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## 13 The Finnish approach to innovation strategy and indicators

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### INTRODUCTION

Finland has been a high performer in international comparisons on innovation capability. The high performance of the Finnish innovation system can be said to rely on policies and conditions that closely reflect the Washington Consensus, such as a strong rule of law, stable macro-economic policy, domestic competition, a healthy financial sector and openness to outside ideas, and free trade (Williamson 2004).

The Finnish innovation strategy has greatly benefited from national characteristics ranging from a national affinity for technology and the speed of technology diffusion in the country, to the quality of higher education and the central role that engineers, both Finns and non-Finns, have played in Finnish industrialization. Of these characteristics, long-term investments in education, a positive attitude towards technology and Finnish engineering skills are key determinants of Finnish success in innovation.

In recent international comparisons, Finland has been ranked among the top performers by the *OECD STI Scoreboard* (OECD 2011), the *EU Innovation Union Scoreboard* (EC 2012), the *World Economic Forum Competitiveness Report* (World Economic Forum 2012a) and the *Global Information Technology Report* (World Economic Forum 2012b), and reports of various academic institutions such as the *INSEAD/WIPO Global Innovation Index* (INSEAD 2012). These indicators support the Finnish brand as a leading technological economy.

This chapter on the Finnish approach to innovation strategy and indicators describes how Finnish investments in research and development (R&D) and innovation, and measuring these investments, have evolved, what has changed, and what has worked at different times.

The chapter also introduces future issues, such as how Finland is looking anew at its national innovation potential and adapting its innovation system to better meet domestic and international challenges. As in other European economies, Finland is searching for a new model to reflect the evolving nature of innovation and to respond to the global influence on the division of capital, labour and innovation.

## HISTORY OF STRATEGY IN FINLAND

This section examines the reaction of Finland to the economically turbulent 1970s, the economically and politically turbulent 1980s and the transformation of the Finnish economy in the 1990s, driven by information and communication technologies (ICTs).

### **The Classic Finnish Industrial Strategy until the Late 1970s**

Industrialization of Finland took place in two different stages. The first started in the latter part of the nineteenth century when Finland was still a part of the Russian Empire. The second phase began after the Second World War, when Finland was still primarily an agrarian society with approximately 60 per cent of the workforce employed in the agriculture and forestry sectors.

Early Finnish industrial history is mostly about entrepreneurship, knowledge and technology transfers in an open environment. Many inventions and innovative ideas arrived in Finland to find new markets. The nature of Finnish geography and natural resources led to rapid technology diffusion, primarily in the forestry-related technologies and secondly in the communications and transport technologies.

This early Finnish industrial model led to an investment-driven economy. This meant developing a national policy framework to support export-oriented industrial assets of the country, leading to (Rouvinen 2002):

- a low level of both general and sector-specific R&D investments;
- the majority of R&D serving the traditional industrial sectors; and
- the absence of a national technology policy.

Forestry-related investments in education and in R&D and initiatives in trade policy served the needs of the traditional exporting industry. Electronics research, the cradle of the Finnish ICT industry, was largely on the margin of the classic resource-based Finnish innovation map.

The main focus of the classic Finnish innovation model was on the supply side, based on the following goals for spurring innovation in Finland up to the late 1970s (Rouvinen 2002). They were:

- the raising of national educational levels;
- the provision for more R&D investments;
- the investment in national infrastructure and production facilities;

- the creation of stability and predictability in the business environment; and
- the maintenance of social cohesion.

The steady investments in production, infrastructure and the maintenance of a supportive business environment contributed to a positive economic development in Finland coupled with rapid job creation. Thanks to these investments, Finland industrialized faster than any other European country and quickly strengthened its role as a rising industrial economy.

The positive domestic development was greatly supported by extensive barter trade with the Soviet Union and the contemporary international trends favouring trade liberalization, high-technology diffusion and the relative global stability of the cold war world.

The classic Finnish approach in science, technology and innovation supported the development of Finland from an agrarian economy to an industrial one while enabling social transformation and generating the required engineering skills.

At the time, due to the export-oriented growth patterns, statistics on international trade in goods, tangible investments, incremental product innovations, currency exchange rates and access to capital were the key indicators for Finnish policy makers right up to the 1970s.

