

Unclassified

DSTI/ICCP/IE(2004)5/FINAL



Organisation de Coopération et de Développement Economiques
Organisation for Economic Co-operation and Development

English - Or. English

**DIRECTORATE FOR SCIENCE, TECHNOLOGY AND INDUSTRY
COMMITTEE FOR INFORMATION, COMPUTER AND COMMUNICATIONS POLICY**

**DSTI/ICCP/IE(2004)5/FINAL
Unclassified**

Working Party on the Information Economy

ICT DIFFUSION TO BUSINESS: Peer review

Country report: Norway

English - Or. English

Document complet disponible sur OLIS dans son format d'origine
Complete document available on OLIS in its original format

FOREWORD

In June 2004, this report was presented to the Working Party on the Information Economy (IE).

The report was prepared by Håkon Finne (SINTEF Technology and Society, IFIM) and Graham Vickery of the OECD Secretariat. The series of peer reviews of ICT diffusion to business have been coordinated by Graham Vickery. It is published under the responsibility of the Secretary-General of the OECD.

Copyright OECD, 2004.

Applications for permission to reproduce or translate all or part of this material should be made to:

Head of Publications Service, OECD, 2 rue André-Pascal, 75775 Paris Cedex 16, France.

TABLE OF CONTENTS

SUMMARY	4
ICT DIFFUSION TO BUSINESS IN NORWAY	5
Introduction	5
ICT diffusion to business	6
Economic setting and industry structure	6
ICT diffusion and business use	7
Indicators and composite measures	7
The ICT supply sector	7
Total ICT spending	8
PCs	10
Telecommunications	10
ICT use in general	11
ICT skills	12
ICT use in enterprises	12
E-business and e-commerce	15
Summary	18
General approach to ICT policy	19
Strategy for an information society	19
Focus of government policies and programmes	20
Policy co-ordination	21
Specific initiatives	23
Infrastructure: telecommunication markets	23
R&D	24
Equipment, software, and services	25
Business organisation	26
Content and electronic Government information	27
Trust and security	27
Demonstration and awareness	28
Small firms	28
Some further initiatives	28
Policy evaluation	29
Conclusions	30
General remarks	30
Strengths	30
Weaknesses	31
Recommendations	32
NOTES	34
BIBLIOGRAPHY	35
APPENDIX: LIST OF PERSONS INTERVIEWED DURING THE OECD MISSION	40
ANNEX	41

SUMMARY

Norway has a good track record in investing in ICT and widely adopting and using ICT. The strong engineering and technology base and geographical challenges have meant that despite competitive pressures linked to the high exchange rate, Norway has developed niche expertise and firms often directly or indirectly linked with the dominant offshore, maritime, construction and infrastructure sectors. It has a consistent market-led policy stance and cautious budget policy that ideally would provide a stable framework for more focused ICT policies. High priority is given to education and a cost-effective public sector, and there is continuing policy concern regarding the need to shift to a knowledge-intensive economy after oil and gas resources are exhausted. However, full use of ICT in business lags particularly in broad sections of manufacturing, and there is evidence that implementation of modern ICT is slower than in neighbouring Nordic countries, that there is a lower degree of innovativeness in industry and that specific skills to develop e-business are not sufficient.

With an overall policy setting that limits public measures to those that are market-led and will not distort markets, that adheres to strict government fiscal targets in a budgetary framework that make little distinction between long-term investment expenditures and transfers for consumption, and that gives major funding priority and responsibilities to regional distribution goals, achieving ICT policy aims requires a well co-ordinated and effective policy framework and efficient policy initiatives. Building on established strengths, priority areas recommended for attention include: improve policy prioritisation and extend coverage to regional ICT-related programmes; learn from the diverse regional structure and experience; increase efforts to boost business sector ICT-related R&D and the supply of venture capital; broaden education and training to include e-business; expand efforts for digital content and digital signatures; and develop more effective e-business programmes that have a wide reach and involve a wider range of business sectors. Overall there is a need for more systematic evaluation across all ministries, aimed at assessing benefits and impacts of policies on business performance and economic performance more generally. The following table summarises analyses and recommendations developed in more detail in the report.

