2004), while in Denmark, for example, it is more than 75%
- Nearly 9% of the labour force remains unemployed in Finland, which translates as almost 280,000 people
- The population is ageing rapidly and the dependency ratio is weakening more steeply than in the OECD countries on average
- The R&D intensity of the service sector (R&D costs in proportion to the value of production) does not reach the level of the top OECD countries
- Labour productivity within most service sectors is relatively weak
- The investment rate is relatively low in Finland, clearly below the OECD average
- The share of GDP represented by direct investments coming to Finland is noticeably below the EU average
- Even though the level of education in the younger age groups has risen fast, about 15% do not have a secondary-level qualification or a higher degree
- Immigrants represent about 1.7% of the population, while their proportion in Sweden, the Netherlands and the United States is at least 10%
- Foreigners represent about 6% of all doctoral students in Finland, while their share is more than 15% in Switzerland, the UK, Belgium, the USA, Australia, Sweden, Denmark and Norway, for example.

From the perspective of today's national economy, trade and commerce, the following can be considered as fundamental challenges:

- maintaining a high level of exports, which functions as the driving force of economic growth
- increased investments across the entire economy (fixed investments, R&D investments)
- developing the service sector (productivity, increased R&D efforts, exports, public services)
- utilisation of technology in traditional fields and in public and private services (increasing productivity, improving quality)
- commercialisation of ideas, creativity and know-how (funding in the establishment and early growth phases, business competence, productisation, branding, willingness for growth)
- increasing entrepreneurial activity (incentives, changes in the atmosphere, elimination of the obstacles to entrepreneurship).

In an extremely simplified way, the challenges to Finland's competence can be presented using Figure 1, where the vertical axis shows the level of competence in relation to the international level and the horizontal axis shows the three central areas of competence, including R&D (research, product development), production (manufacturing, industrial processes and productivity), as well as commercialisation and marketing. Finland must achieve the top level in all the areas of competence. Our strongest area is research and development, although the trend in industry investments is downward in this sector. We have

Figure 1. The level of Finnish competence in some key fields






seen good growth in manufacturing productivity, particularly in the electrotechnical industry, but for various reasons, the growth in productivity has been practically non-existent since the middle of the 1990s in the forest industry, construction, and the textile and fashion industry. The area requiring most development is commercialisation and marketing (linked to a low rate of entrepreneurship and the undeveloped state of the service sectors).

The industry (and construction) share is considerable in Finland's production structure, representing almost one-third, while the service sector accounts for about two-thirds and the primary production share is over 3%. The technology-intensive

industry share in Finland's GDP increased extremely rapidly in the 1990s. Industry is also emphasised in Finland's exports, and the share of high-tech exports has increased particularly strongly.

The growth in productivity has been weakest in the construction and service sectors. The Finnish service sector is smaller than that in several other industrial countries (for example in the United States). The development of the service sector lags behind industry particularly in terms of R&D, productivity, exports and internationalisation. Productivity is only close to the global peak in a few service branches, such as telecommunications and the banking and finance sector.

## World of unexpected opportunities 2015



The future is imbued with many uncertainties. This report does not present any scenarios or analyse weak signals. We present only those trends and tendencies that we presume to be increasing and that have the capacity to change the world profoundly. It is extremely important that we are able to visualise the world within 5 to 10 years should these trends continue. This analysis of the future has substantially benefited from the trips that the workgroup made to California (San Diego, Los Angeles, Tijuana) and Ireland (Dublin) in early 2005.

### **Pacific Rim on the rise**

One of the most significant changes is the fact that the Pacific Rim is becoming the world's leading economic zone. Its sphere includes North America (the US and particularly its west coast, Canada and Mexico), Japan, China, Korea, Taiwan, etc. The region is already an area of huge industrial production and of population concentration. The Pacific Rim is also aware of itself: the people, businesses and governments of the region are seeking connections and partnerships, and constantly monitor the movements of each other. China and India are leading this development. From 1998 to 2005, industrial production has increased by 2.3-fold in China, about two-fold in South Korea and about 1.5-fold in India, while productivity in the United States, Japan and the EU has almost stagnated. The Pacific Rim has already become the world's leading region in terms of science and technological development. The role of the United States has changed from that of an industrial producer into a developer of research activities and high-quality innovative production. China, India, Korea and other developing countries in the region are increasing their R&D efforts and educating their population, and will be increasingly more capable of high-quality industrial production. From 1992 to 2002, China doubled its R&D provisions, and exports of its technology products have increased by about 20% annually. Finnish business must also focus on the Pacific Rim, in other words the other side of the globe.

### **Europe in change**

What will happen to Europe when the focus of the world's development moves to the Pacific Rim? Industrial production

and jobs within the EU have been diminishing for years, and Europe has lost its competitive ability. The problems of the EU include, among others, rigidity in the labour market and in the national structures of the old member countries. The growth of the national product in the euro countries has been 1.9% per annum in the 1990s, compared for example to 3.4% in the USA, 5.5% in Korea and about 9% in China. Under the circumstances, the Lisbon strategy of making the EU the world's most competitive and dynamic knowledge-based economy by 2010 does not seem to be coming true. At present, new plans to achieve the Lisbon objectives are being prepared. The enlarged European Union is an alliance of 450 million inhabitants with a high level of education, stable social conditions and strong industrial traditions. The EU is also a value-driven community where shared values strengthen solidarity. Respect for human rights is emphasised in the EU and in its foreign policy. The internal market is large but its functionality is weak, particularly within the service and networking branches. The EU now has a fairly comprehensive common euro area that makes the euro a significant currency. The new constitutional treaty will clarify the operations and decision-making of the EU. During the next 5 to 10 years, Europe will still be a significant economic zone, although its growth rate will clearly fall short of that of developing regions.

It is important for the development of the EU to improve transatlantic relations with the United States which is Europe's most significant trading partner and to which there are plenty of historical and cultural ties. The East, in other words the new members and the applicant countries (Turkey, among others) and the border countries (Russia, the Ukraine, etc.) will also affect the development of Europe. With its growing market and abundance of competence and business partners, Russia is a particularly important country for Finland. There is a lot of growth potential in these regions, and production costs are below the EU level. Some of the obvious weaknesses of Europe include the ageing population, the difficulty in decision-making and the slow transformation of economies. Some of the solutions to the ageing problem include increased immigration and extended work permits. Finland's ability to utilise the strengths of the EU and avoid its constraints is among the central challenges for our EU policy.

### **The population is ageing but are we prepared for it?**

Ageing is one of the trends for which relatively reliable information is available. The development of population by continent reveals some interesting points.

REGION (POPULATION IN MILLIONS)	2000	2050
Europe	727	603
North America	314	438
Latin America and the Caribbean	519	806
Africa	794	2000
Asia	3672	5428
Oceania	31	47

The population of Europe is decreasing along with ageing. Within the countries of the European Union, the population is substantially increasing only in Ireland and France (Ireland 3.8 m -> 5.4 m, France 59.2 m -> 61.8 m from 2000 to 2050). It must be noted that even though the focus of growth is in Asia, Africa and Latin America, the population of the United States is also increasing. The share of people younger than 15 years in the US population is 21.8% at present, while the corresponding figure in Italy is 14.3%, in Germany 15.6% and in Finland 18.1%. In Japan, which is one of the most rapidly ageing countries, the share of people younger than 15 years is 14.6% of the population. It should be mentioned that the expansion of the EU in the beginning of 2005 did not substantially improve the population situation, because the ageing of the population is as rapid in the new member countries as in the old ones, and the birth rate is even lower than that in Finland. China is in a challenging situation with regard to ageing, because the one-child policy will mean that in 20 to 30 years, the share of young people in the population will become distinctly smaller. It has been said that China must become rich before it ages. However, the actual problem is not ageing but the declining birth rate.

The ageing of the population will bring substantial changes to the labour markets of different countries and cause pressures to change both the service and the pension systems. The present economic system can only be efficient through growth. Most national economies have been built on the as-

sumption of a constantly increasing population. If the ageing and declining population causes decreases in demand and the supply of labour, the economy will drift into immense structural difficulties. The size of the young generation also has an effect on society's ability to reform and be innovative.

Increased immigration is vital to many countries. Also, in Finland, 660,000 people will leave the labour force between 2006 and 2015. Immigration will strengthen the variety of Finland's society and increase its dynamics. Immigrant families often have several children and will thus contribute to making the population younger. Immigration, however, also brings social problems (issues of language and culture, immigrants' unemployment and integration, and discrimination), and due to these, it is imperative that racism be prevented. An active, controlled immigration policy and integration will be among the most important methods of facing the decreases in the labour force and young age groups. When affected by ageing, Finland must be able to translate this into a resource, for example by developing products associated with ageing for the global market.

### **Digitalisation continues**

Digitalisation and the increasing significance of biological information are the two most significant science-intensive and technology-intensive trends. Digitalisation is seen, for example, as rapid growth in the number of broadband connections. In Korea, which is the most advanced country in this respect, there were 25 broadband connections per 100 inhabitants in 2004. Broadband connections are perhaps the most crucial factor in promoting digitalisation. Convergence is a technologically significant process whereby the same content can be distributed through different information channels, such as telephones, computers and digital TV receivers, on wired and wireless links, etc. Another technological trend is the integration of information technology as a part of the environment. This kind of information technology (ubiquitous computing) will substantially change the management of space and processes (logistics, the control of the environment, etc.). Only a fraction of the opportunities provided by information and communication technology to develop services, improve productivity and increase worldwide communication has been utilised so

far. Great benefits will be gained through digitalisation by using it to change existing functions. The focus of development has switched from equipment manufacturing to software and content (services, multimedia, entertainment, etc.). This transition is a big step for Finland, because the country specialises in the electrotechnical industry and, for example, its software industry has not reached the worldwide market. The possibilities of content production and its associated creative branches remain largely unutilised. The most crucial challenge for Finland is to utilise information and communication technology and digitalisation across the entire society: within traditional sectors, in services and in public administration.