This rather stable situation started to change in the middle of the 1970s, when the Finnish economy was hit by a substantial economic downturn and, in the aftermath of the oil crisis, the period of fast industrialization and the industrial strategy in Finland came to an end.

### **Emerging Role of National Technology Policy Planning – the 1980s**

The rapid industrialization of Finland started to reach its peak just before the oil crisis hit the world economy. This prompted new thinking within the Finnish business and policy circles, aiming to find potential opportunities provided by rapid developments in new technologies. The central and crucial role of science and technology in future economic development was becoming widely acknowledged, and significant increases in R&D were regarded as an essential tool to overcome any emerging challenges to economic growth.

A key result of this transformation in thinking was the new Finnish national technology strategy designed by the Parliamentary Technology Committee in 1980. This strategy included an ambitious target for R&D spending in Finland. In 1980 Finnish R&D investments amounted to roughly 1 per cent of Finnish GDP, below the OECD average. The new investment target was to double Finnish R&D investments to the level of 2 per cent of GDP by 1990.

The new R&D-centric strategy was further complemented by significant institutional reforms. By the early 1980s, the only special institution to foster applied research was the Finnish Innovation Fund – SITRA, which was established in 1967 as a unit linked to the Bank of Finland. Since its beginning, SITRA had become an agent for change for new ideas or new approaches to remodel existing Finnish processes such as healthcare and other public services. In 1991, SITRA was transformed into an independent organization reporting to the Finnish Parliament.

SITRA's funding comes from an original, separate fund and not from government funding. In recent evaluations of the Finnish innovation system (SITRA 2011), the role of SITRA remains distinct as an agent for innovative pilots and for searching for diversity in ideas for public–private sector partnerships. As an example, SITRA is said to have introduced the venture capital investment model to Finland.

Today, SITRA focuses on wider social development issues such as sustainable lifestyles, smart use of natural resources and generating new efficiencies in the public administration by holistic policy initiatives (SITRA 2011).

Another key institution for the Finnish innovation system was created in 1983 to maximize the benefits of increasing R&D spending, the Finnish Funding Agency for Technology and Innovation, TEKES. It first aimed to align Finnish industrial policy approaches to better serve future-oriented technology needs. TEKES's first programme reflected the sign of the times by focusing on semiconductors.

Throughout the 1980s and the 1990s, TEKES assumed a leading role in coordinating national R&D efforts. Since then, it has supported large enterprises as well as small and medium-sized firms (SMEs) with targeted public funding, especially in terms of incremental innovation. Its funding has helped companies to enhance their productivity and young companies to cross the 'valley of death' (Ministry of Employment and the Economy 2012).

In 2012, an evaluation of TEKES indicated that as an instrument for innovation in Finland, it had participated in the funding of more than 60 per cent of the well-known Finnish innovations and in 94 per cent of the innovations based on scientific breakthroughs created in the time period of 1985–2007 (TEKES 2012).

Among the TEKES-supported large enterprises, Nokia received approximately €210 million of TEKES funding in 1995–2011. During the same time period, Nokia is estimated to have contributed directly and indirectly close to €20 billion to the Finnish economy (Ali-Yrkkö et al. 2012).

In addition to SITRA and TEKES, the creation of the Finnish Science and Technology Council in 1987 further fostered the integration of government, business and academic resources. The council organized the

successful implementation of the national technology strategy and its coordination between various actors. In 2008, the Council changed its name to the Research and Innovation Council.

### **The 1990s Onwards – ‘the Great Transformation’ towards an ICT-driven Innovation Economy**

The Finnish technology strategy and policy framework came to a critical point in the early 1990s when Finland was hit by a dramatic economic shock.

There were several simultaneous factors behind this deep economic shock. Financial sector deregulation had created a financial bubble that burst in the early 1990s. Diminishing international competitiveness of Finnish traditional industries led to chronic current account deficits. The Finnish economy also suffered from the collapse of the Soviet Union and simultaneous slower economic growth in Europe.

Finland entered the deepest economic recession of any OECD country since the Second World War. In 1990, Finnish GDP dropped by 7 per cent. The economic crisis led to high unemployment, a growing fiscal deficit and urgent need for reforms.

The economic crisis of 1990–93 forced Finland to design a new strategy for future growth. In this strategy both R&D and innovation played key roles. Innovation activities gained status as a source for new competitiveness, growth and job creation. The key questions were now how to regain the competitiveness of traditional industrial sectors and simultaneously reap maximum benefits from investment in new science and technology.

