THE TERRITORIAL AVAILABILITY AND DIFFUSION OF BROADBAND IN FINLAND: LESSONS FROM FINNISH BROADBAND POLICY

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ABSTRACT

Although there is no unambiguous definition of what an Information Society (IS) is actually composed of, the availability and use of information and communications technology (ICT) can be considered as an established part of it. This article examines the case of one IS indicator: the measurement of the availability of broadband in Finland from the year 2001 to 2004. The focus is on the overall sensibility of the use of an indicator, the evolution of territorial differences at different spatial scales, and the effectiveness of the broadband policy in Finland in the years 2001 to 2004.

The analysis shows that the indicators of the availability of broadband might be misleading for purposes of policy formulation and monitoring. The results also indicate that the Finnish broadband policy has resulted in regional differences and spatially uneven impacts in terms of availability.

This article is an outgrowth of the ESPON project “Identification of Spatially Relevant aspects of the Information Society”.

1 INTRODUCTION

Most countries dispose eagerly towards the development of an information society (IS). Due to increased political interest, there has also been a growing need to collect and compile IS statistics for informed decision-making. Thus, various indicators have been collected and different indices been developed to measure IS, to monitor its development and to compare countries in terms of IS performance.

Simple and one-sided indicators are suitable for monitoring the evolution of IS, but the matter becomes complicated if the collected IS indicators are used for other purposes. Especially the political use of IS indicators – the considering of policy alternatives and the evaluation of the effectiveness of policy actions – is linked with problems.

Broadband policy can be used as an example for illustrating these problems, where at least two problems can be identified. The first problem is linked with the measuring of the availability of broadband. In the case of broadband this is relatively straightforward: the debate is about the classification based on the speed of the connection, but otherwise the matter is dichotomous – broadband is either available or it is not. The second problem is how the used measures fit for arguments and evaluation measures of political decisions. Although the topic has been extensively researched in the Finnish context by public authorities (e.g. MINTC 2002, 2004, 2005a, 2005b; Sirkiä et al. 2005), and the evolution has also been evaluated analytically (e.g. Eskelinen, Frank and Hirvonen 2004a, 2004b), broadband availability doesn't seem to have been examined from a sensibility and evaluation of indicators point of view.

Although there doesn't seem to be an unambiguous definition of what IS is actually composed of, the availability and use of information and communications technology (ICT) can be considered as an established part of it.. This article examines the case of one IS indicator: the measurement of the availability of broadband in Finland from the year 2001 to 2004. The focus is on the overall sensibility of the indicators approach, the evolution of territorial differences at different spatial scales, and the effectiveness of the broadband policy in Finland in the years 2001 to 2004.

The case study presented in this article has two parts: First, in the next section the characteristics of broadband diffusion are introduced, and the sensibility of broadband availability indi-

cators are evaluated. This is followed by an analysis of the diffusion of broadband and broadband policy in Finland in the years 2001 to 2004, looking also at the evolution of territorial broadband differences within the country. The final section presents the conclusions of this study.

2 EVALUATING THE USE OF IS INDICATORS

Differences in use of ICT – technologies related to IS – are usually measured by the so called 'digital divide'. Factors causing the digital divide can be grouped into three, following a framework for communication readiness presented by Viherä (1999). The framework gives three factors for differences in use of communications technologies, which are access (availability), skills (education) and motivation (utility).

Figure 1 illustrates the dynamic nature of the digital divide: It relates the evolution of the availability and use of ICT technology (y-axis) with time (x-axis). It can be noted that the availability of technology generally diffuses faster than the use of it (examined in more detail in Eskelinen et al. 2004b). The diffusion of the use of ICT technology is often noted to draw an S-curve, following the theory of innovation diffusion: the use is low in the beginning, grows rapidly after a while, and in the end it slows down again.

