English Summary

IT INFRASTRUCTURE STUDY ON NORDIC BROADBAND POLICY

August 2003
For

Nordic
COUNCIL OF MINISTERS

Background

Towards the end of 2000 the Nordic Council recommended that the Nordic Council of Ministers should carry out an IT infrastructure study on Nordic Broadband policy.

The central arguments in favour of undertaking a study were:

- That the Internet must be accessible to all citizens in the Nordic countries
- That the Nordic Area should, through IT, strengthen its position as a region with a high level of education, evenly spread

Against that background the Nordic countries should ensure the availability of a high and continual Internet capacity.

In the Nordic countries there is agreement that Broadband roll-out is central to the development of Nordic competence and revenue. The Nordic countries appear to have the same tempo of IT development and therefore face common problems, either as regards exploiting the advantages or countering the unfavourable consequences of IT development.

The Ministerial Council for Information Technology and the Ministerial Council for regional policy have together decided to carry out an IT infrastructure study which should focus on
1. The varying Nordic Broadband policies
2. The execution of Broadband policies
3. The connection between Broadband policies and the provision and use of digital content
4. The connection between Broadband policies and the regional policy of the Nordic countries

Summary and conclusions

Nordic countries are among the world leaders as regards the coverage and use of Broadband.

Broadband has primarily been on the political agenda for the past five years and is part of the Information Society strategy. From the outset the Nordic countries had their own Broadband policy but, as set out in official statements, that policy has gradually come more and more to resemble, and to be influenced by, the EU's eEurope initiative.

In practice there are some differences. The major drive has been made in Sweden, where SEK 5.25 bn. has been allocated to Information and Communications Technology (ICT) infrastructure at the local, regional and national level. The other Nordic countries have taken fewer initiatives and have to a greater degree relied on competition, and the incumbent telephone operators[1], to create new infrastructure. So far it appears as if this strategy has been successful.

With more than 24 million inhabitants, the Nordic Countries are in the forefront as regards Broadband coverage. Over 75% of households in the Nordic Area have access to a Broadband network, but there are differences among the countries. Denmark and Iceland are those with the highest Broadband coverage, with over 90%, while Sweden and Finland have coverage of between 70 and 75%. Norway has the lowest, with coverage of nearly 65%. We expect that these percentages will even out in the course of the next few years, though Finland, Norway and Sweden will have difficulty in achieving coverage much above 90%, because of geographical factors and the pattern of population distribution.

We expect that in the course of 2003 the market will have passed the critical mass and that growth will therefore continue as has been seen with other telecommunication services in the Nordic Area. Even though the Nordic Broadband network covered over 75% of households at the end of 2002, only 15 % of the population had yet connected to it. The proportion of households connected to Broadband will be over 20% at the beginning of 2004. Even though development is proceeding rapidly, at the present rate of growth it will be another 5 years before half of all households have adopted Broadband.

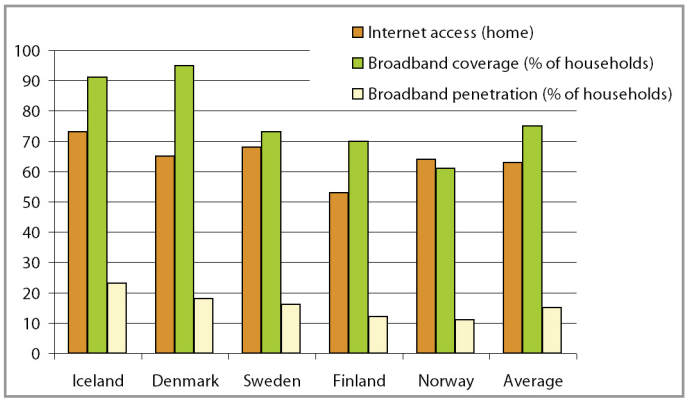

Figure 1. Broadband development in the Nordic Area, 2002 (Sources: National statistics, official reports, interviews with operators and authorities, Teleplan analyses)

Competition on the Broadband market has been extremely important in its establishment, not least for price-setting of Broadband products. But if we examine the market situation

[1] The Nordic utilities, with a monopoly on fixed infrastructure before deregulation, were TDC, TeliaSonera, Siminn, Telenor, Elisa and the Finnet Group

today, it is the traditional national telephone utilities which have market power in the Broadband market. ADSL makes use of the copper-wired network which covers the majority of households in the Nordic Area. By upgrading telephone exchanges, Broadband becomes possible without laying a new cable network to every household. In addition, the costs of extending ADSL, which is the most popular method of access, have been reduced thanks to steeply falling equipment prices for the tele-operators.

