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Highlights in this issue:

- ICT 'miracle' due to combination of private initiative and public technology policy
- Nokia boosted Finnish economic performance
- Increasing competition but strong technology base should secure the future of the ICT sector

Policy towards information technology starts to shape the ICT cluster...

From Wood to Nokia: The Impact of the ICT Sector in the Finnish Economy

*By Timo Hirvonen**

Summary

In the 1990s, Finland became one of the most technology-intensive economies in the world. The main stimulus for this development came from the leading mobile communications company Nokia, which in the peak year of 2000 contributed 1.6 percentage points to overall GDP growth of over 5%. Nokia has also been one of the main reasons that total R&D expenditures have grown by annual average rate of 8% between 1999 and 2003, when Finland exceeded the 3% of GDP reference value for R&D expenditures. Finnish technology policy had started to move towards information technology in the 1980s when the government established the Science and Technology Policy Council of Finland and the National Technology Agent, Tekes, in order to co-ordinate the planning of policy on innovation and expertise and provide funding. Recently, the contribution from Nokia to GDP growth has shrunk in the face of increased competition and saturation of markets in the western world. Nevertheless, the share of the ICT sector has remained over 10% of GDP in the current decade due to strong performance in other areas of the sector. This progress should ensure that ICT sector will keep its powerful role in the Finnish economy in the future

What is behind the Finnish 'ICT miracle'?

During the 1990s, Finland emerged as one of the world's most technology-intensive countries, finding itself in the front rank of the world's digital economies. This Finnish 'ICT miracle' has created much interest and gave rise to various theories as to its origin, many of them stressing individual factors as catalysts for its development. However, the achievements in the ICT sector cannot be regarded as a purely internal phenomenon of the sector. Rather, its performance must be examined within a broader context.

Finland's transition to a high-tech economy has not really taken place as suddenly as it appears. In the background is a long, self-strengthening and complex development process that began in institutions, organisations and throughout the society as early as in the 1980s. When examining the evolution of the ICT cluster it is nevertheless apparent that the major processes enabling this development were set in motion by public sector decisions. The promotion of industrial policy objectives was not always behind these decisions, even though the Finnish ICT cluster may seem the result of a master plan. Measures by the public authorities have, however, been fruitful to the Finnish ICT sector, as they have generally been in the right direction and have created a solid foundation for developing competitiveness.

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However, the emergence of the ICT sector, and in particular Nokia, has not been an end-product of a systematic plan by the government to form an old-fashioned national or European champion by providing state subsidies and creating a protected monopoly position in the markets. On the contrary, Nokia can claim to be a champion created by markets. By utilising Finland's competitiveness and favourable business conditions and being in the right place in the right time, Nokia emerged as one of the leading companies in telecommunications. Therefore, the company is able to compete with other multinationals in the global market place.

In the 1980s, Finnish technology policy started to emphasise information technology. At that time the importance of science in developing technology was also more clearly recognised. In 1986, the Science and Technology Policy Council of Finland was founded with the aim of co-ordinating the planning of policy on expertise and innovation. This Council brings the main economic stakeholders together - government, industry, science and labour - and has a prominent role in shaping, co-ordinating and resourcing science and technology policy. The change in the direction of science and technology policy in the early 1980s was also indicated by the founding of Tekes, the National Technology Agent, which has an active role in establishing networks and providing support, consultancy and funding to new ICT companies. This approach, based on technology and expertise, has lifted both Finnish R&D investment and the networking of public and private cluster operators to high international levels.

...and liberalisation of telecommunications and capital markets provided incentives for growth...

In Finland, the early liberalisation of telecommunication caused a breakthrough in digital communications. The impetus for liberalisation of competition came from the private telecom sector, which had criticised the state monopoly in many new telecom services. In 1994, the Finnish telecom markets were fully liberalised as one of the first in the world. As a result of the liberalisation, heightened competition drove prices down and led to mass markets for wireless communication, providing a test laboratory for the equipment industry.