Policy domain	Current policy priority	This priority should be	Recommendations
Co-ordination of initiatives	High	Continued	Maintain co-ordination and extend to more firmly cover regional initiatives; strengthen prioritisation and priority implementation
Infrastructure	Medium	Continued	Build on and extend HØYKOM and market-led broadband rollout. Ensure interoperable coverage and access
R&D	Medium	Increased	Further measures to foster business R&D. Assess experience with R&D tax incentive
Equipment	Low	Continued	Uptake of equipment, software and services generally good. Underinvestment in advanced business applications needs special attention
ICT skills	High	Continued	Continue high priority given to ICT-related education. Improve mix of technical, business and other necessary skill development
Business organisation	Low	Increased	More consideration to business restructuring and improving policies to reach firms more effectively
Content creation	Medium	Increased	Enhance availability of public sector content, improve pricing and payment mechanisms
Trust / security	Medium	Increased	Need to adopt stronger leadership role in developing and adopting digital signatures and digital records where government has responsibility
Demonstration / awareness	Low	Continued	Shift focus to services sector
Small firms	Medium	Continued	Maintain innovation programmes, expand business R&D support and diffusion of business organisation as above

ICT DIFFUSION TO BUSINESS IN NORWAY

Introduction

The OECD Growth Study concluded that information and communications technology (ICT) is a key input to productivity and growth performance (OECD, 2001a; OECD, 2001b; OECD, 2003e). In 2001 the OECD Council Ministerial urged the OECD to strengthen its peer review of structural reforms. The 2002 Council Ministerial requested “the OECD to increase its monitoring of member countries’ implementation of the recommendations of the OECD Growth Study”.

This report is part of the peer review process of policies promoting ICT diffusion to business, which has been designed to respond to the two Ministerial requests as part of the Growth Follow-up; Micro-policies for Growth project. OECD peer reviews are used as a method to bring together peers from member countries to discuss policy experience and policy challenges in an individual country. Once a critical mass of countries has been reviewed, a cross-country comparative synthesis report will be prepared with a view to identifying common good policy practices. Following a first round of reviews conducted in the Working Party on the Information Economy (WPIE) in December 2003, the present report is background to the second round of reviews in June 2004. The discussion and comments made at the meeting are reflected in this final version of the report.

The report reviews the status of diffusion of ICT to business in Norway and describes current and previous policies aimed at ICT uptake in firms, the focus for these peer reviews. It is one of the five pillars of the ICT policy framework used in the *Information Technology Outlook 2004* Policy Questionnaire, shown in Table 1. Given the complexity of the ICT diffusion process and the central role of a number of the other factors, attention is also given to the other parts of the framework (R&D, public procurement, payment systems, standards, broadband, trust and security) that are important elements in the diffusion of ICT to business.

Table 1. ICT Policy Framework

ICT Policies				
Fostering ICT Innovation	Increasing Diffusion / Use	Maintaining a Healthy ICT Business Environment	Enhancing the Infrastructure	Promoting Trust Online
R&D programmes	<i>Diffusion to households and individuals</i>	<i>Competition in ICT markets</i>	Electronic payment / settlement	<i>Security of information systems and networks</i>
Government development	<i>Diffusion to businesses</i>	<i>Intellectual property rights</i>	Standards	<i>Privacy protection</i>
Government procurement	Professional/managerial ICT skills	<i>Trade and FDI</i>	Broadband	<i>Consumer protection</i>
Venture finance	Organisational change	International co-operation	<i>General network infrastructure *</i>	
Innovation networks	<i>e-government</i>			
	Content			
	Government demonstration			

The report presents recommendations for possible policy actions based on the strengths and weaknesses in the Norwegian situation and policy approach, taking into account that policy priorities change with changes in government and over time. Policies to encourage ICT diffusion to business have covered traditional areas such as publicly financed awareness-raising and business services to develop ICT readiness in small and medium sized firms, and also more general business environment policies such as infrastructure competition. The review does not focus directly on broader aspects of Information Society policies aimed at citizens' and household's uptake of ICTs and participation in the Information Society. The review should not be seen as a comprehensive evaluation of the effectiveness of all recent initiatives, but as a guiding tool for understanding policy challenges and setting priorities for new initiatives.