### ***Biosociety about to arrive?***

The growing significance of biological information is clearly visible. The amount of biological information is rapidly increasing, particularly with regard to genotyping. Knowledge of cell-level processes and the functions of the brain is also increasing. Some of the visible forms of biotechnology based on biological information include, among others, artificial organs, biochips, cloning, hydrogen cells, genetic engineering, gene therapy and targeted drugs. Thanks to biological knowledge, the expected lifetime of humans can be extended. It has been estimated that by around 2050, even an expected age of 120 years can be achieved. Another significant application of biotechnology is genetically modified food. For example, it is possible to develop species of plants that yield more in a smaller area or adapt themselves to more severe natural conditions. This may make it possible to solve the food problems of the world while simultaneously reducing the burden on the environment.

The biotechnology sector is increasing in the EU, the USA and Japan, as well as in transitional economies such as China. Both Europe and the United States already have a couple of thousand businesses involved in the biotechnology sector. The sector employs more than 60,000 people in the EU and more than 160,000 people in the United States. Europe is far behind the USA in this race: the USA has an advantage of about 2 to 1 in terms of investments, research contributions, the number of researchers, etc. Countries such as China with great incentives to invest in biotechnology and a lack of ethical debate similar to

that found in Europe and the United States may take a leading position in the utilisation of biotechnology.

Researchers have begun to talk about the biosociety that will come after the information society. It is probably more correct to talk about a hybrid society in which information technology affects, above all, the means of action and communication possibilities of society, businesses and individuals, while biotechnology affects health care, food production, materials, etc.

### ***Ecological boundary conditions must be identified***

Ecological change is difficult to predict and manage. The basic problem is that according to the current trends, many global environmental problems will only have increased by 2020, despite the fact that these issues are receiving an increasing amount of attention. A key phenomenon is atmospheric warming, which would seem to be caused particularly by the increased concentration of carbon dioxide in the atmosphere. Statistics spanning 140 years indicate a clear increase in mean temperature since the 1980s. This development could have many harmful effects for Finland.

The increase in population and the growth in traffic and industrial production burden the environment. In poorer countries, forests are cleared to create fields, and the wood is simply used for heating. A requirement as basic as clean water is an increasingly scarce commodity in many regions. The fuel reserves of the globe are limited. The greatest oil reserves are found in the Middle East (the OPEC countries), whereas the region with the highest consumption, North America (24 billion barrels per year), and the region with the strongest growth, China and its vicinity (23 billion barrels per year), have remarkably small oil reserves. China currently consumes 8% of the world's oil resources. If its demand for oil is of the same order as the growth in the consumption of other raw materials, oil consumption in China will increase by a factor of 2 to 3 within ten years. According to current estimates, the oil reserves will be sufficient for about 20 to 30 years. In order to reduce harmful emissions, the burning of coal and oil must be reduced, and efforts to develop and commercialise cleaner forms of energy must be increased.

Natural disasters are also a significant and often unpredictable risk factor (floods, volcanic eruptions, earthquakes, etc.). Thanks to Finland's remote northern location, the country is safe from many environmental problems, but on the other hand, our natural environment is relatively sensitive. Ecological phenomena, such as atmospheric warming, are global, as are the means of controlling them. Increased environmental awareness and the importance of ecological concerns are a clear trend. This will have a great effect on investments made to counteract global environmental problems.

The demand for energy-efficient and material-efficient solutions will increase exponentially in the future when the price of raw materials and the cost of harmful emissions increase as a consequence of political agreements and normative control. At the same time, the development of technology will continuously create new opportunities to solve environmental problems. It is possible to switch to energy-saving technology, to increase recycling and closed processes, to improve waste management and to control water supplies and energy reserves better. Finland has great potential to productise and market its high-class environmental know-how and to increase its environmental technology exports. Atmospheric warming, which may significantly change the climate in Finland, must also be translated into an advantage, and it must be ensured that within 20 to 30 years, we will have competitive operations that can adapt themselves to climate change.

### **Undeniable globalisation**

The major common denominator of the change factors of the future is globalisation. Globalisation can be crystallised into two features, mobility and dependence. Capital, products, services and ideas, as well as production factors such as R&D operations and labour, are moving faster and more extensively across the borders of the entire globe. At the same time, the mutual dependence of regional economies is strengthening. Economic crises and variations in demand and supply are reflected very quickly in the global economy.

Globalisation is not a new phenomenon: international trade and the mobility of people increased significantly in the 19th century. The development of information and communication technology during the last two or three decades has

contributed to the present extension and deepening of globalisation. Information and communication technology enables worldwide operations and decentralisation of functions, accelerating and intensifying the processes of the economy. The cycles of economy will accelerate. A global network economy means that partners can be located anywhere in the world. Increasingly more countries and actors have entered the sphere of globalisation, and rapid data communications links facilitate real-time interaction all over the globe.

Today we can talk about the third stage of globalisation, characterised by a movement of research and development to developing countries such as China and India. In new business models, different stages of the value chain are outsourced. This also applies to research and development and other parts higher up the value chain. When R&D functions are outsourced to developing economies, these economies will benefit from R&D know-how. China, India and many other developing countries are capitalising on this outsourcing process by offering attractive innovation environments (science parks, etc.) to the world's leading enterprises. The costs of product development in China, for example, are presently about one-third of the costs in industrialised countries. As this trend continues it will level the differences between industrialised and developing countries and the comparative advantages. The newest phase of globalisation has been seen as a great threat to the traditional industrial countries. It has led them to develop new strategies and to search for their own strengths. Research, development and innovation activities have been further identified as the most important factors strengthening competitive ability. Industrialised countries believe that by maintaining know-how at a high level, they can retain their lead in the areas of more demanding new production.

Globalisation accelerates modernisation, for example by increasing urbanisation and industrialisation. Tourism, international business and mass media increase multi-cultural awareness. Encounters and even confrontations between different groups of people and cultures are increasing. Great changes are taking place in value systems, even if some of these changes are slow. As globalisation is standardising operational models throughout the world, the appreciation of national and local identities will rise. Values that emphasise individualism and quality of life have strengthened in industrialised countries. In

spite of secularisation, religion still has a significant position in individuals' values.

Global economic trends clearly indicate that services will become more important. The growth of services can be interpreted as a rise in customer awareness. When the supply increases, the customers' choices will determine the success of products. The customer end of the production chain has become even more important. The clientele is dividing into increasingly distinct segments, but simultaneously there is a huge market for certain mass-produced articles. The margins of mass production are decreasing and competition is becoming more intense. Added value is sought by tailoring the products to the different market segments. Services related to the products form an increasing part of the turnover. The significance of brands increases in a customer-controlled market economy. Such a world puts emphasis on design, the significance of the creative industries and cultural know-how. New markets will open for tourism, entertainment and the culture industry.

The effect of the said development tendencies and globalisation is changing the world into an extremely complex and unpredictable "self-controlling system". Predictability has been replaced by interruptions and turbulence. The global economy provides both small and large enterprises with new business opportunities but it is also associated with growing risks (economic crises, cultural conflicts, tensions between developing and declining regions, environmental catastrophes, etc.). Globalisation cannot be stopped, and it is accelerated by the desire of the developing countries to raise their standard of living and to receive their share of global prosperity. Even though protectionist actions still occur (particularly within agricultural production), the advantages of free trade are obvious. Globalisation has raised the standard of living of hundreds of millions of people in developing countries, but a significant part of the global population still lives in conditions ravaged by wars, exile and poverty. The need for global governance and mutually accepted rules is increasing.

### ***Finland facing new opportunities***

How will Finland manage in changing conditions? After all, globalisation is more a possibility than a threat for Finland. We have a well-educated population and we make signifi-

cant investments in knowledge and competence. However, opportunities will not be realised by themselves; one must consciously seize them. In a rapidly changing world of unexpected opportunities, Finland's ability to react and reform will face a severe test.

From the perspective of know-how, Finland's school system has functioned well by guaranteeing everybody the opportunity to study and develop oneself. This is one of the most significant competitive factors of the Nordic welfare society. In future, as the population ages and the competition for competence becomes more intense, it will be more important to be proactive in preventing people from dropping out of education and working life. Finland's absolute strength is that everyone has the opportunity to use his/her creativity and know-how, and this makes Finland stand out from socially polarised countries.

Our research and development is at a good level but the amounts spent are small. This is not a question of just increasing financial input but rather of improving the effectiveness of R&D operations. In a small country, focusing is necessary in order to achieve the top level. This applies to research activities as well as to product development. One of the indicators of the effectiveness of R&D operations is the number of new competence-based growth enterprises. When measured by this indicator, we have serious shortcomings that need to be corrected by increasing public funding for enterprises in the seed and early growth stages. In addition, public support should be counterbalanced by more active, expansive entrepreneurs.

Finland has strong technological know-how, especially in information and communication technology. Competence in new technologies, particularly in biotechnology and nanotechnology, should be strengthened further. The underdevelopment of the service sector can be considered a clear weakness of Finland in a customer-controlled economy. One symptom of this is the dearth of global consumer brands (cf. many Swedish success concepts such as Ikea and H&M). In the future, innovation activity must be substantially extended to the areas of business concepts, creative industries, services and technology utilisation, without forgetting the modernisation of traditional industry. The structure and operating models of public-sector services must be reshaped at once in order to avoid a decrease in the level of services and a financing crisis.