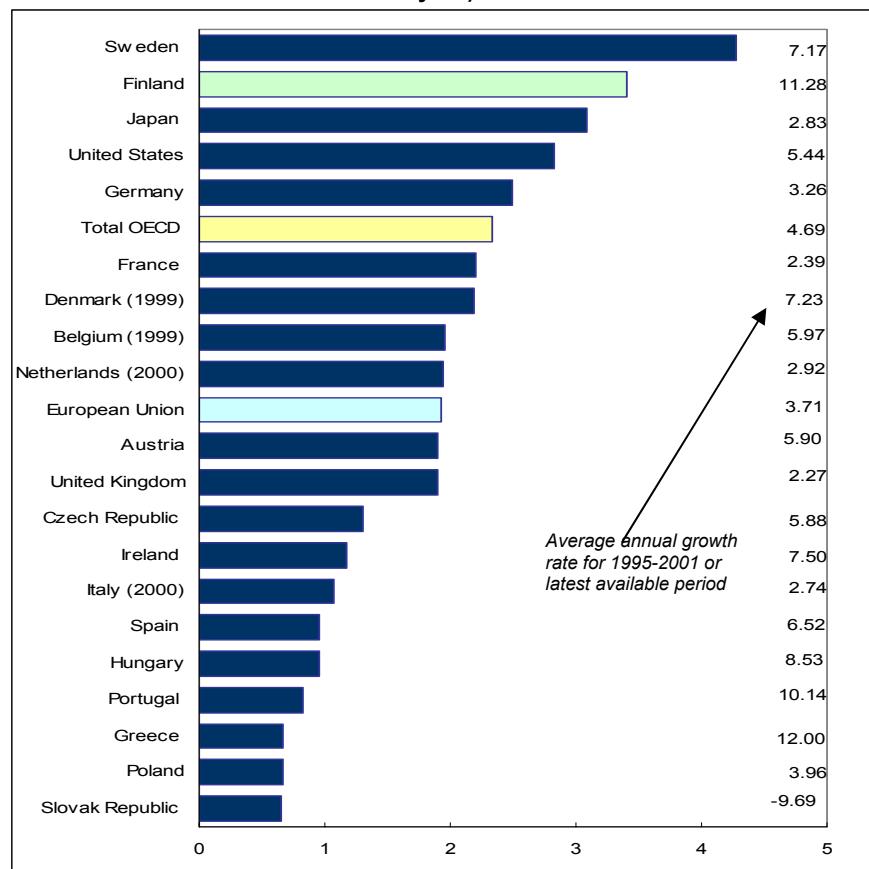
Furthermore, the liberalisation of capital markets and the following rapid increase in risk financing gave a stimulus to the growth, diversification and internationalisation of the ICT sector. The lack of risk capital had been a major hurdle to new business activity right up to the early 1990s. However, by the end of the decade the number of bank loans to small and medium-sized enterprises had dropped to below 50% from over 80% in 1995 as the inflow of risk capital to these companies increased.

Finns' fascination with technology, reflected in the fact they have one of the highest penetration of mobile phones and the internet in the world, has received some of its inspiration from the academic world. The right to free studies and an advantageous student grant system have created ample opportunities for innovative activity. Academic inventors also have the ownership rights to their own ideas, which is not the case in a number of other countries. Universities and the technology villages that sprout up around them have become major sources of new business activity. Academic careers often turn into entrepreneurial ones to commercialise an innovation. The main reason why Nokia thrives in Finland is that it can draw on the local environment of advanced expertise in information and radio technology. Despite Nokia's global network of research units, it is estimated that around 45% of the company's R&D work is carried out in Finland.

...which made Finland one of the most R&D intensive countries in the world.

According to the OECD Science, Technology and Industry Scoreboard 2003 (Fig. 1), Finland was one of the leading countries in the world in terms of annual growth rate and share of gross domestic expenditure on R&D between 1995 and 2001. In 2001, Finland and Sweden were the only EU-countries that exceeded the R&D-to-GDP ratio of 3% set in the Lisbon targets. This also indicates that there has been a concerted effort to have R&D funding high on the government's agenda while also providing business sector with the necessary elements to invest in R&D: high quality education, business friendly environment and good infrastructure.

Figure 1. Gross domestic expenditure on R&D (2001 or latest available year)