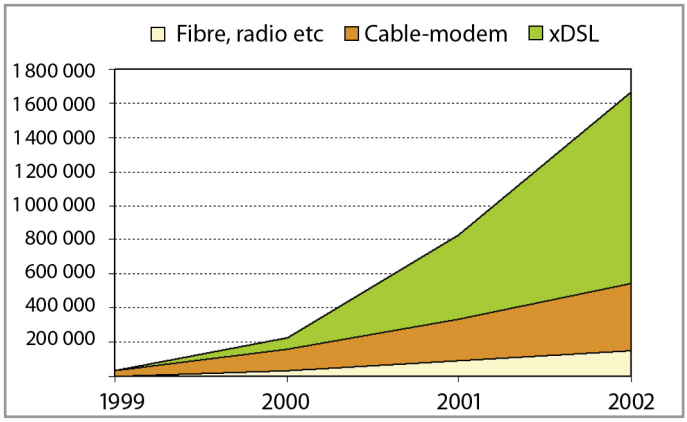

Figure 2. Broadband connections in the Nordic Area, by technology (1999-2002)

In the Nordic Area, Broadband costs between €30 and €50 per month for lower speeds. In general prices are lowest in Sweden, perhaps mostly because of Bredbandsbolaget AB ["the Broadband Company"], which offers a product with a very high bandwidth (up to 10 Mbit per second) for SEK 230 per month. Bredbandsbolaget's high speed and low price has put an effective stop to the possibility for competitors to raise their prices. In the other Nordic countries Bredbandsbolaget does not operate or plays a more modest role. Figure 3 shows a review of Broadband prices in the Nordic countries, for May 2003.

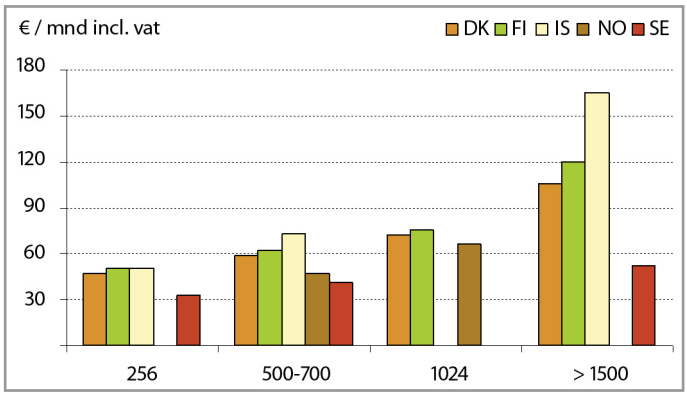

Figure 3. Broadband prices – major actors, May 2003 (*Sources*: *TDC, Elisa, Siminn, Telia, Telenor)*

Increased demand for Broadband will have positive effects on Internet usage. Inquiries show that Internet users who have Broadband increase the demand for advanced services. Access to Broadband networks is nonetheless not sufficient by itself to bring about growth in demand for Broadband services. Users must have access to terminals, primarily modern home computers. They must also have access to attractive services and the foundation must be a business model which makes possible profitable or efficient management for private and public organisations.

Stimulating the spread of computers by giving tax concessions on the purchase of home computers through places of employment has proved to be an effective means of increasing the distribution of terminals.

Important services which can drive the demand for Broadband are access to entertainment and to legal music and film services. This means that the holders of performing rights must be willing to make their contents accessible on the Internet via a user-friendly interface at an acceptable price. Home-office arrangements are expected to be an important service which will drive the demand for Broadband.

Good solutions for electronic signatures and authentication of identity (PKI) are important in order to increase the security of transaction services. This will be an important foundation for the efficient functioning of services. Electronic learning could also be a service which can drive demand for Broadband. The availability of higher education on the Internet is still limited in the Nordic context.

Finally, there must be a functioning business model for the enterprises wishing to offer services on the Internet. That requires these enterprises to use the Internet as an integral part of their own business plan.