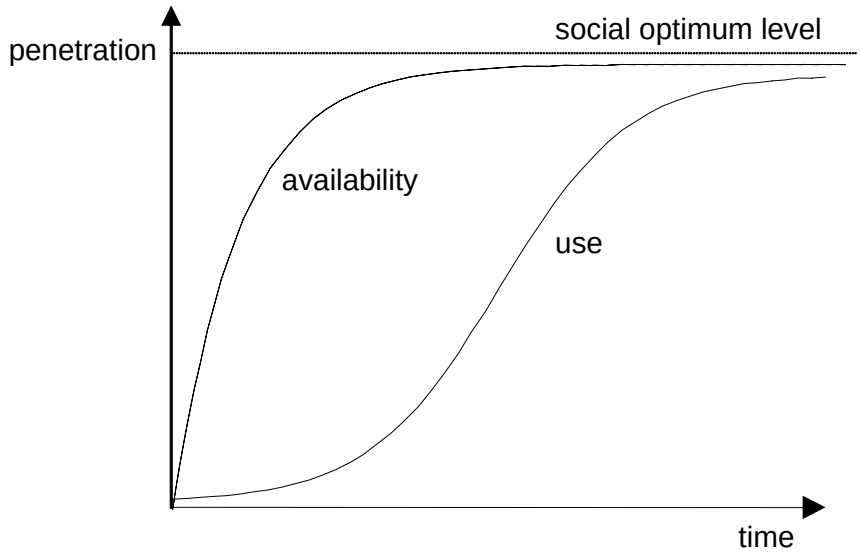

Figure 1. The dynamics of availability and use of ICT technology.

The horizontal line in the upper part of Figure 1 depicts the social optimum level, i.e. the best level of technology use from the society's point of view. The optimal level line and the curves depicting the availability and use can be used to define three interpretations of the digital divide: The traditionally recognized digital divide is between users and non-users, i.e. the difference between the users-curve and the social optimum line. Another interpretation of the digital divide is the difference between availability and use, i.e. the vertical difference of the two curves in Figure 1. A third interpretation of the digital divide would be the difference between the social optimum level and the availability curve.

The availability and use of a new ICT technology are thus two separate matters, and their difference changes with time. By looking at Figure 1, one can understand why concerns of a (territorial) digital divide are the greatest in the early days of an ICT technology: At this point of time two dimensions of the digital divide – the difference between the actual and social optimum availability, and the difference between the use and availability – are at their greatest.

The differences in the use of broadband follow very much the differences of demographic structure. The most educated, motivated and computer skilled are usually located in city regions and other densely populated areas, thus the demand for broadband is the greatest in these areas. Also the availability increases with the population. This is due to the fact that availability is usually built upon demand. For example, the availability of xDSL broadband technology in Finland has diffused following the population density: densely populated areas were served first and sparsely populated territories last. (Eskelinen et al. 2004a).

These nodal diffusion patterns of the availability of a new ICT, causing the exponential rise to maximum curve depicted in Figure 1, and the clear visibility of the digital divide in the early stages of the diffusion, are bothersome from the regional policy point of view. Sparse population and weak success in the most measures of regional development exist usually in the same regions, and the lack of broadband cannot be considered as debilitating that link. Thus, policy makers have a justified reason to react to the regional differences which are characteristic to the early stages of the diffusion of a new ICT. This explains, for example, the big investment plans announced in Sweden a couple of years ago. The technology specific and market based diffusion pattern determines whether an action is a political overreaction, related to a random measuring point of time, or a justified action against the failure of market mechanism and the excessive slow diffusion of technology.

In the case of broadband one should also pay attention towards the regional level of the used indicators. Figure 2 exemplifies how the picture of the availability of broadband can vary with the used regional level.

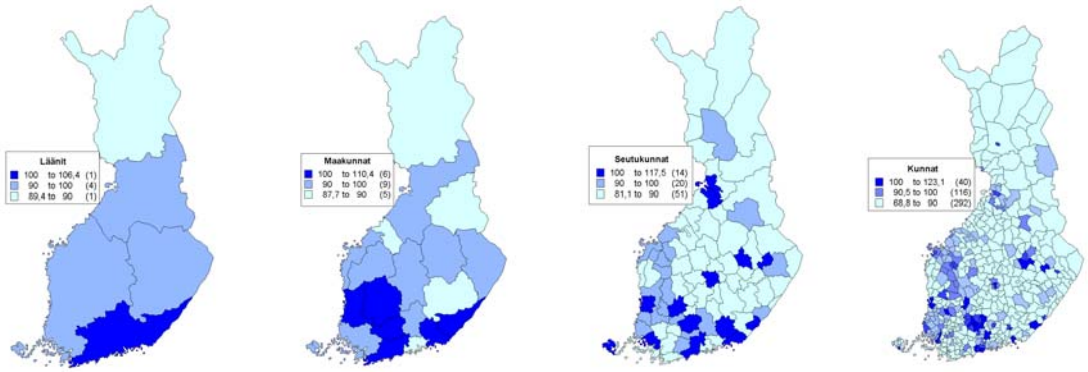

Figure 2. Availability of broadband on province, NUTS3, NUTS4 and NUTS5 levels in the year 2001. Source: MINTC 2002 and calculations of authors.