Another significant weakness of ours is the relatively low level of entrepreneurial activity. We seem to lack financial as well as mental incentives for entrepreneurship and risk-taking. Finland's culture of equality has not been able to place enough value on individuals and their desire for success. Finland is not particularly tolerant of differences. A tolerant atmosphere has to be strengthened both by national measures and within work communities. The significance of tolerance will become more emphasised when the number of immigrants and multi-cultural work communities increases.

Once the focus of the global economy has moved to the Pacific Rim, we will have to invest more in the internationalisation of innovation activity and entrepreneurship. European integration has attracted the decision-makers' attention and the globalisation strategy has been trampled upon. Ageing will be rapid in Finland during the next few years, and we have not prepared for it with the required degree of seriousness. For example, our immigration policy that should consist of active persuasion of experts in the circumstances of globalisation remains passive and backward.

The good quality of life of the Finns can also be secured in changed conditions. The idea of sustainable development is a strong guide, combining the demands of economic, social and ecological development in a balanced way. None of these factors may leave the others behind in the long run. Short-term focal points clearly emphasise the economic factor. This is due to intensifying international competition, the success of which will create the economic foundations for securing the financing of the welfare society. On the other hand, a small country cannot manage if it is not able to utilise the talent of the entire population, emphasising socially sustainable development. Ecological boundary conditions will become stricter, which will lead to the development of environmentally friendly technology that saves energy. This report concentrates on the cornerstone of economic success, in other words innovation activity. By building a world-class innovation environment in Finland, we have done a lot to secure the preconditions for a good life.



## Towards dynamic innovation environments



Experiences and analyses of globalisation indicate that the global economy has entered an innovation-oriented phase. It is characterised by:

- intensifying competition in the global market
- human capital becoming one of the most central factors of competitive ability
- emphasis on research and development nationally as well as in enterprises
- differentiation of products and services according to customers and markets.

Each national economy is in its own phase of development and all such economies are not necessarily on the same development track. Nevertheless, new developing national economies (China, India, South Korea, etc.) will be rapidly moving to the innovation-oriented phase. Correspondingly, many current industrial countries are in danger of drifting to a prosperity-oriented phase, characterised by excessive complacency with the achieved competitive ability and standard of living. This may lead to regression and freezing of the society's transformation ability. Signs of stagnation are already visible in Finland. Increasing social dynamics is one of the most important fundamental challenges when making Finland a leader in innovation activity.

### ***Innovation at the core of human activities***

Innovation refers to the successful production, application and utilisation of novelty both in the economy and in society. Innovations can be classified as being technological, product, process, service or organisational innovations. Innovation creates added value to the operations. The innovation process has traditionally been perceived as consisting of three different stages, namely invention, innovation and dissemination. This traditional view has been called the waterfall model because it is based on the idea that the amount of basic research affects the number of innovations, which in turn determines the growth rate of production and subsequently of employment.

However, limitations of the waterfall model have been identified. It has been noticed that technological change does not proceed in a linear manner as presumed by the model, and that it is impossible to separate any clearly distinguishable stages that must follow each other. It has also been noticed that several

social factors affect the development of innovation processes. Market factors and social demand are the most crucial of these. A more recent view emphasises the interactive character of the innovation process, the significance of communication, and the synergic advantages of networks and clusters.

The concept of innovation is often associated with technology alone, but practical innovations can also comprise new types of products, services, operating models, organisation methods or strategic approaches. According to more recent opinion, innovations can be created any time and in any area of economic (or other) activity. When innovation is understood in its broad sense, there is no reason to associate it only with great radical changes but also with gradual incremental changes. The change of view increasingly emphasises the significance of an entire innovation process or innovation activity in addition to an individual innovation.

This programme has adopted a broad view of the concept of innovation. In other words, innovation refers to doing things in a new, different way, the objective being a better final result or creation of added value. According to this, the reform of the Finnish economy will require good conditions for both radical and incremental innovations. When employing the broad concept of innovation, attention is focused above all on the learning processes through which new knowledge and new technology are created, distributed and used in different fields. Learning is an interactive process affected by existing production structures, organisation structures and institutional factors.

### ***The innovation system is an interaction network***

In the 1990s, it became common in Finland to take a holistic view of innovation activity through the concept of the innovation system. The innovation system consists of a group of institutions that together and separately contribute to the development and dissemination of new knowledge and new technologies and that form the structural and legislative framework within which the government implements policy that promotes innovation activity. Defined more broadly, the innovation system includes the structures, actors and interdependencies, as well as the operating environment created by regulations. Finland's national innovation policy in particular but also the EU's innovation policy



affect the innovation system as well as innovation activity. The main levels of innovation policy are: development of structures and infrastructure, and supporting the innovation processes of enterprises and development of services, as well as the promotion of an innovation culture and the creation of shared visions.

The most crucial actors of Finland's innovation system at national level include the ministries, the Science and Technology Policy Council, the Academy of Finland, National Technology Agency of Finland Tekes, National Fund for Research and Development Sitra, the universities, Technical Research Centre of Finland VTT, sector research institutions, Finpro, Finnvera, Finnish Industry Investment and venture capital investors. Some of the important actors at local level include various technology centres, TE Centres, so-called centres of competence, local venture capital investors, as well as industry-related municipal bodies. It is characteristic of the Finnish innovation system that in addition to a number of large national actors, it is composed of many relatively small organisations, the operations of which have elements of duplication. It is most important to intensify cooperation and increase interaction. Duplication must also be eliminated and units with sufficient functional ability must be formed. Even though cooperation works better in Finland than in many other countries, we are still far from an operating model in which local and national innovation actors develop the innovation environment jointly in accordance with a common strategy.

Cooperation relationships welling forth from the operating environment have a significant effect on innovativeness. Surveys have indicated that the most important sources of innovations in enterprises include customers and subcontractors, and often also competitors. Interaction between universities and enterprises is also a significant source of innovations. The innovation system has indeed been supported by the idea that innovations are not created and organisations and individuals do not innovate in a vacuum: an organisation is always a part of its environment and many social actors influence the innovation activity of enterprises and other organisations.

### **The innovation environment as a culture medium for innovations**

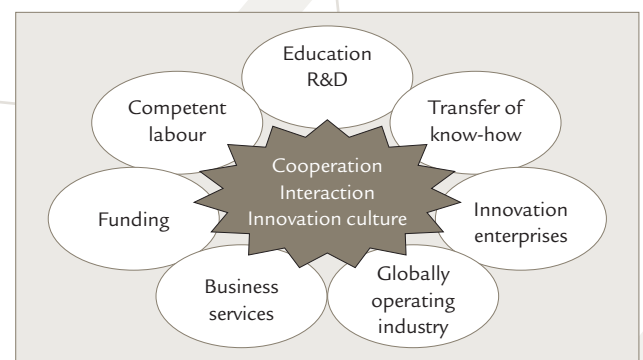
Even though the concept of an innovation system has been a good tool for improving the functions that support innova-

tion activity, it does not cover all the significant factors. Due to this, the significance of innovation environments has been emphasised in parallel with the innovation system or even instead of it. In the development of innovation environments, the scope is both wider and deeper than when attention is mostly focused on systems. Here it must be noticed, however, that the concept of an innovation environment does not replace the innovation system. These approaches supplement each other. The innovation system is the foundation of the innovation environment.

In addition to the innovation system, the central elements of the innovation environment include an innovation culture, "buzzing", or a number of processes that inspire individuals and organisations and create new innovations, global information channels, a common awareness of innovation and shared interpretative frames of reference (in other words, realisation of the significance of reforming, a common vocabulary and a way to perceive the innovation processes of a certain sector). To a great extent, the emphasis on innovation environments is due to the observation that innovativeness is highest in encouraging and dynamic innovation environments with a high risk-taking capacity.

The innovation environment is perceived by the actors as heterogeneous and dynamic networks that are always simultaneously both international and local. Networking with international centres of competence and actors plays a key role in the development of the innovation environment. On the other hand, locality is emphasised due to the fact that

Figure 2. Fundamental factors of a creative innovation environment



people live and operate in certain physical environments and within a certain type of national frame of reference (legislation, infrastructure, services, etc.). Research on innovation and creativity has indicated that “the quality of the location” is very significant for innovation activity. Successful locations and high-quality innovation environments bound to a certain place attract experts and investments. Here one must notice, however, that individuals as well as enterprises generally perceive the innovation environment as a cross-border network. However, it is essential that Finland should have strong nodes in global innovation networks, local innovation environments.

It is characteristic of innovation environments that many kinds of fascinating and useful processes that create new knowledge are constantly under way, and these attract innovative and creative individuals and enterprises. Thus, the core of innovation environments is an information and communication environment in which research and practice are intertwined and in which opportunities for both conscious and unconscious learning are continuously created. This creates common views of the development and outlook of a certain industry, a generic technology or branch-specific technology, as well as the effects of these on the future. It is essential that the actors gain a lot of information from many sources both directly and indirectly by just being present in the innovation environment. These environments are thus characterised by a kind of “drizzle of information” in which a lot of information is conveyed to the actors without the actors necessarily being able to identify any individual source of information.

Innovations are often created through individuals and their networks. Therefore the ability to attract competent and creative individuals has become quite a crucial feature of the innovation environment. Among others, Richard Florida has paid attention to this feature. His studies emphasise the significance of creative individuals in the economic success of urban regions. Creative individuals look for inspiring assignments, colleagues and environments. They appreciate difference and tolerance. In addition to work, leisure time is important to them according to Florida. Creative environments have enough “buzzing” and events to keep life interesting and challenging. The core of a really dynamic innovation environment is an innovation culture that encourages individuals to take risks, accepts failure, tolerates difference and appreciates entrepreneurship.