Despite the doom and gloom of the overall prospects for the Finnish economy, one crucial element of the Finnish approach was maintained and even strengthened at the height of the crisis. In spite of substantial cuts in all major governmental expenditure areas, radical increases in R&D expenditure were continued. As an example, funding for TEKES was doubled during the first part of the 1990s, when all Finnish economic indicators were in free fall.

## **STRATEGY AND TECHNOLOGY: REAPING THE BENEFITS**

This section discusses the role of innovation strategy in transforming the economy over the last 20 years and the indicators used to track the transformation.

### **The Finnish Success Story of the 1990s**

Thanks to the radical changes in Finnish economic policy, the Finnish economy returned to growth in 1993. The main driver for the new growth was technology-driven export industry. Its strength was supported by the expansion of the Finnish ICT sector led by Nokia.

In 1993, the Finnish Ministry of Trade and Industry issued a National Industrial Strategy White Paper setting objectives for the creation of a new national innovation system based on redesigned industrial clusters. The report highlighted ICT as the industrial cluster for future economic development in Finland. This cluster was envisioned to spur innovation and eventually lead to new economic growth and job creation.

The above assumption about the role of ICT was firmly based on the realization that information technology had become pervasive in all OECD countries. Beside this major trend, Finland had also developed domestic assets in ICT by making long-term investments in radio communications technology and electronics.

Long-term, smaller-scale ICT R&D efforts and close links between the private sector and the public sector, such as with the military, had existed even before the Second World War. Now, in the early 1990s, tangible examples of domestic inventions and a new kind of technical-driven innovation capability started to emerge. Data and mobile communications were growing and Finland possessed competitive knowledge and global competitive advantage in the field.

At the same time, Finland's full membership in the EU provided the country with new opportunities for market access and easier access to EU programmes. Europe was also able to tap into a highly competitive ecosystem in mobile communications led by opening competition in the markets and the successful development of the GSM (Global System for Mobile communications) standard adopted in Copenhagen in 1987.

Thus, in the 1990s, Finland rose in status from an unremarkable industrialized European country to becoming a global, high performer in such essential areas as:

- global competitiveness;
- human development;
- regulatory quality and openness;
- number of ICT researchers;
- level of collaboration between universities and firms;
- number of patent applications;
- number of Internet connections; and
- computers per 1000 people.

At the time, there was a growing understanding that the more these activities grew, the more the country could gain from ICT-enabled growth. Of course, indicators played a role in showing how these activities were changing.

While investing heavily in ICT and funding ICT-related R&D, Finland also improved its global competitiveness in the other economic sectors by acquiring the best global technologies available. Through this process, initiated by the economic crisis, Finland transformed itself from an investment-driven economy to an innovation-driven economy (Rouvinen 2002).

Traditionally, Finland had benefited from improving on imported knowledge and technologies. Now, thanks to new innovative companies, universities and supporting policies, Finland became more and more an indigenous innovator especially in the field of mobile communication technologies.

### **National Strategies Supporting the Nokia Growth Story**

Nokia, founded in 1865, and partly active in the forestry industry, was originally engaged in paper production, later expanding to rubber and cable products, and in the 1980s to consumer electronics. Before 1992, Nokia was among the beneficiaries of the classic Finnish industrial system.

In the midst of the national economic crisis, Nokia faced a radical transformation as well. Being close to bankruptcy in the early 1990s, Nokia adopted a new strategy concentrating completely on telecommunications technology and mobile products, transforming the company from an old-fashioned conglomerate into a nimble and focused company.

For that purpose, the 1990s Finnish national technology strategy was a perfect tool to support Nokia. It provided Nokia with access to R&D funding and other assets to build the company's global competitiveness and innovation capacity. Besides the R&D funding, the national university system supported Nokia's long-term growth.

Through coordinated dialogue and converging strategies between Nokia and the Finnish national strategy implementation, the company was able to become a globally relevant actor. Newly created and rapidly expanding markets for Nokia-made mobile phones drove the growth of the company, and also Finland, to worldwide recognition as a leader in the ICT-enabled world. The Finnish innovation system and Nokia became a success story to be monitored, followed and copied (Dahlman et al. 2006).