Figure 2 clearly shows if the availability of broadband is examined on the province level, a clear north-south division can be seen. Using the NUTS5 division, on the other hand, gives a much richer picture of regional variation of broadband availability. In the case of broadband, the actual picture is even more fine-grained: For example, in the case of xDSL the availability is determined by the location of phone switches, and the availability of cable modem varies even with housing blocks. (Eskelinen et al. 2003). The maps in Figure 2 lead to very different policy recommendations. Because of this, the information loss caused by the regional aggregation of statistical data, and the use of a "wrong" regional level, can be considered as notably reducing the usability of information society indicators.

3 THE SPATIAL DIFFUSION OF BROADBAND IN FINLAND FROM YEAR 2001 TO 2004

The different paces of the evolution of the use and availability of broadband in Finland can be sketched as follows. The availability of broadband, measured by the population covered, has been relatively high already for years. It has grown from 65% in year 2002 to ca. 82% in the end of year 2003, and further to 94% in the end of year 2004. The use of broadband in house-

holds has grown following the s-shaped growth curve, proposed by innovation diffusion theory: slowly, but with an increasing speed. The share of broadband households was about 10% in the year 2002, ca. 13% in the year 2003, ca. 25% in the year 2004, and already about 40% in the year 2005. (MINTC 2002; MINTC 2004; Sirkiä et al. 2005)

Broadband is estimated as being available for households since the year 1999 (MINTC 2003). This year can thus be set as a starting point, and the above figures are used to model the diffusion and availability of broadband in Finland. This can be done by the curve fitting property of SPSS. The diffusion is modeled by using a logistic curve, which provides a s-shaped growth curve. The upper limit of the logistic curve is limited to 100% (1,0), which would mean that all households have acquired broadband. The evolution availability can be estimated by using a logarithmic growth curve, which is as well limited to a maximum availability of 100% (i.e. all households would be covered by broadband). Figure 3 below depicts the actual diffusion and availability evolution of broadband, which are complemented by the growth estimates calculated as explained above.

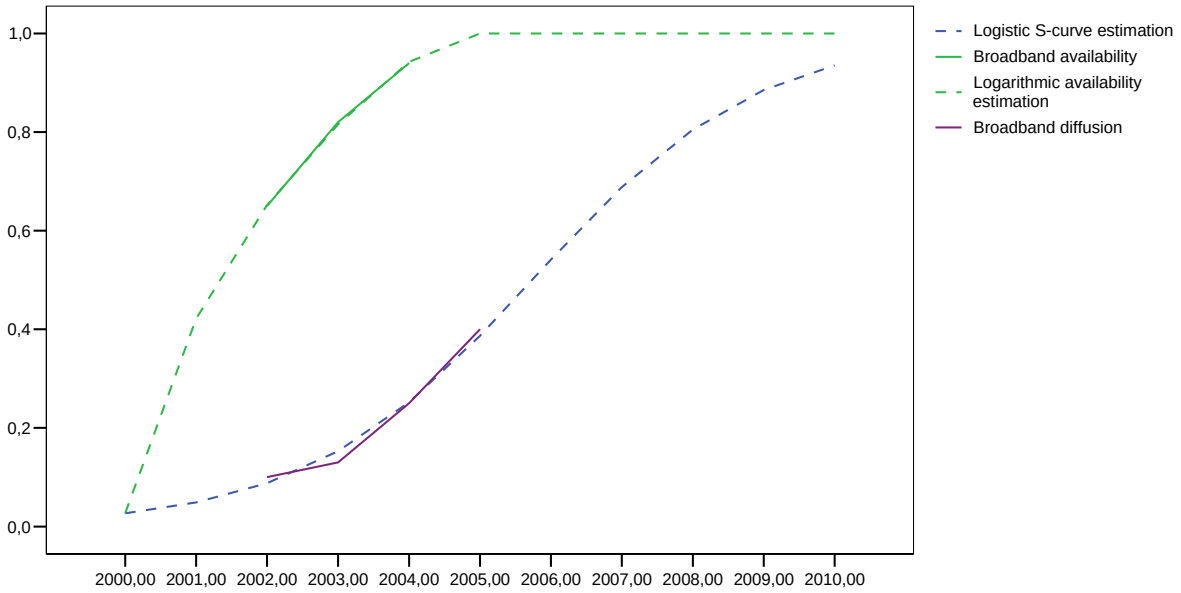

Figure 3. Broadband availability and use in Finland from year 2001 to 2004. Sources: MINTC 2002; MINTC 2004; Sirkiä et al. 2005 and calculations of authors.