### ***Innovation activity must be international***

Even though international cooperation relationships were previously mentioned as a characteristic feature of the innovation environment, the significance of international activity is worthy of brief separate consideration. High-quality cooperation relationships with the world’s leading centres of innovation are extremely important for Finland’s future development because innovation activity will be even more international in the future. Innovation activity will be organised as global innovation networks having local nodes in different parts of the world. The majority of new knowledge and innovation produced in the world originates beyond the borders of Finland. Because of this, remaining at the leading edge of development will require Finland to actively seek cooperation with the best centres of innovation in the world.

The transfer to Finland of knowledge and innovations produced at international centres and their utilisation has been totally inadequate so far. The transfer of knowledge and innovations requires that Finns engage in intensive long-term work at foreign centres of competence – visits of a few weeks are not enough to transfer the “quiet information” included in know-how. We must build “two-way bridges” to world-class concentrations of know-how so that there will be ample movement of people both from Finland to global centres of competence and from other countries to Finland.

The business processes of enterprises are also global. Business is increasingly developing towards the direction that each enterprise focuses on certain areas of strength and supplements its own competence by finding the best partners and suppliers in the international market. This leads to the global networking of business and emphasises the management (orchestration) of networks as a central form of business competence. Enterprises establish their functions in locations that provide the best framework from a functional point of view. Crucial points governing location include:


- the dynamics and high quality of the innovation environment
- the vicinity of growing markets
- the presence of business partners
- the existence of legislation favourable to business (copyrights, competition legislation, rights of ownership, etc.)

- the availability of skilled labour and
- the total costs of practising business (labour expenses, transport expenses, taxation, etc.).

The objective of this programme is to create a world-class dynamic innovation environment in Finland, attracting innovative companies and creative individuals to the country.



## Vision of Finland as a leader in innovation activity



Even though our innovation and business environments have been found to be competitive during the last few years, this is no guarantee of success in the future. When weighing the present situation in the light of the visible challenges of the global economy, there are good grounds for concluding that without significant structural reforms and redirection of resources, we will lose our competitive ability. Most industrial countries and developing national economies are investing more and more in innovation activity. Furthermore, many countries can offer advantages that we do not have. Finland must be extremely good in those areas in which we intend to compete.

For a long time, the core of Finland's competitiveness policy has been a commitment to know-how and product development. We have succeeded relatively well in this respect. The problem is inadequate investments: we will only be able to reduce unemployment and improve our standard of living through investing. Ireland's example indicates that a determined policy of attracting investments can quite rapidly increase the standard of living and achieve full employment in practice. In ten years, Ireland's unemployment rate has fallen from 15.7% to 4.5% and the gross domestic product has nearly doubled, already surpassing that of Finland.

When developing our competitive ability, we must clearly see our strengths and weaknesses. Finland lacks the advantages of closeness to the markets and a large labour reserve. The Finnish level of costs is also moderately high. Our basic strength can be found in Finland's high level of education, research and know-how. Even though our innovation system has been found to be excellent, there are serious shortcomings in innovation activities. In this respect, we have not succeeded adequately. Our opportunities depend on our ability to use know-how better than others. We must be able to develop know-how into profitable innovative business. We cannot afford to be complacent.

In the light of the analysis presented above, the development programme proposes that *Finland must become a leading country in innovation activity by 2015*. As a leading country in such activity, Finland must fulfil the following conditions:

1. we must create an innovation environment that is among the best in the world
2. we must concentrate world-class know-how and clusters in the select fields
3. we must ensure that our innovation activity is globally networked
4. we must be able to attract top experts and investments to Finland.

Condition 1 means that the innovation environment should include a sufficient amount of everything discussed above. If an essential factor, such as the funding or incubation of start-up companies, is deficient, we will lose opportunities to attract investments. Versatility also includes an extensive knowledge base (technology, business competence, design, etc.). Condition 2 emphasises that we must reach world-class quality in a few areas of competence in which strong global business exists. A small country cannot be good in all areas of competence, so choices must be made here. According to condition 3, our innovation activity has to be totally international and networked with the best foreign centres of competence. Global networking will require foreign experts coming to Finland as well as Finns working abroad. In line with condition 4, Finland's innovation environment must be so good and globally recognised to such an extent that we can attract plenty of new top experts and investments to the country. The improvement of attractiveness will also require a revision of taxation. Promotion and determined work will also be needed to gain foreign investments.

As a leader in innovation activity, Finland must be among the best countries in the world and be a pioneer. Finland cannot complacently follow other countries. We can be a leading country only by being *a pioneer of innovation activity*. Innovation activity must not be restricted solely to business life. It has to apply to the entire society, its operating models and structures. The promotion of innovation activity requires close cooperation between the different sectors of society, particularly between enterprises and the public sector. When talking about the strengthening of cooperation and the reforming of the entire society, we are above all referring to *social innovations*, i.e. structural reforms and new operating models that improve the quality of life and the performance of society.

The objective of making Finland a leading country in innovation activity by 2015 can also be associated with concrete indicators, the development of which has to be monitored at

national level. These indicators are linked to the economy as well as to innovation activity.

1. Our standard of living measured by gross domestic product per capita improves and we are ranked among the 10 best countries
2. Exports account for 50% of GDP and the share of high technology exports in proportion to all industrial exports increases to the level of the best countries
3. Finland has become a more tempting target for investment and the amount of investments coming to Finland in relation to GDP is at least on par with the EU average
4. Finland is one of the most competitive countries in the world
5. Entrepreneurial activity in Finland has doubled in comparison to the present level.





## ***II***

# ***Action programme***



The actions presented in this report apply mainly to the development of innovation activity. It is clear that maintaining and improving the competitive ability of our society will require measures at many levels and at different sectors. This will require greater flexibility in the labour market, the improvement of competition conditions, an overall reform of taxation, improved efficiency of the public sector, etc. These and similar matters have not been comprehensively dealt with in this report, partly because weighty proposals have been made in other reports, such as the final report of the Finland in the Global Economy project, also known as the globalisation report: *Finland's competence, openness and renewability* (Prime Minister's Office: Publications 26/2004). The proposals for action presented in this report have been chosen because they are thought to have significant leverage.

The action programme contains proposals intended to ensure the competitiveness of Finland's innovation environment in a situation of intensifying global competition and profound changes in the operating environment. Many proposals will

mean significant changes in structures and methods of action. We believe that nothing less than these reforms will be adequate to achieve the objectives, and without these, Finland may drift into immense economic difficulties. It is clear that the implementation of the presented measures requires a strong commitment from the parties involved, as well as long-term reforms. The participants in the development programme that produced this final report include several actors responsible for the development of the innovation environment.

The programme contains five *basic objectives*, the implementation of which is critical to turn Finland into a leading country in innovation activity. The basic objectives have been further divided into a number of *partial objectives*. Several proposals are included within the partial objectives, the most important of which have been raised as actual *proposals for action*. Brief descriptions and justifications are presented for each objective and proposal for action. The proposals for action indicate the parties with the main responsibility for preparing and implementing the action.

## Basic objectives

The basic objectives of the action programme are associated with structures, know-how, entrepreneurship, regional centres, individuals and the general atmosphere. The development of society and operations within its scope are directed and restricted by structures (legislation, administration, institutions). These structures have to be developed to cope with new challenges so that they are encouraging and so that they eliminate harmful inflexibility and unnecessary obstacles. There is widespread unanimity concerning the fact that an innovation environment is based on top-quality education and research. We must have a world-class educational system and achieve the international peak in research with regard to disciplines important to business life and social development.

Know-how must be leveraged to create a globally competent and networked enterprise field that brings prosperity and welfare to our country. The constant improvement of innovation activities by businesses is a necessity dictated by intensifying international competition. Under conditions of global mobility, Finland must be able to attract experts and

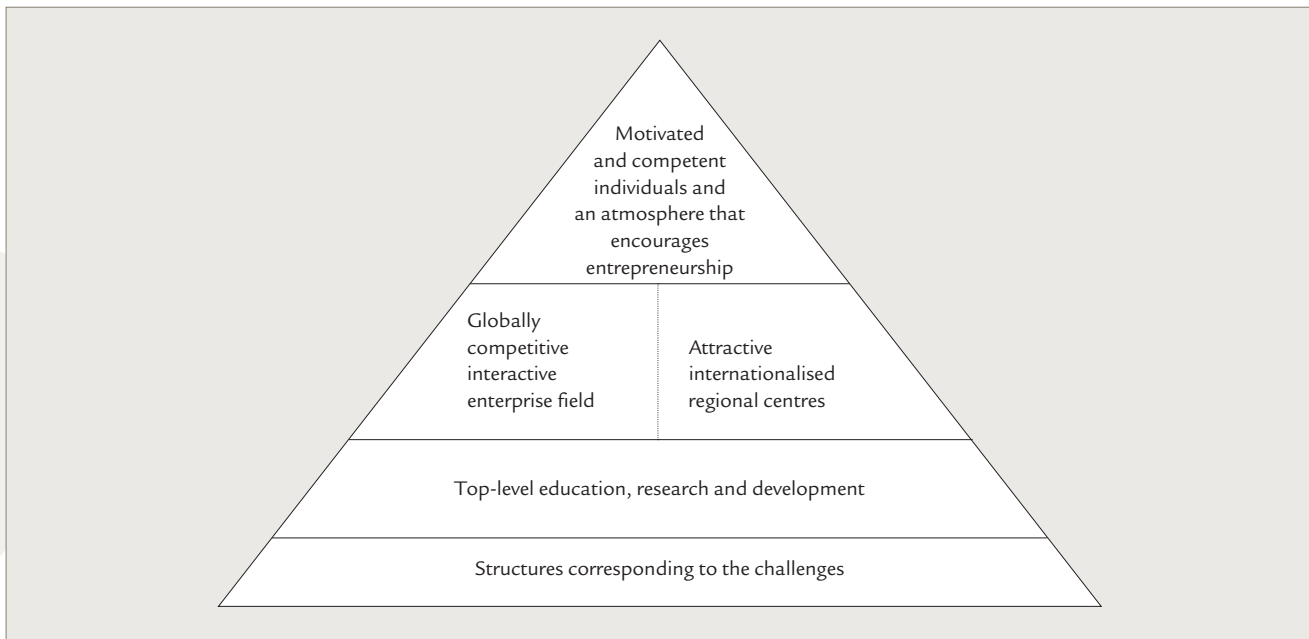
investments to the country. This will transpire through the creation of attractive, heavily internationalised and networked regions.