ICT diffusion to business

ICT investment and use can be a strong driver for labour productivity and multifactor productivity at firm level. Complementary factors including the regulatory environment, the availability of appropriate skills, the capability for organisational change, as well as the strength of accompanying innovations in ICT applications, all have major effects on the ability of enterprises to seize the benefits of private and public investments in ICT (OECD, 2003a).

The role of ICT as an enabler of change across traditional segments of society and its institutions also introduces some new challenges in terms of developing and implementing appropriate policies and implementation mechanisms. This broader understanding of success factors calls for a wider range of policies and better statistics for the full monitoring of policies and their impact. Where such indicators are not available, the report draws on related data.

Economic setting and industry structure

Norway's GDP per capita is about 50% above the OECD average (OECD, 2003d), to a great extent due to income from its large offshore petroleum resources. It is a high cost country, and the pressure on the Norwegian currency rose sharply in 2001 and 2002, remained high in 2003, and eventually resulted in a series of cuts in Norges Bank's official sight deposit rate from 7% in December 2002 to 1.75% in March 2004. Whereas annual growth in real GDP¹ was well above the OECD average from 1991 to 1997, it has subsequently been far below except in 2001. The growth for 2003 was 0.6% and the projection for 2004 is 2.8%. Unemployment has risen steadily from a 3.1% low in 1998 and is expected to peak at 4.7% in 2004. For the years 2001 to 2003, annual labour productivity growth has been around 1.6%, which is below the current 2.1% OECD average, but a pickup is expected. The target of fiscal policy (to keep the annual deficit below the real yield of the accumulated petroleum fund) was overshot by 1% of GDP in 2003 and a similar result is expected for 2004 (OECD, 2003c).

Norway's major export revenues derive from commodities (and some niche products) based on indigenous natural resources: oil and gas 60%, fish 6%, hydroelectric power used in chemical and metallurgical processes for a total of around 15%. However, manufacturing of machinery and equipment (including ships) remains strong and takes up 12% of total exports (SSB, 2003d). While important parts of the service sector are clustered with the major export industries and contribute strongly to their competitiveness, the larger part is only weakly connected to these industrial strong points. Manufacturing employment dropped dramatically during the 1980s but has since stabilised, albeit with great differences between individual industries. Major challenges for innovation and productivity lie ahead, particularly in creating a post-petroleum economy and in renewal of the industrial base in the periphery in order to sustain currently preferred settlement patterns. The demographic trend (the population share aged 60+ will rise from 20 to 30% over the next four decades), high disability rates (the labour force participation rate is 76% for men and 69% for women, but one in eight has a disability pension and the ratio is growing), falling retirement age, and relatively good although declining pension rights add to the challenge (SSB, 2004a).

The private sector accounts for 70% of employment. Of these 1.6 million people, 5% work in the primary sector, 29% in the secondary sector, 8% in services typically provided by government (education, health and social services, etc.), and 58% in services where the private sector dominates (retail and wholesale, transport, restaurants and hotels, knowledge-intensive business services, personal services, etc.). The public sector accounts for 30% of employment (0.7 million), and the ICT experience in public administration and public services is of potential importance for private sector ICT usage, and vice versa.²

Some 317 000 enterprises are on file for 2004 (excluding the primary sector and public administration), 63% of which have no employees (this includes self-employed individuals), 30% have 1-9 employees, 7% have 10-99 employees, and almost 1 600 (0.5%) have 100 employees or more, but the latter category has 43% of total employment (SSB, 2004b).³ The challenges of turning ICT use into benefits are strongly related to this structural composition of the enterprise population.

The government's express primary contribution to national competitiveness is through fiscal policy, which in many respects takes precedence. Therefore, new initiatives (in ICT or other fields) are balanced against the entire budget before and if adopted, with little differentiation between consumption and investment expenditures. This, in many respects, leads to a conservative approach to innovation in policy, but it may also lure out inventiveness in devising new schemes to achieve a lot for little expense.