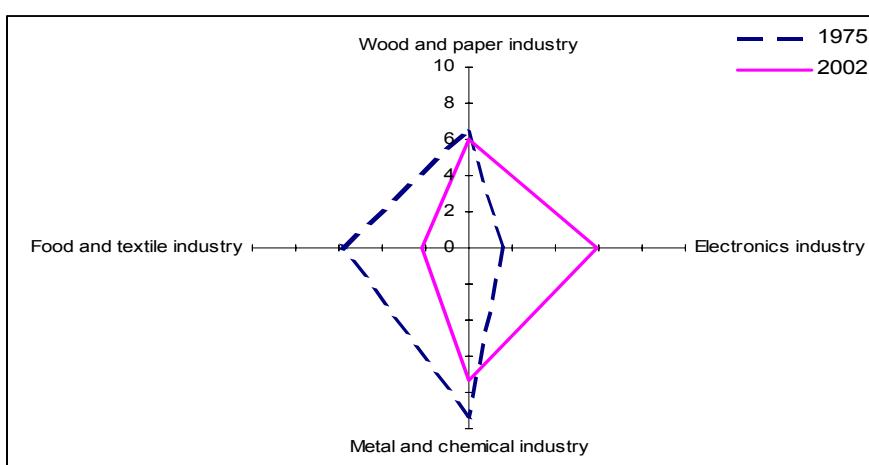
Source: OECD Science, Technology and Industry Scoreboard 2003

ICT surge led to a large change in the industrial structure

The ICT Sector's Role in the Finnish Economy

Traditionally, Finnish manufacturing sector relied upon forest and metal industries to generate growth in the economy. However, as Fig. 2 indicates, there has been a significant shift in the structure of manufacturing as the electronics sector emerged in the 1990s to broaden the base for the economy. Therefore, the Finnish economy is better accustomed to encounter risks deriving from developments in the global economy than previously.

Figure 2. Share of industry sectors in GDP in 1975 and 2002, %



Source: Statistics Finland

Key figures of the ICT sector for 2002 are presented in table 1. The ICT sector is represented by the NACE codes of manufacture of electrical and optical equipment (30-33), telecommunications (642) and computer and related activities sectors (72). The total production value of the ICT sector was EUR 30 billion in 2002 and it employed 134 000 persons. Manufacture of electrical and optical equipment (manufacturing of electronics) dominated the sector by accounting for two thirds of the production and half of the value added and employment.

Table 1. Key economic indicators of the ICT cluster in 2002

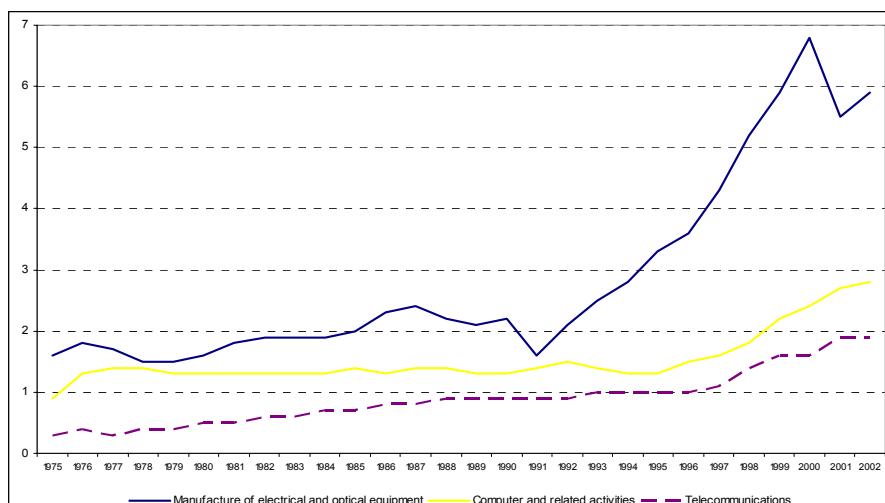
	Manufacture of electronics	Telecommunications	Computer and related activities	Cluster total
	% of total	% of total	% of total	
Production	68.6	18.1	13.3	100
value added	55.6	26.5	17.9	100
employment	50.0	16.0	34.0	100

Source: Statistics Finland

Breakthrough in telecommunications products

Fig. 3 shows the breakthrough in telecommunications products in domestic production. Between the period of Nokia's recovery from 1992 onwards to the peak year of 2000, the value-added in the manufacturing of electronics grew by an annual average rate of 23.7% to a very high level compared to the European average (compare Visselaar & Albers 2004). After the slowdown experienced in global markets with its effects reflected in the electronics manufacturing, the annual average growth rate in the first two years of this decade has been a mere 4.9%. Telecommunications and computer and related activities sectors grew on annual average basis by 14.3% and 9.0% between 1992 and 2002 and in 2001-02 by 9.4% and 12.3%, respectively. In 2002, the sector's total contribution to GDP was 10.6%.