### **Internet, Technology Convergence and the Changing Role of Globalization**

The Finnish transformation to a role model in innovation was reflected in a host of international studies explaining the Finnish success story and looking for common lessons to be learned by other countries.

While the old strategy was still being efficiently applied with fairly good results, there started to emerge real weaknesses in the Finnish innovation system (Ministry of Trade and Industry 2003). These signs of national weaknesses were also reflected in the relative decline in Nokia's innovation capacity from the middle of the first decade of the 2000s.

In 2004 a Finnish government report proposed initiatives to maintain innovation capacity. These initiatives included further increases to public R&D resources by at least 7 per cent per annum up to the end of the decade, focus on growth entrepreneurship, strengthening the attractiveness of the Finnish universities and enhancing the international mobility of the Finnish workforce (Prime Minister's Office 2004).

The Ministry of Employment and the Economy (2008) put forward a proposal for a new Finnish national innovation strategy focusing primarily on innovation ecosystem issues rather than on industrial clusters. The proposal reflected the changing times and the wider role of technology in societies. The new innovation strategy proposed a renewal based on four main principles.

1. Innovation activity in a world without borders: In order to join, and position itself within, global competence and value networks, Finland must actively participate and exert influence and be internationally mobile and attractive.
2. Demand and user orientation: Innovation steered by demand, paying attention to the needs of customers, consumers and citizens in the operations of the public and private sector alike, requires a market with incentives and shared innovation processes between users and developers.
3. Innovative individuals and communities: Individuals and close innovation communities play a key role in innovation processes. The ability of individuals and entrepreneurs to innovate, and the presence of incentives, are critical success factors of the future.
4. Systemic approach: Exploitation of the results of innovation activities also require broad-based development activities aiming at structural renewal, and determined management of change.

The references to the global flow of innovation and the requirements for systemic changes were the essential elements of the 2008 innovation

strategy. Statistics Finland, through the Finnish Community Innovation Survey, is producing innovation indicators to monitor changes in the system.

At the same time, the Federation of Finnish Technology Industries (2008) produced an economic study emphasizing the wider socioeconomic impact of the ICT sector in the Finnish economy. It also stated the importance of cross-sectoral utilization of ICT for increased future competitiveness. This economic analysis indicated that without increased ICT usage, in both the private and public sectors at all levels, future Finnish economic growth potential would be gravely jeopardized.

Finland is facing dramatic changes in demographics, especially in declining labour supply. This situation foresees future economic growth almost entirely dependent on ICT-enabled productivity improvements. These basic facts are driving changes and improvements in the Finnish innovation system.

The changing position of Finland in the global industrial value chain, outsourcing of production, the stronger role of emerging markets in the global economy and the growing role of the Internet in the ICT industry require Finland to make a leap from an ICT manufacturing and producing country to being a service-led innovator – an active user of the Internet and other ICT-enabled services.

The changing situation of Finland was also described in a 2012 Ministry of Communications and Transport study on the economic impact of the Internet in Finland. The study made it clear that measuring the economic impact of ICT on the Finnish economy with old indicators, such as number of ICT equipment investments, was creating a false sense of satisfaction about the true state of the Finnish information society and the Finnish ICT cluster. The study also highlighted that the high ranking of Finland in the contribution of the Internet to GDP was almost entirely dependent on foreign trade surpluses in ICT equipment and ICT services. Finland still appears a better ICT provider than an innovative ICT user (Ministry of Communications and Transport 2012).

## THE FUTURE

Based on experience gained in the recent past, Finland must build ecosystems and platforms on which future innovations can be based. Given the growing healthcare demands of an ageing population, this is an obvious and urgent opportunity to demonstrate that the ecosystems and platform approach can work.

## **Healthcare**

During recent decades, Finland has invested heavily in education, research and innovation activities in the health sector. Finland has some first-class individuals in the field of healthcare, and the quality of science is high. Investments made in health are also considerable in terms of the health-care system as a whole. However, while Finland has fared well in creating this strong basis of knowledge, it has done poorly in commercializing inventions in the health sector.

From a business perspective, the countries that will prevail in the competition are those that are able to produce a strong basis of knowledge and high-quality, world-class science, as well as to build partnerships with operators in the private sector. Finland's Nordic neighbours Denmark and Sweden seem to have a clear strategy for growth, investment and commercialization of their strong competence base in healthcare.