ICT diffusion and business use

Indicators and composite measures

A number of statistical sources exist to measure ICT diffusion and related topics, although international comparison is sometimes difficult. At one end of the scale, there are such composite measures as the Economist's e-readiness index, which for over sixty countries gives a weighted summary of a hundred indicators in the areas of connectivity and electronic infrastructure, business environment, consumer and business adoption, legal and policy environment, social and cultural environment, and supporting e-activities. On this composite measure, Norway moved from seventh to fourth position from 2003 to 2004, only beaten by Denmark, the UK, and Sweden (Economist Intelligence Unit and IBM Institute for Business Value, 2004). While such composite indicators are easily communicated and give a good general overview, more detailed data are necessary to target policy effectively.

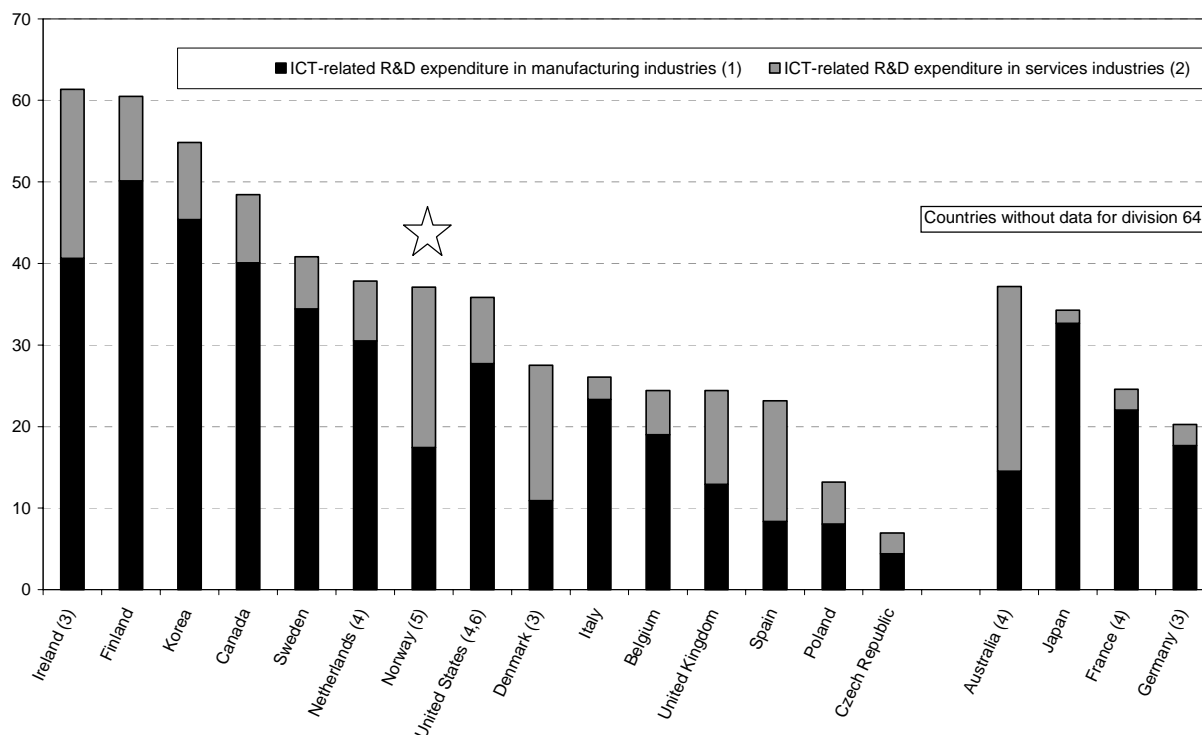
At the other end of the scale, many national studies or data permit the probing of individual indicators of particular interest. Statistics Norway has produced statistics of business usage of certain ICTs since 1998 and private household usage since 1994. They also publish data on the ICT and content provider sectors as well as on ICT education. Other sources include the Norwegian Post and Telecommunications Authority for telecommunications statistics, IKT-Norge (a business association for the ICT industry) for PC sales and ICT investments, and TNS Gallup (a private opinion poller) for Internet and telecommunications statistics. In addition, the government has commissioned several ad hoc broadband coverage studies. Such indicators should be interpreted within the broader framework of their presumed importance for seizing the benefits of ICT. As in the other peer reviews, this report also relies heavily on internationally comparable statistics compiled by the OECD and by other organisations such as the IDC.