The success of innovation activity ultimately depends on people. Motivated individuals are able to realise the opportunities that unfold. Incentives are required for studying, working and entrepreneurship. One of the biggest challenges for Finland is to create an atmosphere and operating culture that encourages innovativeness and entrepreneurship across the entire society.

The measures necessary for creating a leading country in innovation activity can be grouped in accordance with five *basic objectives*. These basic objectives are to:

1. Develop structures corresponding to the challenges
2. Provide top-level education, research and development
3. Create a globally competitive interactive enterprise field
4. Develop attractive internationalised regional centres
5. Produce motivated and competent individuals and an atmosphere that encourages entrepreneurship.

Figure 3. Basic objectives of the action programme





## Structures corresponding to the challenges



The operations of society are directed and regulated by a multitude of structures such as legislation, administration and various institutions. Solid, clear structures support the development of society and provide support in turbulent times. During large developments that occur in a somewhat gradual manner, justifiable inertia regarding the changing of structures delays their reform in the way required by the new challenges.

Therefore many structures of the Finnish monocultural society that have functioned well during times of steady development and sudden crises have not reformed in all respects to the extent required by constant technological development and the intense progress of globalisation.

In the following, some crucial partial objectives for the adaptation of structures to both present challenges and to those that can be envisaged are presented from the viewpoint of developing the innovation environment.

### **Towards a dynamic unified innovation policy**

An innovation-led economy needs flexible administrative structures. Mostly as a result of historical development, the responsibility for industrial policy, which includes innovation policy as a crucial element, is distributed between several ministries in Finland. This has contributed to fragmentation and rigid administrative borders. In order to achieve efficient use of resources and sufficient ability to react, the responsibility for innovation policy should be centralised, and the division of tasks and powers between ministries should be reformed.

It is also important to ensure that the different official actors in the innovation field are maximally integrated into the global innovation system and that the operations and contributions are directed without delay in accordance with general development and our needs. Examples include the appropriate expansion of public-sector investments and Finland's presence in the Pacific Rim, which is the driving force of global technology, industry and trade, as well as additional measures to utilise Russia and Eastern Europe in subcontracting chains and the establishment of an innovation centre in St. Petersburg.

**Proposal for action:** *Efficient innovation policy requires the Government Programme to include a national innovation strategy, the implementation of which is the responsibility of the Prime Minister. At the beginning of each term of office, the Government will agree on an appropriate and efficient division of tasks between the different ministries from the point of view of innovation policy (Government, Prime Minister's Office).*

### **From collection of taxes to a stimulating tax system**

The manifold dynamics brought to society by globalisation have significantly increased the possibility of using tax incentives to direct the functions of society in a way that boosts competitive ability and subsequently increases the accumulation of taxes – directly and indirectly. Optimised tax incentives can be used to influence people to engage in work and entrepreneurship, to encourage businesses to invest in production as well as in R&D operations in Finland, as well as to attract foreign businesses and top experts to the country.

It seems that taxation is becoming also an increasingly important complex competition factor in Europe where Ireland's successful model has been adopted with enthusiasm in the new and prospective Member States of the EU.

According to experts in San Diego, the following two factors have had a substantial effect on the growth and development of new entrepreneurship in California: the "permission/obligation" of pension funds to make a certain amount of risk capital investments and the tax incentives granted to private venture capital investors (business angels). The issue concerns permission or even an obligation to invest a certain portion of a fund's assets in growth enterprises that represent a greater risk but simultaneously have higher return expectations.

In the current situation in Finland, the development of domestic financial markets and the diversification of financing opportunities available to enterprises could be promoted by increasing the popularity of mutual fund and direct equity investments by households.

As a small country with a high standard of welfare, a high level of taxation and a tax system with a relatively static history, Finland must aim to quickly and efficiently respond to the challenges of global tax competition.

**Proposal for action:** *The proposal presented in the globalisation report for a reform of the taxation of foreign key people shall be implemented (Ministry of Finance).*

**Proposal for action:** *The financing opportunities of innovative growth companies shall be increased by promoting private venture capital investments with tax incentives (Ministry of Finance).*

**Proposal for action:** *The upper limit for the tax exemption of donations made by enterprises and individuals to scientific research shall be abolished (Ministry of Finance).*

**Proposal for action:** *A proposal for the possibility of employment pension companies to increase risk investments in enterprises in the start-up and rapid growth phases shall be implemented quickly (Government, employment pension companies).*

### **More innovation contributions in the production of services and in the administration of the public sector**

Innovation activity is minor within the sphere of public administration and the public service sector. This is the case even though these are very large sectors, the quality of the operations and operators is often high, and, in principle, the areas involved have a need for innovative activity.

The reason for the current state of affairs is historical structural development. Innovation activity with its associated risks has not been part of the structures of the sector operations and has not been encouraged. Neither human resources nor financing have been allocated to innovation activity to any substantial degree even though significant challenges are met continuously and in-house know-how does exist, in addition to the availability of skilled cooperation partners.

From the perspectives of both the effectiveness of the public sector and the regulation of the cost level, it is important that the sector itself should also initiate innovation activity to an appropriate extent with the help of suitable cooperation arrangements to develop the level of performance of its own tasks.

By purposefully making innovativeness a criterion for competitive bidding associated with public procurement, we could

contribute to the reform, development and positive attitudes of both the suppliers and the public sector. The implementation of this may require changes to competition laws.

**Proposal for action:** *A certain portion of the appropriations granted to different branches of administration shall be allocated to innovation and development activities. The research and development units of the branches of administration shall be effectively integrated into the development of innovation activity. The effectiveness of contributions shall be monitored regularly (all ministries, municipalities).*

**Proposal for action:** *Innovativeness shall be included among the criteria for public procurement decisions and competitive bidding (ministries, municipalities).*

### **Towards active immigration policy**

The challenges of globalisation and our own needs require significant activation of our immigration policy to make it attractive to experts and active people. This has to include campaigning on the significance of immigrants as a factor enriching the labour force as well as the culture. Success will require significant development and change of attitudes across all strata of social and business life.

A specific aspect associated with innovation activity that requires remediation is the fact that foreign students, who have so far been educated free of charge at our universities and other educational institutions, mostly move elsewhere to work – partly due to the difficult processes of applying for residence and work permits and to the personal uncertainty associated with getting a job.

**Proposal for action:** *A focused immigration programme for special experts shall be prepared (Ministry of Labour, Ministry of the Interior).*

**Proposal for action:** *The promotion of cultural tolerance using different methods shall be made an important part of immigration policy. These methods must be specified in more detail in the immigration policy programme currently in preparation (Government).*

## Top-level education, research and development



Top-quality education, research and development that appropriately evolve in accordance with current needs are the cornerstones of successful innovation activity. Finland has received plenty of flattering international recognition in all these areas in recent years. We have every reason to be happy with the good general grades received in the past, but one should keep in mind that satisfaction often causes inertia, and remaining at the leading edge under changing challenges will require a more intensive effort than that required to get there. However, the starting points for facing the upcoming challenges are good provided that we proceed and make contributions vigorously and without prejudice, paying careful attention to any global trends.

### **Solid comprehensive school, upper secondary school and vocational education**

It is absolutely essential for Finland's success that a solid basic education is guaranteed for everybody (cf. PISA achievements), and there could possibly be even stronger incentives for activity and creativity.

Appropriate special measures should be continued at the upper secondary school level in order to develop talents for the needs of business life, the sciences and culture. Experiments to combine special upper secondary school with practical training have to be continued and developed further in crucial sectors of industry – in fact similarly to the long-time established practice in the arts, particularly music.

The image, appreciation and level of vocational education have to be raised by suitable means as required by the needs of society and the opportunities provided by education. In order to optimise the quality, volumes and cooperation of upper secondary school and vocational education, all secondary-level education should be brought within the sphere of common control.

The number of international schools has to be increased, considering immigrants in particular.

**Proposal for action:** *Comprehensive schooling shall be maintained at a high level that provides good foundations for further studies. Enough attention shall also be paid to the development of creativity and innovativeness. It shall be ensured that the entire*

*age group continues studies after comprehensive school (Ministry of Education).*

**Proposal for action:** *A high level of teaching in mathematical and scientific subjects in upper secondary school shall be ensured, making it possible for students with particular talent to specialise in these subjects. A system combining upper secondary school education and practical training shall be developed, particularly in the ICT sector, the forest industry and the metal industry (Ministry of Education, Sitra, industry).*

**Proposal for action:** *Action shall be initiated to prevent dropping out of school on the basis of information on the reasons and mechanisms of dropping out (Sitra, National Board of Education).*

### **Dynamic internationalisation of universities and polytechnics**

By means such as appropriate specialisation, universities have to constantly increase the quality of teaching and research in order to be a world leader in selected areas and to remain there. In order to improve specialisation and administrative efficiency, our university network has to be developed to create 5 to 10 university entities in Finland (cf. the University of California with its separate campuses). The largest universities are capable of versatile research and an extensive supply of teaching, and also possess resources for specialisation. A university entity includes two or more universities with a common research and education strategy and chancellor, as well as shared administration and support services. Each university has a Rector with leadership skills and knowledge of the university field. The administration of universities, as well as their functional and financial autonomy, have to be significantly developed. Many outside members have to be appointed to the Board of Directors.