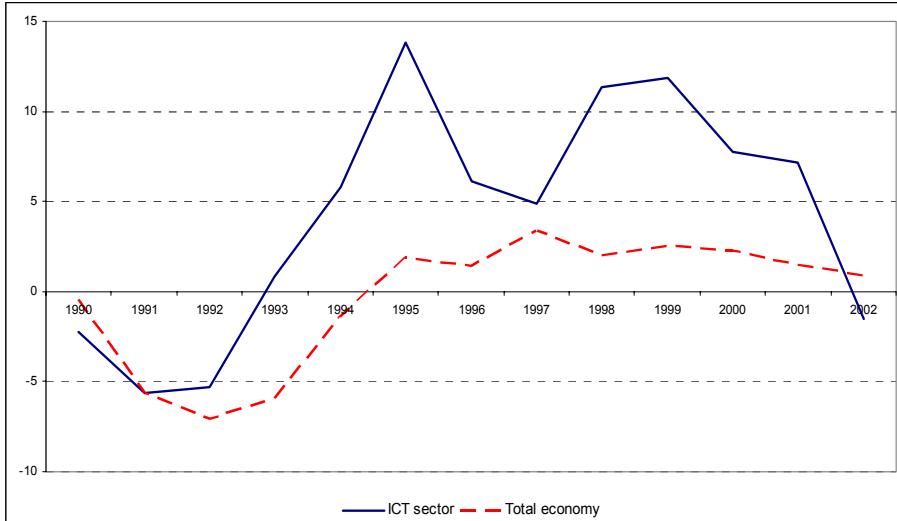
Figure 3. Value added of industries as a proportion of the GDP



Source: Statistics Finland

The ICT sector coped better with the severe recession in the early part of 1990s than the overall economy, as the sector was able to maintain higher employment growth rates (Fig. 4). The unprecedented weakening in total employment was further aggravated by the coinciding full liberalisation of the telecommunications market. Highly automated and digitised systems meant that there was a necessity to reduce and restructure personnel in view of the opening to competition. Fortunately, at the same time Nokia was starting to focus increasingly on telecommunications. As the company had a vast need for competent people, its recruiting compensated for the outflow from the telecommunications operator sector. However, since the rapid growth in the 1990s, the sector has faced obstacles during the early part of this decade. Employment growth in the sector has slowed down considerably after the 1999, even recording a contraction of 1.5% in 2002. With 134 000 employees, the whole ICT sector accounted for 5.6% of total employment in 2002.

Figure 4. Annual employment growth in the ICT sector and total economy (%)