The ICT supply sector

The ICT and content industries⁴ account for about 8% of the economy (SSB, 2003c). ICT exports are around 3% of total exports and ICT imports are around 2.5 times exports (Leppälähti *et al.*, 2002). R&D in ICT manufacturing and services as a percentage of total R&D is shown in Figure 1 for selected OECD countries. The ICT services' share in Norway ranks high among those countries and has the same volume

as that of the ICT manufacturing industries (OECD, 2004). National statistics for 2001 show that 35% of enterprise R&D expenditures went to ICT activities (NIFU *et al.*, 2004).

Figure 1. R&D expenditure in selected ICT industries, 2001 or latest year available.
% of business enterprise sector R&D expenditure



Notes:

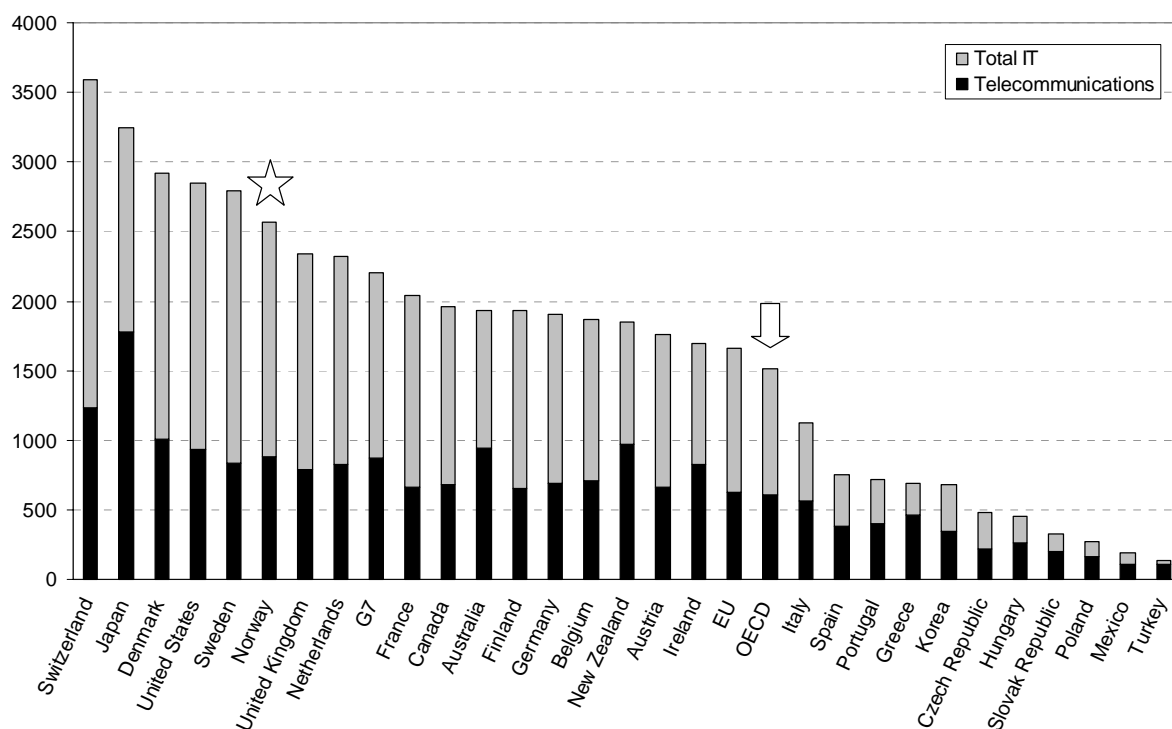
1. ISIC, Rev. 3 divisions: 30 (manufacture of office, accounting and computing machinery; 32 (manufacture of radio, television and communication equipment and apparatus) and 33 (manufacture of medical, precision and optical instruments, watches and clocks).
2. ISIC, Rev. 3 divisions: 64 (post and telecommunications) and 72 (computer and related activities).
3. 1999 instead of 2001.
4. 2000 instead of 2001.
5. 1997 instead of 2001.
6. Due to unavailability of data for division 64, class 642 (telecommunication) is included in services ICT R&D as a proxy. Available information shows that in the United States class 642 accounts for about 97-98% of division 64 total.

