

What is Behind the Finnish 'ICT Miracle'?

Laura Pajja

During the last decade, Finland became one of the world's most technology-intensive economies, finding itself in the front rank of the world's digital economies. The Finnish 'ICT miracle' has generated much interest and various theories as to its origin, many of them stressing individual factors as the catalyst for development. But can it actually be explained?

Strong Cluster Structures as a Basis for Competitiveness

Success in the information and communications sector cannot be considered exclusively an internal phenomenon of that sector. Rather, the growth of the Finnish telecommunications industry to its present dimensions must be examined within the context of a cross-sector cluster concept.

Finnish ICT companies' co-operation networks stretch far into other industries, into the world of research and into universities. During the last decade, networking suddenly increased due to the need to concentrate on areas of core competence, to spread the risk that was characteristic of the sector and to exploit external expertise and information. In international comparisons, co-operation between Finnish companies and public research institutes is exceptionally broad.

Generally speaking, the competitiveness of a cluster is dependent on the political, institutional and cultural environment within which it operates. The growth potential of a cluster is also dictated by changes in the international environment, not to mention incidental events.

Long Historical Precedent to Sudden Change

Finland's transition to a high-tech economy has not really taken place as suddenly as it seems. In the background is a long, self-strengthening and complex development process that started in institutions, organisations and throughout society as far back as the 1800s.

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 aims was not always the reason for these decisions, although the Finnish ICT cluster looks like the result of a grand master plan. Action by public authorities has, however, been beneficial to the Finnish ICT cluster, as it has generally been in the right direction and has created a firm foundation for developing competitiveness, despite the fact that the goals and focal areas of industrial policy underwent major changes in post-war Finland.

Exceptional Market Structure Fostered Technological Expertise

The structure of Finnish telecom markets established over a century ago was exceptional up until the 1990s, as it enabled interaction between operators and equipment suppliers, unlike in other countries which had resorted to monopolies.

The origin of the exceptional market structure was fruit of the insight of the Finnish Senate which, at the end of the 1880s (under the Russian Empire at the time) granted several private licences to engage in telecommunications activity that circumvented Russian telegraph regulations. Following independence in 1917, a state telecom operator was established to operate the telegraph and army telephone network left behind by the Russians.

Thus, from an early time onwards, a duopoly of private and public telecom markets existed in Finland, providing a favourable foundation for equal competition once the markets were liberalised in the 1990s. When monopoly markets were opened up elsewhere in the world, complicated regulation was often necessary to help bring about a situation of equitable competition.

Additionally, Finnish markets were open to foreign equipment suppliers, unlike in other countries, where national equipment suppliers enjoyed a monopoly position. In Finland, the large number of operators – over 800 at the peak of the 1930s – enticed leading equipment suppliers to test their latest technology in Finland.

In order to integrate different manufacturers' network components, operators had to develop technological expertise to make them expert customers. This expertise was later exploited by the budding domestic component industry, i.e. the 'forefathers' of Nokia.

The State Uncovered Hidden Expertise

In three companies established in the 1920s - Salora, Suomen Kaapelitehdas (Finnish Cable Works) and Valtion Sähköpaja (State Electrical Works, later known as Televa) - radiotechnology was practised in addition to normal business operations.

In 1963 the National Defence establishment's call for tenders for a company radio finally spurred companies into giving physical expression to their accumulated expertise. Although the army did not ultimately have the resources to purchase the telephone, its prototypes were later developed into the first export telephones. Several public institutions, such as the National Defence, VR (the State Railways) and the Border Guard called for tenders for their demanding communications requirements, thus fostering the development of radio technology expertise and turning it into a budding industry.

Planning the NMT Standard Got Companies Sparring

Co-operation between public authorities and the telecommunication component industry culminated in the creation of the NMT network in the 1970s. Nordic telecommunications au-

thorities aimed to create competitive markets, and therefore the standards were made open. At the start of the 1980s the Nordic countries formed the world's largest mobile communication market, within which about a dozen of the equipment suppliers operated.

At the planned starting phase of the system Finnish companies were neither ready, nor willing to supply network components. Instead, Mobira supplied the first telephones for the network. Under pressure from Finland's national post and telegraph authority, Mobira, and later Tele-Nokia, started to manufacture network components - which was later to become the cornerstone of their development.

The NMT standard spread extensively, guaranteeing the Nordic countries an advantageous position in the new telecom industry. In certain countries, national component monopolies developed their own closed standards, which almost invariably remained local curiosities. Moreover, in the USA, AT&T spent years trying to persuade American telecom authorities about the potential of wireless communication.

The fixed network pricing we are used to (time-based, caller pays, no operator component subsidies) created 'normal' markets, unlike in those countries where divergent pricing distorted the structure of demand.

Main Cluster Actors Around the Same Table

In the 1980s Finnish technology policy began to emphasise information technology. The importance of science in developing technology was also more clearly acknowledged.

In 1986 the Science and Technology Policy Council of Finland was established to co-ordinate planning of policy on expertise and innovation. It brings the main economic stakeholders – government, industry, science and the labour markets – together around the same table and has a prominent position in shaping, coordinating and resourcing science and technology policy. Given its broad and prestigious representation – being chaired by the Prime Minister – it is, even from an international perspective, an exceptional body. Finland's persistent investment in technological development, even during the worst recession years of the early 1990s, is probably very much a result of the joint visions conceived at the 'round table',

which aimed at setting Finland back on its feet through know-how.

The change in direction of science and technology policy at the turn of the 1980s was also communicated by the establishment of Tekes, the National Technology Agent, which has, in recent years, taken a very active role as a 'weaver' of networks and 'godfather' to new ICT companies.