Polytechnics shall be moved into the sphere of the same administration and control. Cooperation with universities has to be significantly developed. This would increase preconditions for flexible cooperation with regard to teaching as well as research, and provide the opportunity to intensify the utilisation of special competencies, premises and equipment. It should be noted that through state subsidies, the Government is already responsible for the costs of polytechnics in practice.

**Proposal for action:** *The current universities shall be reformed into 5 to 10 university entities each having a common education, research and internationalisation strategy. The university system shall not be expanded to any new sites. The financial autonomy of universities shall be increased and the management system strengthened. In order to develop the quality and networking of the university entities, research funding subject to competition shall be increased (Ministry of Education, universities, Academy of Finland, Tekes).*

**Proposal for action:** *The polytechnics shall be included within the sphere of the same control system, administration and funding. It shall be ensured that the polytechnics primarily serve the needs of working life (Ministry of Education).*

The cooperation of universities and polytechnics with enterprises and the public sector has to be increased significantly within the frameworks of different levels of student projects and other joint ventures. Projects that are properly managed by the parties involved will expedite graduation and, in many cases, can serve as a boost for the transition to working life. IPR issues have to be solved in a manner that encourages all parties to engage in cooperation and utilise research results. The know-how of universities in IPR issues has to be increased, and IPR services have to be provided in a centralised manner to ensure their sufficient quality. It is particularly important to agree on intellectual property rights in projects jointly funded by universities and enterprises.

Teaching that facilitates and encourages business and entrepreneurship must also be increased in a horizontal manner in universities as well as in polytechnics.

Sufficient resources must be allocated to study guidance for the entire duration of studies in order to guarantee results, maintain the ability to study and prevent dropping out. University studies shall be made subject to fees compensated by study vouchers and scholarship systems for Finnish and EU students. A systematic and guided career model for professional researchers must be developed in order to increase the attractiveness of an academic career.

The share of foreign students at universities has to be increased to at least 10%– with an equal number of Finns studying abroad. Top foreign researchers and young hopefuls shall

be invited by appropriate special arrangements particularly to centres of excellence, both to raise their standard and to further increase their attractiveness. A sufficient portion of funding must be used to build a basis for the creation of new centres of excellence.

Universities, polytechnics and other educational institutions must significantly increase language and cultural competence for practical needs all across society – with special emphasis on the Chinese language and culture.

**Proposal for action:** *University studies shall be made subject to fees. Decisions to obtain fees from students coming from outside the EU and the EEA shall be made immediately. The fees shall be compensated with study vouchers and a scholarship system (Ministry of Education).*

**Proposal for action:** *The Academy of Finland, Tekes, universities and research institutions shall jointly create a system making it possible to recruit notable foreign researchers (Finnish Research Chairs) for long-term work in our country (Academy of Finland, Tekes, universities, research institutions).*

### **Investments in research and development and impact on the global leading edge**

Finnish investments in research and development have been significantly increased during the last few decades by the public as well as the private sector. We are indeed among the vanguard of the world with regard to the proportion of R&D investments to GDP. A small and remote welfare society that significantly depends on the export of high-quality products must certainly be the leader in proportional R&D investments. Therefore, the generally accepted objective of spending 4% of GDP in research and development cannot be considered any magic limit given our challenges. Absolute investments, their focus and effectiveness of use, as well as competence, are the determining factors in open competition. It is particularly important that we hold onto this objective and the associated obligations in the public as well as in the private sector as provided in the globalisation report.

The policy of Centres of Excellence must be continued, creating even higher-quality and more specialised units and

development platforms within the sphere of universities and research institutions to operate in close cooperation with enterprises. At the same time, resources must be reserved for researchers and research groups seeking to conquer new areas and who are also taking risks. We must be daring and capable of making sufficient investments in emerging fields of science and technology, such as biotechnology, nanotechnology, environmental technology, and in the welfare sector. Good examples of this are the biosciences and biotechnology, in which fields the utilisation of breakthroughs has been partly delayed by many issues of an ethical nature. However, the amount of knowledge in the field and the ideas for concrete fields of application have increased exponentially and will play absolutely central roles in many areas of human activity.

When trying to retain and strengthen the international leading position of the most essential sectors of our industry on the global playing field, the disunity of our technological research and development becomes an increasingly large problem in addition to the small size of our country. It can be generally stated that we have internationally good research and development at several locations in a certain sector but too little knowledge and skill that represents the absolute international top level and leads to real breakthroughs. Even in the ICT sector, we have to increasingly resort to foreign experts in critical cases. Historical fragmentation of the more traditional sectors of importance, such as the forest and machinery industries, emphasises the disadvantages.

All of this weakens our vital image and visibility as a leader of technology and industry within the EU and worldwide, and


complicates the effort to maintain and increase our exports and attract investments and high-level experts, researchers and students to our country.

In order to rectify the situation, research and development in these key sectors of our industry must be developed and utilised nationwide with appropriate focus and coordination. This should create a number of centres of technological excellence operating in close interaction with each other and, naturally, with international centres of excellence within their sector. The system would also comprise Industrial Cluster Research Chairs at suitable locations, creating links between basic research, applied research, business competence and industrial design. Their functions would be directed towards interdisciplinary and intertechnological areas, in other words areas not covered by the interests of universities or industry alone.

**Proposal for action:** *An active and persistent effort shall be made to develop emerging core sectors of science and technology and to support the efficient commercialisation of innovations based on them (Academy of Finland, Tekes).*

**Proposal for action:** *A nationwide network of competence with international visibility, respect and activity shall be created, consisting of centres of technological excellence in the core sectors of industry (ICT, forest, metal and machinery). Universities, research institutions and enterprises are responsible for creating the centres of excellence. Close cooperation shall be established between centres of excellence in technology and science (Ministry of Trade and Industry, Ministry of Education, Academy of Finland, Tekes, industry).*

## Globally competitive interactive enterprise field



The ongoing pace of change in the deregulation and expansion of world trade together with the constant development of technology imposes great challenges on the entire enterprise field. Global business models differ from former ones, and really good core competence and its continuous development will be needed in order to get to the top and remain there. Our own resources and know-how must be supplemented by active networking and efficient acquisition of information. As often as possible, one must aim to control the network and brand and not be satisfied with the role of a mere subcontractor.

### **Towards networked enterprises and the efficient transfer of information and technology**

During a period of intense worldwide development, it is even more important to identify weak signals indicating the future as early as possible. A great deal of information and estimates related to these are produced in different parts of the world and also in Finland. It is difficult for enterprises wrestling with short-term everyday issues to filter important information out of this huge mass of information, and this often happens at random. The situation could be improved from the viewpoint of the needs of Finnish enterprises and public administration by initiating a kind of a future forum to analyse weak signals indicating the future and to communicate them to Finnish enterprises. The future forum would be a common annual meeting of parties engaging in future-oriented work or utilising its results.

**Proposal for action:** *A future forum shall be established in order to analyse weak signals caused by the development of technology and other factors of change to ensure the competitive ability of Finnish society and enterprises (Sitra).*

The development of technology has provided excellent means for enterprises to acquire the external information necessary for their development work and business. Finding the best information is often the problem in this respect. There is plenty of expert help available for the purpose within Finland. Its use must be increased from the current level. In addition to

international sources of information, the utilisation of our own special information resources (among others, the databases and services of the National Board of Patents and Registration) must be kept in mind.

For the present, the purchase of classified commercial information seems to be too big a sacrifice in Finnish enterprise culture. This can be concluded from the fact that the volume of licence sales from Finland to other countries is significantly greater than are purchases to Finland – in other words contrary to industrial investments. The disproportion is probably caused by attitudes as well as poor knowledge and understanding of the material available for purchase and its relative value.

The deregulation of world trade has made concrete international networking with investments both out of and into the country an even more important factor for the competitiveness and development of each country's own enterprise field. Ireland's determined, high-volume, centralised actions and success in recent years are a good example of this. It indeed looks obvious that the objectives, organisation and resource allocation of Finnish public actors in the sector should be substantially developed and increased in the present situation.

**Proposal for action:** *Finpro and Invest in Finland shall be combined, and sufficient resources shall be allocated to the new organisation in order to efficiently promote the internationalisation of Finnish industries and to increase the level of investments directed to Finland (Ministry of Trade and Industry, during 2005).*

### **Towards an innovative service sector of high productivity and the internationalisation of creative industries**

The service sector is the biggest production sector in all developed countries. In Finland, private services account for more than 40% of the gross domestic product. Even though the Finnish service sector has increased significantly in recent decades, both independently and through the outsourcing actions of industry, we still lag behind most industrialised countries. There is growth potential in our country particularly in well-being services, leisure and user-experience services and business-to-business services. The development of the latter is particularly important for the efficient operation and innovativeness of the

entire enterprise field. The growth outlook of creative industries is promising as well, but the promotion of exports and internationalisation in these industries is deficient and lacks a coherent strategy.

The development of the service sector is heavily affected by regulation and competition conditions. The ongoing deregulation of services in the EU will also bring a great challenge to Finland. This is especially true with regard to our public sector.