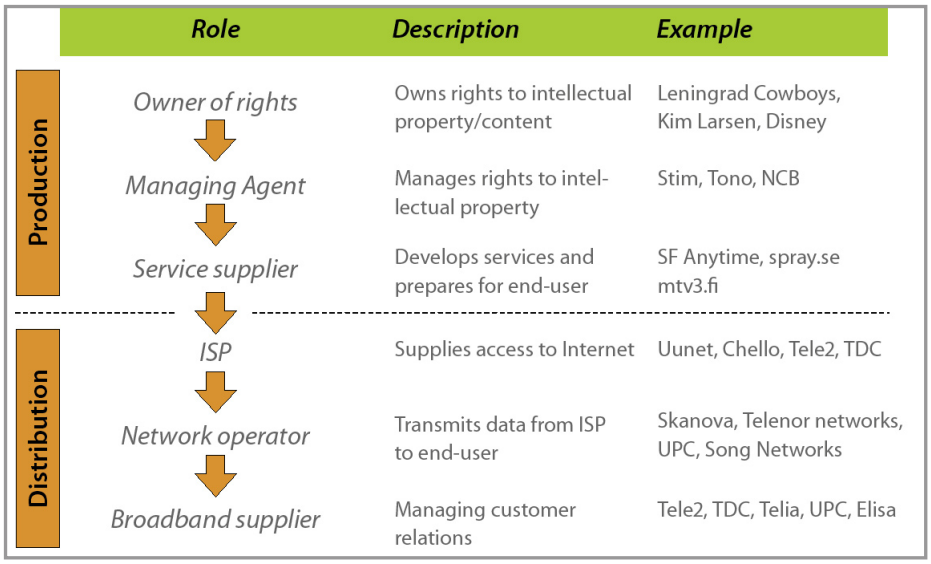

Figure 4. Value chain for Broadband services

Investigations based on business enterprise data show that ICT is used very differently in different branches of industry and commerce. The strategic use of ICT is more common in major firms and in the supply of business services, while so far ICT is rather more haphazardly integrated in small enterprises and in primary branches of industry and commerce.

Even though Nordic ICT statistics show that the great majority of firms are now connected to the Internet, it is only a few sectors which so far have achieved the major productivity gains offered by access to Broadband connections. It is primarily firms in the banking and finance sectors, the provision of business services and R & D which can show these effects. Since these are branches which are over-represented, in both absolute and relative terms, in the major towns, it is to be expected that the greatest economic gains from Broadband are to be achieved in urban districts.

In the northernmost parts of the Nordic Area in general, in Iceland, on a number of Danish islands, in the Faeroes, Greenland and the Åland Islands, the structure of the municipalities is such that many of them have very few inhabitants, despite the fact that they cover large areas. Here there are special technical challenges linked with the balance between the development of a hard ICT infrastructure and effective production of services. Since the strongholds of the ICT industry are in the major towns it opens the way for an increased interplay between the ICT sector and public authorities in the further development of ICT infrastructure, even if official political signals seem to indicate the opposite.

Since regional responsibility for development is differently allocated in the Nordic countries the EU's regional policy is important for current changes in regional development policy not only in the three Nordic EU member countries, Denmark, Finland and Sweden, but also in Iceland and Norway. For the member countries the EU contribution through the Structural Funds (the EU's Social Fund, Regional Fund and Agricultural Fund) represents, respectively, 50% (Denmark, Finland) and 33% (Sweden) of their budgets for regional development measures.

The objective of regional policy in the EU is to contribute to a balanced economic and social development in the Union, and almost one-third of the EU budget is spent on various structural measures. The Structural Funds are the EU's aid in the implementation of this policy. Structural Fund resources have been divided into different time periods. One period was from 1994 to 1999, while the current period runs from 2000 to 2006. Within a time period EU resources are allocated to various programmes, which in turn are divided into various Objectives and Community initiatives.

An assessment published in September 2002[2] investigated how the EU countries integrate measures to promote roll-out of Broadband in their Structural Fund programmes. Projects to promote a faster and cheaper Internet had the largest funding in terms of all measures in total expenditure under the various eEurope-initiatives. More than one-quarter of the planned expenditure on the 11 different eEurope initiatives – 28% – is allocated to roll-out of Broadband for the period 2000-2006 alone. Broadband deployment is an essential regional development measure not only in the EU countries, but also in Norway and Iceland.

However, it is not evident that such measures on the supply side correspond to the regional pattern on the demand side. In the "census" of access to a Broadband network in different types of municipality in the Nordic countries which is presented in this report, a persistent pattern to emerge is that good access to Broadband networks can be explained by the municipality's centrality, household income, make-up of local commerce and industry and the general level of education of the working population. This largely explains the relationship between the municipality's centrality, access to Broadband and demand for "a fast Internet" and other Broadband services. There is in general a conjunction between access to Broadband and the level of content production for the Internet – municipalities with good Broadband access also have a high Internet domain density.

The composition of the local business and industry structure explains much of the commercial demand. It is not in the primary branches and in manufacturing in the districts that fast Internet connections are taken up first. In a study of economic development and the Broadband network in the peripheral parts of the Nordic Area, Rasmussen therefore asks "how far traditional branches of commerce … in the peripheral areas in general have taken to the Broadband network" (Rasmussen 2002: 92).