This approach, based on technology and expertise, has lifted both Finnish R&D investments and the networking of public and private cluster operators to an international peak. And these have been the central structural elements of the national innovation system.

Liberalisation Was the Key to Many Telecom Developments...

In Finland, the early liberalisation of telecommunications competition prompted a breakthrough in digital communications. Competition pressed prices down and led to mass markets for wireless communication and a test laboratory for the equipment industry.

The impetus for the liberalisation of competition came from the private telecom sector, which, since the 1960s had criticised the state monopoly in many new telecom services. The imperial telephone decree, valid since 1886, could not give an unambiguous answer to the question of who had the right to transfer data and images on a network.

The establishment of Datatie Oy without a licence in 1985 set the wheels in motion for a series of changes in the law. These were completed in 1994, by which time telecom markets in Finland had become some of the first in the world to be fully liberalised.

The liberalisation of telecom competition culminated in the Radiolinja GSM licence in 1990. Private companies had previously been refused an NMT licence due to the supposed social benefits arising from a 'natural monopoly'.

Radiolinja, too, was established without a country-wide licence in 1988. Because regional licences permitted the construction of local radio telephone networks, telephone companies began to construct networks in their own areas, believing that the right to operate nationally would eventually be granted. The private li-

cence application also caused much political wrangling. The Posts and Telecommunications authority put up heavy resistance – the demand for NMT services was just beginning to heat up.

In 1991, the world's first commercial GSM call was made in Helsinki with a Nokia phone, on a network supplied by Nokia. In answer to the challenge, the Posts and Telecommunications Operator brought forward the launch date for their GSM services, which took place shortly after Radiolinja's. Its original intention had been to keep in step with the other GSM development projects in Europe.

...and to Opening Up Company Financing

The liberalisation of the capital markets and the ensuing rapid increase of risk financing gave decisive impetus to the growth, diversification and internationalisation of the ICT cluster. The lack of risk capital had been a major brake to new business activity right up until the 1990s. In 1995, over 80 per cent of small and medium-sized enterprises still had bank loans, but this figure had dropped to less than 50 per cent by 2000.

The recent phenomenon of mobile Internet companies surging to the forefront would not have been possible in financial markets like those of the past. Even Nokia would not have existed in its current form without access to external capital.

Universities: the Heartland of Innovation

Finns' fascination with technology, reflected in the fact that they have the highest penetration of mobile phones and the Internet in the world, has received its inspiration from the university world. Under the umbrella of academic freedom, the right of free study and an advantageous student grant system, there has been ample opportunity 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.

In the 1980s, the Internet, still a largely unknown concept, was brought first in the world from the USA to Finland by students. The world's first graphic-based Internet browser was developed in the IT class of the Helsinki

University of Technology in 1992, a year before Mosaic and Netscape. The inventive students were not, however, sufficiently interested to commercialise the browser. But IT students like Tatu Ylönen (SSH encryption program) and Linus Torvalds (Linux operating system) went on to become legends in their own time.

Universities and the technology villages that sprout up around them have, in some localities, become major sources of new business activity. Academic careers often turn into entrepreneurial ones, to commercialise an innovation. Traditionally, students have done research for their theses in local companies and have already created jobs for themselves before graduating. Thus, the dynamo of pure and applied science has turned the innovation generator.

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, a good 60 per cent of the company's R&D work is carried out in Finland.

The shortage of experts is, nevertheless, the biggest challenge to the Finnish ICT cluster. Public authorities spent the whole of the 1990s considering how to increase the amount of educated staff. The government multiplied the number of higher education institutions, even if study resources were not able to keep pace with the growth.

The recent economic slowdown has alleviated, yet superficially, the labour shortage in the sector. But this is no lasting solution, however. The building of the information society requires years and an increasing range of experts who, in turn, will need to master increasingly demanding technologies. ETLA predicts that the demand for labour in the sector will not even out in Finland until the next decade.

Good Fortune Also Plays a Part

Good fortune has also been an important factor for the success of the cluster.

Radiolinja's GSM licence, gained at the beginning of the 1990s, was perfectly timed – although it was hardly noticed then – to coincide with the beginning of world telecom mar-

ket liberalisation. Finland offered the world's first digital mobile phone service on a network it had built itself. The international attention gained by the event brought Nokia back from the brink of collapse and thrust it into an export market spiral. As telecom monopolies crumbled around the world, the new market entrants eagerly invested in competing networks. Competition caused lower prices and, hence, a boom in demand for mobile phones. It is funny to think where Finland would be now if private telecom companies had been granted the analogue NMT network licence, which they were declined.

The simultaneous recession caused the labour force in Finland to move swiftly into the new growth sector. The global IT breakthrough and, particularly, the commercial expansion of the Internet both coincided with this cycle, thus providing a new development platform for Finnish technology innovations. The integration of mobile and Internet technologies has turned Finland into a digital icon.

In hindsight, it seems almost ludicrous that the political wrangling over the GSM licence at the beginning of the 1990s failed to raise the issues – which were later obvious – of the economic and social effects that mobile communications competition and an early transition to digital telecom services would have. It is hard, however, to blame the decision-makers of the time for being short-sighted. At the beginning of the 1990s both the Finnish economy and Nokia were still in a very depressed state before the real take-off started.

As this very general examination of the evolution of the ICT cluster shows, the development of the competitiveness of a country and its companies is closely bound up with the operating environment and its internal dynamics. A study co-ordinated by the OECD, comparing the competitiveness of ICT clusters from different countries and the economic policy that affects it, confirmed this view. There is no such thing as a universally applicable 'cluster policy'. The best way to encourage more innovation and competitiveness is to create a framework for uninhibited interaction between cluster operators, both private and public.