The productivity of services, R&D and innovation activity and internationalisation are not yet up to the level of competing countries. In order to develop these and increase the number of innovative enterprises, public actors must increase support measures and contributions that take the special nature of the service sector into consideration. The internationalisation of services and creative industries will require particular attention in the future, which is also indicated by the associated proposals for action in the globalisation report:

1. Draw up a long-term internationalisation strategy for knowledge-intensive services in cooperation between service enterprises and export-promoting innovation and bridging organisations.
2. Compile a special programme for productising various welfare services to convert applied service concepts and technologies into exportable products.
3. Allocate export promotion resources to the internationalisation and networking of knowledge-intensive service enterprises.
4. In order to make Finland's creative economy internationally competitive, a creative economy and cultural export development programme should be drawn up for 2005-2010.

**Proposal for action:** *The proposals for action presented in the globalisation report with regard to the promotion of internationalisation of services and the creative industries shall be implemented quickly (Ministry of Trade and Industry, Ministry of Education).*

### **Towards abundant and successful new entrepreneurship**

Particularly in an intense phase of change, abundant and successful new entrepreneurship is a crucial factor for the

competitive ability of all enterprises and the entire country. Different parties in our country have recently expressed great concern over the issue. An indication of this is the extensive AISP strategy prepared by the Ministry of Trade and Industry (Strategy for reforming the seed capital and service system for start-up innovation enterprises, KTM 28/2004, in Finnish). Functional solutions to the challenges presented in it must be found quickly.


In addition to the improvement of competence and other preconditions for business, increased entrepreneurship will require development of the atmosphere and attitudes to encourage risk-taking and to tolerate failure. As a concrete measure supporting this, the entrepreneur's personal risk level has to be quickly reduced to correspond to the practice of several industrialised countries in which the failure of a business does not result in the loss of all of the entrepreneur's personal assets.

Besides increasing the volume of new entrepreneurship, the actors supporting the issue should pay even more attention to the preconditions for rapid growth and internationalisation of newly established enterprises. One of the most important factors is the availability of sufficient and competent staff in the initial stage. Entry into international markets, which is a precondition for rapid growth, must be promoted by centres of innovation established in key locations of international trade and technology.

In addition to measures directed at new and small enterprises, sufficient attention has to be paid to efforts aimed at incentivising and developing medium-sized enterprises that have growth potential. At the growth stage, these enterprises have a significant employment effect, their threshold for internationalisation is relatively low, they can often utilise top research quickly and act as important partners for leading-edge enterprises through specialisation.

**Proposal for action:** *Innovation centres shall be established in regions of international trade and technological development in cooperation with organisations developing Finnish technology and international trade. The most urgent actions include increased cooperation between different actors in Shanghai and California and the establishment of a centre in St. Petersburg (Ministry of Trade and Industry).*

## Attractive internationalised regional centres



The key locations of the global economy are innovative and attractive urban regions such as London, Cambridge, Frankfurt, Barcelona, Silicon Valley, San Diego, Boston, Austin, etc. These regions attract experts, research institutions, technology enterprises, venture capital investors, business-to-business service companies, etc.

Several international evaluations in recent years have mentioned Helsinki and its metropolitan area as one of the most innovative growth centres in Europe. This region of a million inhabitants clearly has innovation potential. It is home to nine universities, eight polytechnics, numerous research institutions and a large number of different regional and national support and intermediary organisations associated with innovation activities. Furthermore, there are top high-technology enterprises operating in the region and the standard of education among the population is very high.

Active development of the Greater Helsinki area, strong international visibility, interaction and marketing are important from the point of view of the development of the entire country – both directly and indirectly. In addition to its other potential, the Helsinki region must fully utilise its exceptional cross-border location (Estonia/EU, Russia/St. Petersburg) and Nordic cooperation. The competition for brilliancy and success is also intensifying in the Baltic Sea region.

The fragmentation of the metropolitan area into four cities has undeniably hampered full utilisation of development potential. The negative effects of the structural rigidity of the public sector have been particularly emphasised. Taking cognisance of this, the cities within the metropolitan area have commissioned a comprehensive innovation strategy for the Helsinki region that has just been completed and includes numerous concrete proposals for action. It is important that all the parties – including the government for its part – realise the significance of the urgent implementation of the development actions proposed.

**Proposal for action:** *The measures required by the recently prepared and approved innovation strategy for the Helsinki region shall be implemented effectively, with the cluster project for digital content and services between enterprises, public organisations and the cities of the region as an urgent spearhead project (Helsinki and the other cities of the region, universities and enterprises).*

The competitive ability of the country, and subsequently the maintenance of welfare, will also require continuous development, specialisation and internationalisation of other strong regional centres. There are several attractive regions in Finland with sufficient resources for developing into tempting innovation environments. The challenges of globalisation and the opportunities it offers may be extended to them with a high degree of concentration in the greater scheme of things. In order to eliminate the duplication of numerous regional actors, a uniform and efficient system of innovation actors should be established in each region. From the perspective of this objective, it is important to improve the operational preconditions of technology centres. The success factors include sufficient and appropriately chosen specialisation, as well as national and international networking in support of this. With regard to the competitive ability of the entire country, it is necessary to be able to utilise the special know-how of different regions nationwide through the networking of regional innovation organisations.

**Proposal for action:** *An efficient system of innovation actors shall be established in each urban region, eliminating duplication, and national cooperation within sectors of substance shall be developed (Ministry of Trade and Industry, Ministry of the Interior, cities, Finnish Science Park Association).*



## Motivated and competent individuals and an atmosphere that encourages entrepreneurship



A small country cannot manage unless it is able to utilise the talent of the entire population. The motivation of individuals to learn and to utilise their know-how creatively is the foundation of the innovativeness of society. Therefore the possibility and desire of everyone to use his/her creativity and know-how is a basic precondition for Finland's competitive advantage – particularly in the present situation in which the population is rapidly decreasing and ageing. Indeed, one of our biggest challenges is to create an atmosphere and operating culture that encourages innovativeness and entrepreneurship across the entire society.

Success in the future is based on our ability to use all kinds of know-how better than other nations. We can only be a leading country by being an international pioneer of innovation activity. However, this requires that we understand as concretely as possible the environments, activities and preconditions that create innovativeness and develop this knowledge into shared know-how across an entire organisation or community.

An innovation environment refers to an environment of information and communication in which research and practice are intertwined. It also means a culture and a way of action that encourages people to take risks, accepts failure, tolerates difference and appreciates entrepreneurship. These characteristics remain poorly developed among Finns at the moment.

### **Towards methodical development of innovation know-how**

The innovation know-how of individuals and organisations must be developed in a goal-oriented manner. Teachers and leaders are in a special position, because they have immense leverage on the motivation of individuals and their opportunities to use their know-how and creativity – and the way in which organisations will be able to utilise this. Management and incentive systems at educational institutions and workplaces must support the development and utilisation of innovativeness.

Innovation know-how must also be concretised as competence, ways of action and methods. The ABC of innovation – in other words, the simple principles of innovativeness – must be distributed in practice. Based on these principles, everyone will

learn to identify the basic preconditions of innovativeness and be able to participate in innovative work with others. Everyone does not need to learn to produce innovations but everyone should be able to support the development of an innovative atmosphere and innovative operations.

An attempt must also be made to influence appreciations and attitudes so that individuals will be more daring to make suggestions, take risks and engage in experimental activities. This is a challenge for schools as well as for workplaces: they must be thought of as innovation environments and consciously developed into such.

Based on the principles of innovation activity, an innovation workshop model must be developed with emphasis on easy implementation. The workshop will increase the innovation know-how of communities and individuals and provide a more extensive basis for the creation, identification and utilisation of innovations. The workshop model will serve as a concrete learning base that can be flexibly adapted to different cooperation situations. The model will be developed in cooperation with enthusiastic volunteers assembled from different organisations (educational institutions, enterprises, public organisations) and piloted in their own particular organisations.

Many development projects of an internationally high standard have been carried out in Finland and are still being carried out, but the methodological results are not being effectively distributed for use by different parties and they are not being refined into functional productivity-increasing methods or product and service concepts. The innovation workshops must gather representatives from successful projects to envisage the methods to be used and transfer them to new projects.

A customer-oriented market emphasises design and cultural meanings, which is why the significance of the utilisation of creativity will increase. Also, opportunities within the content production sector and the culture industry are almost unused in Finland, even though we have a lot of know-how and potential in these sectors. However, forums for common discussion and activities are missing. The innovation workshops must be organised into a joint forum and innovation platform for experts in the creative, technology and business sectors.

**Proposal for action:** *In order to develop the innovation know-how of individuals and organisations, the conception and piloting of innovation workshops shall be initiated (Sitra).*

### **The courage and mental readiness for innovation and entrepreneurship already at school**

Being a small country, further improvement of the effectiveness of R&D operations is a big challenge for Finland. One indicator of effectiveness is the number of new competence-based growth enterprises. When measured by this indicator, we have serious shortcomings that are intended to be corrected by increasing public funding for enterprises in the early growth stage. Beside this, we need more expansive entrepreneurs who are ready and able to internationalise their business and establish connections with the best innovation centres in the world. In addition to structural reforms, achieving the target will require courageous individuals who, even during their school

and student years, have learned to openly create contacts, advance their own ideas, take risks, experience success and failure – and learn from their experience. These characteristics should be established as priorities in addition to all-round and vocational objectives.