Although there are only a couple of data points available for the estimations, Figure 3 shows already that the situation has been very much like the hypothesized relationship in Figure 1. A similar pattern can also be found in analyzing the availability evolution and diffusion of mobile subscriptions in Finland (see Frank 2004).

Broadband is held as a significant infrastructure for the society. Its diffusion and use is supported in many ways, in order to increase the availability and use of it, in order to reach the social optimum level drawn in Figure 1 as fast as possible. In Finland the most significant strategic paper related to broadband is the decision of a national broadband strategy made by the Finnish Council of State on the 29th of January 2004. It contained at least two significant definitions of Finnish information society policy (see MINTC 2003). The first one is a discreet definition, but consistent with previous definitions, to develop the information society from a less technological and more citizen point of view. This kind of switch in the emphasis could, however, already be anticipated from previous policy definitions and actions (see, e.g., Castells & Himanen 2002), and thus it cannot be considered very surprising. In contrast, the other definition of policy presented in the broadband strategy is more surprising, although related to the first one: The government resigned from all state-led broadband investment speculations and reserved only a role of a deregulator, i.e. a promoter and supervisor of competition, of the telecommunications markets.

It is too early to evaluate how the mentioned policy definition has affected for example the information society development of Finland. This definition is, however, interesting if compared with contrary, for example, the Swedish and some other EU countries' strategies. Thus it becomes interesting, whether the Finnish political decision had any effect on the territorial availability of broadband, and if it had, how did the decision affect it?

The question whether the above mentioned broadband decision had any territorial availability consequences, is related to the discussion on the role of public authorities in the telecommunications markets: Is competition regulation more efficient than infrastructure investment subsidies (see, e.g. Eskelinen et al. 2004b), and whether policy has altogether effects when it comes to the exceptionally dynamic, liberalized telecommunications markets. However the examination of the Finnish policy's effect on the territorial availability of broadband is interesting, because the Finnish broadband policy was heavily criticized on this matter. (e.g. Cronberg 2003; Järvinen 2003). Moreover, the government's resignation from subsidies seemed to lead to impressive operations to improve the availability of broadband, especially on the NUTS3 and NUTS4 levels. (Eskelinen et al. 2004a; Eskelinen et al. 2004b).

To find out the effect caused by the Finnish political decision the statistics on telecommunications availability to households in 2001 and 2004 were analyzed. The statistics are provided by the Finnish Ministry of Transport and Communications (MINTC 2002, MINTC 2005a). These two reports are based on a questionnaire to telecommunications operators, where they are asked to evaluate their provision of broadband to each municipal region (NUTS5) in the years 2001 and 2004. For the analysis in this study, the data was reclassified and recoded in order to make the two time points comparable. The outcome was a variable measuring the availability of broadband to households in the year 2001 and 2004. The municipal (NUTS5) information was further aggregated to the NUTS3 and NUTS4 levels. The aggregation method didn't utilize population weights, and thus the aggregated figures are to be considered as estimates. The actual availability is thus better than indicated by these figures, because in practice more populated municipalities have better broadband availability than small municipalities. Because of the used analysis methods, this bias doesn't, however, affect the following comparative analysis of the territories.

The territorial differences, i.e. the degree of internal variation within a group, were measured using the Coefficient of Variation (CV) and the Gini coefficient (Gini). They enable the comparison of two variables of different magnitude. CV measures variation by relating a variable's standard deviation with its mean. The larger the coefficient of variation, the greater the territorial differences are. Gini quantifies the degree of inequality by measuring the observed cumulative share against the equal share. Its values lie between 0 and 1, and the higher the value, the less equally the phenomenon is distributed. The broadband availability comparisons for different territorial levels of the years 2001 and 2004 are presented in Table 1.