Despite its present success, Denmark is aiming to further improve its competitive position with a new and ambitious healthcare development plan. The development plan includes 23 concrete initiatives divided into five different sections (clinical research, new hospital centres, increase in the use of innovative welfare solutions, export of health and welfare solutions, as well as marketing and foreign investments).

In Denmark, for instance, the country's most extensive construction project to date is currently under way: more than €5.5 billion have been invested in the construction of five new hospital complexes. A total of 11 existing hospitals are being expanded and renovated. The largest hospital, Skejby Sygehus, with an area of 400 000 square metres, is due to be completed in 2019. A new medical faculty will further be established to Odense hospital to enhance, in particular, the cooperation of companies in the field of clinical pharmaceutical research. Even while under construction, the new hospital complexes are portrayed as global examples of healthcare and welfare solutions as well as test laboratories. New hospitals offer companies a possibility to test new and innovative products and solutions as well as to demonstrate to doctors and patients how the new solutions can be put into use. Denmark is also aiming to market itself more as a potential target of future health sector investments.

Sweden is another good example. It is currently undergoing what is possibly the largest European public contract ever for a new hospital, Karolinska Solna, which is being constructed in the Stockholm area. The hospital is due to be completed in 2017. The overall value of the investment is over €5 billion. After its completion, the hospital is also planned to support research and education. Sweden also has a significant four-year plan to sustain the high investments in the field of clinical research.

Regardless of the accepted strategies and policy alignments, Finland has had difficulties in rising to the challenge of internationalization of research and innovation activities. Finland has fared quite poorly when measured by international standards relating to investments, foreign R&D personnel and foreign entrepreneurship. In terms of both cooperation in the field of international inventions relating to patents as well as foreign research development funding, Finland is lagging behind the OECD average.

At the moment, Finland does not have a comprehensive strategy regarding the development of the healthcare sector and, in particular, a strategy for the competition of international research investments. However, the present government of Prime Minister Jyrki Katainen has clearly increased focus on foreign direct investments. The Ministry of Labour and the Economy has also initiated, in close cooperation with the Ministry of Social Affairs and Health, an in-depth evaluation of the growth and commercialization opportunities of the pharmaceutical and health technology sector.

The grand challenge in the healthcare sector in Finland is to create a national ecosystem that attracts significant, international pioneers of health research. Furthermore, instead of focusing only on start-up businesses, more importance should be given to the commercialization of Finnish research activities in connection with global-research-oriented companies. These global value chains of health innovation are creating opportunities – as in Sweden – for the future. New structures that provide universities and research institutes with sufficient resources to carry out globally competitive research in the long term need to be developed. Regulatory development also plays a major role. Here Sweden is also a model for putting the newest inventions to use in the healthcare system (Alkio 2011; TEKES 2009).

## CONCLUSION

Since the beginning of the 1980s, the main strength of the Finnish innovation system has been in creating comprehensive, long-term strategies. These strategies have been efficiently implemented by a well-orchestrated collaboration between the public and private sector actors, universities and other key stakeholders (Ornston and Rehn 2006). Finland has also given high priority to R&D and education as key elements of the national strategy and the innovation system.

As seen in the evolutionary story of the Finnish innovation system, the multi-stakeholder dialogue between policy makers, industries, industry associations, economic research institutes, employee organizations

and universities has led to several reassessments and cross-checks – for example, in measuring the impact of policies and institutions central to innovation.

This open national dialogue has not only been a positive agent for change, but has also put pressure on the Finnish innovation system to deliver changes when the country has faced grave challenges such as the economic crisis of the early 1990s (Dahlman et al. 2006).

As stated in the National Innovation Strategy adopted in 2008, there are new global requirements that are challenging Finland's innovation capacity. The most critical components to tackle these requirements are Finland's improved integration into the global innovation flows and an improved capacity for systemic changes.

Finland's main weaknesses in the application of modern technologies have been slowness of reforms and low risk taking. Unfortunately, Finland is already seeing unwanted changes in its global competitiveness due to these weaknesses.

Finland has a huge potential for economic growth and greater social welfare. It is an open and small economy with high dependence on exports, making it vulnerable to global economic shocks, but it has good assets such as high R&D performance, a strong education system and ICT cluster to support international competitiveness. Of late, it has not performed as well as in the recent past, and this presents another challenge to be resolved by Finland's collective and inclusive approach to problem solving.

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