**Proposal for action:** *A national multidimensional campaign shall be started particularly in schools and workplaces with the aim of encouraging individuals and communities to become courageous, take risks, accept difference and engage in entrepreneurship (Ministry of Labour, Ministry of Education, Sitra).*

**Proposal for action:** *Awareness of entrepreneurship shall be strengthened among researchers, creating incentives for cooperation with enterprises or actual entrepreneurship and developing flexible methods of combining research and entrepreneurship (Entrepreneurship Policy Programme, Academy of Finland, Tekes, educational and research institutions in business and administration, Federation of Finnish Enterprises).*

## Participants and organisers of the development programme

### PARTICIPANTS

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### PLANNING OF THE PROGRAMME, IMPLEMENTATION AND REPORTING OF RESULTS

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## Appendix 1: Sessions abroad

Sessions abroad in connection with the Competitive Innovation Environment development programme

### SAN DIEGO

Two periods of work within the programme were carried out abroad. The first session abroad was in California from 9 to 16 January 2005.

The seminar was held in San Diego, with visits to Los Angeles as well as Tijuana on the Mexican side of the border.

The programme at San Diego was prepared in cooperation with the University of California. Lecturers from the University of California at San Diego and Berkeley attended. The visits to Los Angeles and Tijuana were prepared with the assistance of the local Consul General of Finland.

Furthermore, the partners included the VTT, TEKES and FINPRO representatives in California, as well as the Woodside Institute.

The perspective and main themes of the California seminar were focused on subject matter illustrating the possibilities of the private sector to create attractive and successful innovation environments.

The living infrastructure of southern California is based on a large population, and the region is a centre of dynamic innovation and high technology with economic resources for entrepreneurship and top-class know-how. The breakthrough of new multimedia technology can be seen everywhere in southern California.

The participants visited the supercomputer centre of the University of California at San Diego and a top biotechnology research institution, the Burnham Institute. During the seminar day in Los Angeles, the participants visited the multimedia centre of the USC Annenberg Digital Laboratory. In Tijuana, the group visited the Maquilladora industrial district.

The seminar themes at San Diego included

- Concentrations of competence
- Top research and multidisciplinary universities
- Entrepreneurship, high technology and an innovative environment
- Venture capital and successful companies
- Biotechnology, the ICT sector and new multimedia technology
- Immigration – its effect on economy and culture
- The Pacific economic zone

### DUBLIN

The second session abroad was in Ireland from 7 to 9 February 2005. The seminar location was Dublin.

The seminar was prepared in cooperation with research, technology and innovation actors sponsored by the government of Ireland. These include Forfás, Enterprise Ireland, IDA Ireland and Science Foundation Ireland. The lecturers also represented these organisations. Furthermore, the Finnish Embassy assisted in the implementation of the seminar programme.

The themes of the Dublin seminar addressed the so-called Irish model, in other words the possibility to influence the attractiveness of the innovative environment through decisions of the public sector, creating a flourishing national economy and successful enterprises.

The seminar presentations addressed political and strategic decisions made in Ireland that have facilitated a crucial change in the country's economy. Capital and new technology have been flowing into Ireland. Furthermore, Ireland's future as an innovative investment target was discussed.

The seminar participants also visited the innovation centre in Trinity College Dublin where they learned about the operation of the research centre and received a presentation on cooperation between research, innovation and funding.

## Appendix 2: Proposals of action programme

1. Proposal for action: Efficient innovation policy requires the Government Programme to include a national innovation strategy, the implementation of which is the responsibility of the Prime Minister. At the beginning of each term of office, the Government will agree on an appropriate and efficient division of tasks between the different ministries from the point of view of innovation policy (Government, Prime Minister's Office).
2. Proposal for action: The proposal presented in the globalisation report for a reform of the taxation of foreign key people shall be implemented (Ministry of Finance).
3. Proposal for action: The financing opportunities of innovative growth companies shall be increased by promoting private venture capital investments with tax incentives (Ministry of Finance).
4. Proposal for action: The upper limit for the tax exemption of donations made by enterprises and individuals to scientific research shall be abolished (Ministry of Finance).
5. Proposal for action: A proposal for the possibility of employment pension companies to increase risk investments in enterprises in the start-up and rapid growth phases shall be implemented quickly (Government, employment pension companies).
6. Proposal for action: A certain portion of the appropriations granted to different branches of administration shall be allocated to innovation and development activities. The research and development units of the branches of administration shall be effectively integrated into the development of innovation activity. The effectiveness of contributions shall be monitored regularly (all ministries, municipalities).
7. Proposal for action: Innovativeness shall be included among the criteria for public procurement decisions and competitive bidding (ministries, municipalities).
8. Proposal for action: A focused immigration programme for special experts shall be prepared (Ministry of Labour, Ministry of the Interior).
9. Proposal for action: The promotion of cultural tolerance using different methods shall be made an important part of immigration policy. These methods must be specified in more detail in the immigration policy programme currently in preparation (Government).
10. Proposal for action: Comprehensive schooling shall be maintained at a high level that provides good foundations for further studies. Enough attention shall also be paid to the development of creativity and innovativeness. It shall be ensured that the entire age group continues studies after comprehensive school (Ministry of Education).
11. Proposal for action: A high level of teaching in mathematical and scientific subjects in upper secondary school shall be ensured, making it possible for students with particular talent to specialise in these subjects. A system combining upper secondary school education and practical training shall be developed, particularly in the ICT sector, the forest industry and the metal industry (Ministry of Education, Sitra, industry).
12. Proposal for action: Action shall be initiated to prevent dropping out of school on the basis of information on the reasons and mechanisms of dropping out (Sitra, National Board of Education).
13. Proposal for action: The current universities shall be reformed into 5 to 10 university entities each having a common education, research and internationalisation strategy. The university system shall not be expanded to any new sites. The financial autonomy of universities shall be increased and the management system strengthened. In order to develop the quality and networking of the university entities, research funding subject to competition shall be increased (Ministry of Education, universities, Academy of Finland, Tekes).
14. Proposal for action: The polytechnics shall be included within the sphere of the same control system, administration and funding. It shall be ensured that the polytechnics primarily serve the needs of working life (Ministry of Education).

15. Proposal for action: University studies shall be made subject to fees. Decisions to obtain fees from students coming from outside the EU and the EEA shall be made immediately. The fees shall be compensated with study vouchers and a scholarship system (Ministry of Education).
16. Proposal for action: The Academy of Finland, Tekes, universities and research institutions shall jointly create a system making it possible to recruit notable foreign researchers (Finnish Research Chairs) for long-term work in our country (Academy of Finland, Tekes, universities, research institutions).
17. Proposal for action: An active and persistent effort shall be made to develop emerging core sectors of science and technology and to support the efficient commercialisation of innovations based on them (Academy of Finland, Tekes).
18. Proposal for action: A nationwide network of competence with international visibility, respect and activity shall be created, consisting of centres of technological excellence in the core sectors of industry (ICT, forest, metal and machinery). Universities, research institutions and enterprises are responsible for creating the centres of excellence. Close cooperation shall be established between centres of excellence in technology and science (Ministry of Trade and Industry, Ministry of Education, Academy of Finland, Tekes, industry).
19. Proposal for action: A future forum shall be established in order to analyse weak signals caused by the development of technology and other factors of change to ensure the competitive ability of Finnish society and enterprises (Sitra).
20. Proposal for action: Finpro and Invest in Finland shall be combined, and sufficient resources shall be allocated to the new organisation in order to efficiently promote the internationalisation of Finnish industries and to increase the level of investments directed to Finland (Ministry of Trade and Industry, during 2005).
21. Proposal for action: The proposals for action presented in the globalisation report with regard to the promotion of internationalisation of services and the creative industries shall be implemented quickly (Ministry of Trade and Industry, Ministry of Education).
22. Proposal for action: Innovation centres shall be established in regions of international trade and technological development in cooperation with organisations developing Finnish technology and international trade. The most urgent actions include increased cooperation between different actors in Shanghai and California and the establishment of a centre in St. Petersburg (Ministry of Trade and Industry).
23. Proposal for action: The measures required by the recently prepared and approved innovation strategy for the Helsinki region shall be implemented effectively, with the cluster project for digital content and services between enterprises, public organisations and the cities of the region as an urgent spearhead project (Helsinki and the other cities of the region, universities and enterprises).
24. Proposal for action: An efficient system of innovation actors shall be established in each urban region, eliminating duplication, and national cooperation within sectors of substance shall be developed (Ministry of Trade and Industry, Ministry of the Interior, cities, Finnish Science Park Association).
25. Proposal for action: In order to develop the innovation know-how of individuals and organisations, the conception and piloting of innovation workshops shall be initiated (Sitra).
26. Proposal for action: A national multidimensional campaign shall be started particularly in schools and workplaces with the aim of encouraging individuals and communities to become courageous, take risks, accept difference and engage in entrepreneurship (Ministry of Labour, Ministry of Education, Sitra).
27. Proposal for action: Awareness of entrepreneurship shall be strengthened among researchers, creating incentives for cooperation with enterprises or actual entrepreneurship and developing flexible methods of combining research and entrepreneurship (Entrepreneurship Policy Programme, Academy of Finland, Tekes, educational and research institutions in business and administration, Federation of Finnish Enterprises).



World-class innovation activity is a crucial competitive factor in the global economy. Substantial investments in the advancement of research and development activities and in the innovation system have been made in Finland. If the time span under review is extended further, the worldwide development trends would seem to require even more daring measures and reforms. In order to survey these, Sitra carried out the Competitive Innovation Environment Development Programme, running from the end of 2004 into 2005. Twenty-four people important to the development of innovation activity were invited as participants from public administration, businesses and research institutions.

This report is the final report of the development programme. It is divided into two parts, the first of which provides an overview of Finland's situation, changes in the environment and innovation activity. The latter part contains the actual action programme. This report is intended to be used by the actors and decision-makers of the innovation system. However, the analyses and proposals for action included are probably interesting to all parties involved and interested in developing Finland's future.