Table 1. Territorial differences in broadband availability measured by the coefficient of variation and gini coefficient in the years 2001 and 2004. Sources: MINTC 2002; MINTC2005a; calculations of authors

Technology	Year	Availability, % of population	Coefficient of Variation			Gini Coefficient		
			NUTS5	NUTS4	NUTS3	NUTS5	NUTS4	NUTS3
xDSL	2001	65 %	26 %	14 %	5 %	0.11	0.07	0.03
	2004	83 %	16 %	12 %	8 %	0.07	0.06	0.04
Cablemodem	2001	3 %	446 %	269 %	137 %	0.96	0.88	0.67
	2004	8 %	285 %	177 %	93 %	0.90	0.78	0.50

The most striking result in Table 1 is the increase of territorial inequalities in access to xDSL technology between NUTS3 regions in the period from 2001 to 2004. This is an exceptional finding. It is clearly in contrast with, for example, the information presented in Figures 1 and 3, and thus, it can not be held as a natural outcome of the market process. In fact, the finding emphasizes that policy matters as the increased inequalities in xDSL access are likely due to the regionalized broadband policy initiatives carried out by the regional NUTS3 authorities. (see MINTC 2004 for NUTS3 regional broadband strategy presentations).

The central theme in the scientific and political discussion on the information society's infrastructure is to what extent public interventions are needed and useful. From one point of view public investments are justified as necessary facilitators of technological development, and from the other point of view they are seen as disturbing and even slowing down the 'natural' development provided by the market dynamics and the diffusion of innovations. This is related with the waiting strategy argument of the telecommunications operators: The possibility to get public subsidies reduces private investment incentives, and this investment delay caused by these reduced incentives increases the subsidy readiness of the 'less patient' public authorities. (See also Eskelinen et al. 2004b).

In principle, the above presented exceptional finding can be interpreted to support both of the usual arguments about the effects of public intervention. The public intervention favoring viewpoint would see the growth of territorial differences between NUTS3 regions as a sign of efficiency of the subsidy actions carried out by the NUTS3 authorities. In this case the increase in the differences in territorial availability is due to a faster increase in those NUTS3 regions which have subsidized the improvement of broadband availability in their region. Thus the public subsidies would have increased the aggregate volume of the overall broadband infrastructure investment funds. According to the opposite view, the overall investments have not increased, but private investments have been targeted to those NUTS3 regions, where investments are also subsidized by the public authorities. This view would thus imply a rearranging of the rank order of private investments, in favor for the NUTS3 regions providing subsidies.

4 CONCLUSIONS

This article examined the use of information and communications infrastructure indicators in tracking the evolution of the information society. The use of indicators as grounds for political decisions, and the regional implications of policy were also evaluated. The diffusion and availability of broadband in Finland from the year 2001 to 2004 served as a case example for this analysis.

The development of information society has been followed by the means of numerous reports and statistical examinations (see ESPON 2006 for a summary). At the same time, the regional effects of information society development, and especially dimensions related to regional development, have risen in the centre of European and national political discussions. The work on IS measuring indicators is, however constrained by the unestablished concept and statistical data collection related to IS, and the rapid evolution of the phenomenon. Due to this, no extensive regional statistical IS information is available. The thinness of available statistical information is represented, for example, by the fact that there is no comparable information of the regional availability of broadband in the EU-countries (ESPON 2004). The European monitoring of information society is, however, improving with the eEurope process, but the territorial dimension of IS does mainly seem to continue lacking.

The analysis of the regional availability of broadband in Finland showed that information society indicators have only a limited usefulness in monitoring the IS development. The phenomena are complex and change rapidly, and without a careful examination the information provided by the indicators can even be misleading. For example, the regional level and the point of time of the indicator can lead to wrong conclusions about the state of the measured phenomenon.

Although the market forces are without doubt an efficient mean in diffusing the technological prerequisites of information society, also policy seems to have some effects. The resignation of the Finnish state from subsidies to the construction of broadband infrastructure seems to have increased the regional differences between the Finnish NUTS3 regions. The extensive operations carried out by some NUTS3 regional authorities seem thus have had some effect on the availability differences of broadband. On the other hand, the results of the evolution of broadband availability differences support the findings of MINTC (2005a), which indicated

that broadband availability would have increased in Finland rapidly, and that the territorial differences between NUTS5 and NUTS4 regions would have decreased.

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