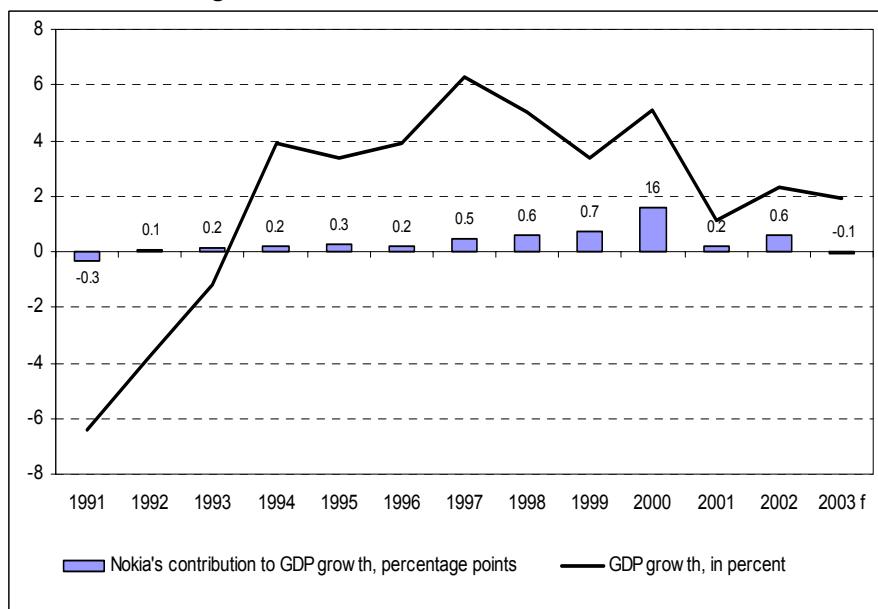
Source: Statistics Finland

Nokia's role

Nokia's rapid growth boosted the Finnish economy

Nokia's rapid growth has had positive effects on the development of main national economic indicators, such as exports, GDP and total R&D expenditure. The most visible impact of Nokia on the Finnish economy is through its contribution to growth, (Fig. 5). According to figures calculated by the Research Institute of the Finnish Economy (ETLA), in the peak year 2000 Nokia's share in the Finnish economy was 3.1% and it contributed 1.6 percentage points to overall GDP growth of 5.1%. However, with the slowdown due to the global economic downturn and saturation of markets in western countries, the contribution to GDP decreased in 2001-2003. In the late 1990s, exports of radio, television and communication equipment and apparatus, mostly Nokia's, grew more than an average rate of 37% a year, but between 2001 and 2003 exports shrank by over 8%. While the share of radio, television and communication equipment and apparatus reached 22.6% in the total value of exports in 2000, it fell to 18.6% in 2003.

Figure 5. Nokia's contribution to Finnish GDP



Source: ETLA

Nokia's share in total R&D expenditures around 35%

Nokia invests heavily in R&D and carries out the bulk of its research in Finland. Etla (2001) estimated that in 2000 roughly 54% of Nokia's R&D expenditure was done in Finland. This percentage has fallen somewhat during recent years as Nokia has expanded more rapidly overseas than in Finland. The estimate for 2003 is around 45%. This means that in 2003 Nokia accounted for 50% of all R&D expenditure carried out by the business sector. Overall, Nokia's share in total R&D expenditure was roughly 35%. These values are only indicative, as Nokia does not publish R&D expenditures by country breakdown for business secrecy reasons. In this way, Finland has been above the 3% reference value of R&D expenditures per GDP set in Lisbon targets since 1999, as Nokia's average growth rate in R&D expenditures in Finland amounted to around 17%.

With roughly 22 600 employees in Finland, i.e. accounting for 1% of total employment, Nokia's direct impact on employment is actually relatively small. However, due to the network of sub-contractors and partner companies, the company's impact on overall employment is far greater. In 2000, Nokia employed more than 18 000 employees in its sub-contractors and partner companies. The corresponding number is estimated to be around 15 000 in 2003. However, Nokia's overall effect on the Finnish economy is difficult to quantify accurately, because the network consists of many layers of sub-contractors and partners, there is a significant impact on other industry sectors (e.g., transportation and retail sales).

Key challenge is how to maintain high value-added industries in Finland

Future prospects

The prospects for the future seem somewhat cloudy as more and more of ICT production is moving out of Finland to countries where production costs are cheaper, in particular to China and Estonia. The key challenge for Finland is how to reap the benefits from the increasing globalisation of markets; in other words, how to keep the high value added input of research and development in Finland and hold on to the remaining parts of the ICT manufacturing in Finland. According to market surveys, Nokia has recently lost market shares and is estimated to do so in future as well in the face of tougher competition from various Asian companies. This means that other sectors of ICT, i.e. computer and related activities and telecommunications, have to strengthen in order to maintain the current levels of production as domestic electronics manufacturing is estimated to decline in the future. Overall, to encounter these challenges the government will continue to pursue economic and industrial policies that promote growth and secure an internationally competitive environment for business and industry. Moreover, the government programme acknowledges that Finland's economic growth and competitiveness will continue to rely mainly on knowledge and utilisation of new technology. Therefore, continued high R&D funding is essential.

Conclusion

The ICT sector has had a distinct impact on the Finnish economy from the early part of the 1990s when Nokia emerged as the world leader in mobile communications and contributed to the growth in the rest of the sector. The emergence of the ICT sector also meant that the Finnish economy now had three strongholds, ICT, metal and paper industries, not only two as previously. Furthermore, without the ICT sector Finland would have most likely continued to drag on in the recession longer. In fact, the ICT sector helped Finland to get out of the recession and experience strong growth rates in the economy during the latter part of 1990s. Even so, the contribution from Nokia has fallen during the early part of this decade, the overall value-added share of ICT in GDP has remained at over 10% of GDP as compared with the average of 8% between 1995-2000. This indicates that the sector has a strong base in Finland, even though some ICT manufacturing will relocate to countries with lower labour costs. The key challenge for Finland is how to keep the high value-added sectors such as research, development and design in the country also in the future. To meet this challenge, the government has, for example, promised to maintain R&D funding high on the agenda and introduced a capital and corporate taxation reform to forestall relocation of businesses to low-corporate taxation countries. Moreover, the government will continue to pursue economic and industrial policies that promote growth and increase competitiveness.

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