[2] Technopolis Ltd and others (2002): Final report for the thematic evaluation of the Information Society

Investment costs per inhabitant are potentially higher in Sweden, with 21.6 inhabitants per km^2, than in Denmark with a population density of 126.6. But Broadband deployment costs are also affected by the proportion of the population living in built-up areas. Iceland is a country with low population density, but since as many as 92% live in urban areas, the necessary investment per inhabitant may be lower. At the same time, excavation costs, measured in cost per metre, are higher in urban areas than in rural areas.

Table 1. Demographic situation in the Nordic Area. Sources: National statistics/UN/CIA factbook

Country	Population	No. Of Households	Area	Population density	Urbanisation
Denmark	5 368 854	2 466 000	42 394	126,6	86 %
Finland	5 183 545	2 295 000	305 470	17,0	65 %
Iceland	279 384	105 000	100 250	2,8	92 %
Norway	4 525 116	1 961 000	307 860	14,7	74 %
Sweden	8 876 744	4 388 163	410 934	21,6	83 %
Total	24 233 643	11 215 163	1 166 908	20,8	78 %

Because of the low population density characteristic of large parts of the Nordic Area it will take a relatively long time before even ADSL investments become profitable in the rural districts. It will therefore fall to public authorities to provide incentives for increased use of Internet and Broadband services in their business activity.

The market will not extend Broadband to everybody

The market will not roll out Broadband to everyone in the Nordic Area at the same price. However, since the political objective is that everybody should have access to Broadband at the same price, the public sector must stimulate extension of the network or subsidise demand in peripheral areas.

The possibility of exploiting the telephone companies' existing hard-wire connections for Broadband is the main driver for Broadband at present. Since deregulation of the market the former national telephone utility companies have also been active in building out Broadband. It seems as if some of these companies may have taken a certain national responsibility for building up the network, either in order to have the backing of an advanced domestic market, or because a certain political influence is at work in their management.

The last part of the extension of the network will be difficult to justify commercially. New technology can bring about some change in this picture, but as things look today, the market will need incentives in the form of direct support for its extension. Alternatively, buyers can be subsidised to choose other technologies such as leased connections, satellites or wireless systems.

The challenge is to see where the market will not supply Broadband. Peripheral regions, which at present are of no interest to market forces, can become attractive for market actors in a few years' time, on the basis of new technology and falling production costs.

Aggregated and co-ordinated demand can increase Broadband coverage

If Broadband is to achieve wide distribution there must be common objectives and initiatives from the state, local authorities, industry and society at large.

Regional actors must so far as possible try to aggregate demand for Broadband and to influence private suppliers to build out the network on a commercial basis. Many major users of Broadband in peripheral regions, such as universities and major local firms, do not include regional development among the assessment criteria when selecting those invited to tender for the supply of Broadband. This should become one of the criteria when, in particular, public institutions are selecting infrastructure suppliers.

Co-ordination of the purchase of Broadband could also bring advantages at the Nordic level, particularly in the Arctic regions where the geographical distances are so great and the population density so low. The initiatives which have been taken in the EU INTERREG programmes can give valuable experience in what co-ordination effects exist among the Nordic countries.

Co-ordination of demand will also make it possible to influence the price payable for access to high-speed networks. The price per kilobyte falls dramatically the higher the capacity which is bought. That means that if a number of consumers can get together to make a combined purchase of IT infrastructure, the large buy-in of equipment and the possibility of optimising the extension of the network will give a double incentive to suppliers.

For a regional Internet Service Provider (ISP) the cost of connecting to the national Internet eXchange-IX is a large part of the cost to the-end user, because of distance and speed requirements. At present Internet exchanges are situated in central districts. In a Nordic perspective it should be possible to set up an exchange in the northern areas, also with a view to cooperation with the Baltic Region and the Barents Region.

Local advanced consumer environments affect the roll-out of Broadband

Access to the Broadband network can be explained by the centrality of the Municipality, household income, the structure of local business and industry and the general level of education of the working population.

The cost and utility of different measures to develop local demand for Broadband can vary greatly from geographical area to area. In terms of regional policy, the greatest effect might be expected from local initiatives to increase access to public and social services. Thereafter, initiatives within sectors such as eHealth and eLearning can be expected to contribute to regional development, while measures to promote financial transactions (data network security and encryption) will be of more than just local benefit.

In order to create a local base for demand, the education sector can be advanced as a central actor in this work in peripheral areas since a) these institutions will often be the most advanced consumer environments at the extreme periphery, and b) the educational institutions will be central in the development of formal IT competence and IT training in working life.

To stimulate the development of Internet services

Access to exciting and useful Internet services is an important driver for the development and use of Broadband networks. Even though there are differences in Internet penetration and the pricing of Internet access in the Nordic countries, there is relatively little difference among them in the use of different services. E-mail and the search for information about goods and services are the most popular services among Nordic Internet-users. In the figure below the population-weighted average for each service is shown by the circles, while the bars show penetration in the highest and lowest countries. No data are available in respect of Norwegian users.

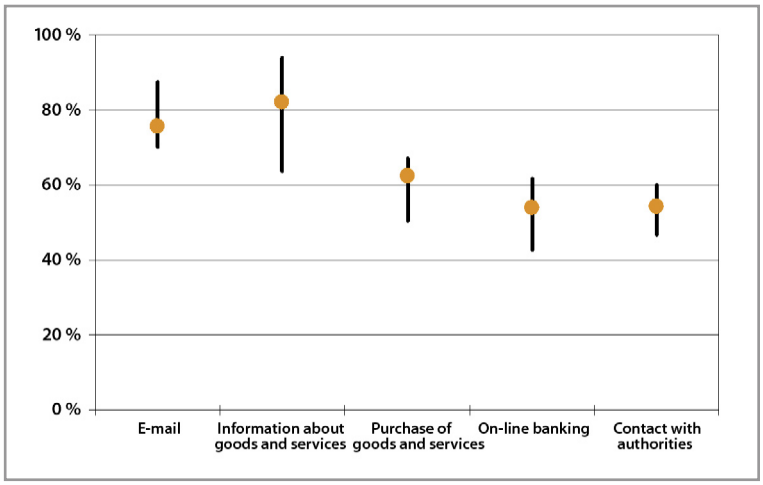

Figure 5. Use of Internet services by Internet users in Nordic countries. (*Source: Nordic Information Society Statistics (NISS) 2002, adapted byTeleplan.)*

There are many services which have considerable potential for further development and the Nordic authorities can play an important part in several sectors in order to stimulate it:

- Solutions for electronic signature and identification (PKI) will simplify and increase security for many services. PKI development can be accelerated through participation by the public authorities in the co-ordination of technological developments and the introduction of PKI solutions in public networks.
- The electronic teaching on offer from Nordic education institutions is currently limited. It can be increased by giving educational institutions greater freedom and better financial incentives to develop Internet-based courses.
- Public authorities possess large amounts of basic data, for example cartographic data and land-registry information. Simple and cheap access to such information is an important prerequisite for the development of services.
- There are a number of exciting Nordic initiatives for access to legal music and film services. The Nordic authorities should evaluate how they can influence the price level and price structures for the owners of performing and other rights to films and music, in such a way that the content becomes accessible through electronic channels at an acceptable price.
- Increase cooperation on local testing and development of soft ICT infrastructure, preferably within the framework of EU initiatives such as INTERREG.

Prepare the next generation of Broadband

Municipalities and other regional authorities should take the initiative to draw up a Broadband plan for their own district, in order to obtain a picture both of the current infrastructure and of the longer term prospects. Sweden has made an arrangement by which the Municipalities produce their own IT infrastructure programme.

Even if the current needs for Broadband are largely covered by technologies such as ADSL and cable modem, in the last 10 to 20 years the market has demanded ever greater network capacity. We must therefore expect that demand for faster Broadband will increase. Even if new xDSL and cable modem technology will be able to cover much of this demand, the future lies with fibre as the transmission medium for high transmission capacity.

Therefore in regions where excavation work is currently being carried out in order to lay copper and other cables, conduits should now be put in place for fibre. Municipalities which are responsible for water, highways and electricity should in their planning of the infrastructure also take an overall responsibility for transmission paths for high-speed networks. There are a number of models for how such responsibility can be assumed. The Municipality itself can own such a network, as Stokab does in Stockholm, and lease it out to commercial actors. Alternatively the private sector can develop it, while the Municipality takes the initiative to aggregate and co-ordinate demand for Broadband in order to persuade a number of operators to develop it locally.

Monitors and informers

In the expectation that commercial supply of Broadband services will not be extended throughout the country, it is important for the authorities to be able to monitor the market and not least international developments, so that they can assess the timing and effect of any measures introduced in order to make Broadband universally available.

Increased Nordic co-operation to obtain data on the demand side of the IT sector can facilitate good comparisons between similar regions. Particular focus should be put on collecting data at a lower geographical level.

The Nordic Ministerial Council has previously published statistics for the Nordic Area and it should up-date its collected statistics bi-annually or annually. Particular weight should be put on obtaining data on the demand side. Here there is particularly important need for good indicators for the development of the ICT sector.