Source: OECD, ANBERD database, January 2004 (OECD, 2004).

Total ICT spending

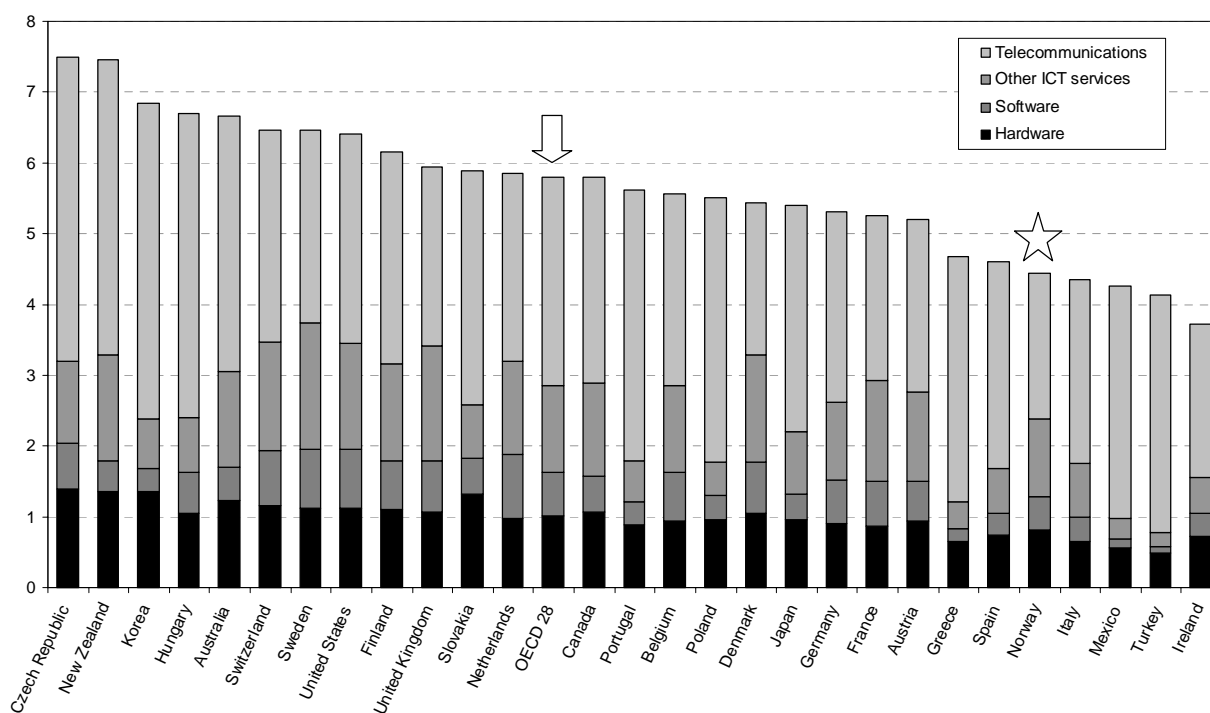
Total ICT spending per inhabitant was around 70% higher than the OECD average throughout the 1990s, in part due to high average incomes and exchange rates (see Figure 2, calculated from IDC and WITSA, 2002). In 2003, ICT markets in OECD countries ranged between 3.8 and 7.5% of total GDP, with Norway at 4.5% at the lower end of that list (see Figure 3 based on IDC data).

Figure 2. Total ICT spending per inhabitant, 2001. USD



Source: OECD, based on *Digital Planet 2002* (IDC and WITSA, 2002).

Figure 3. ICT market intensities, 2003. % of GDP

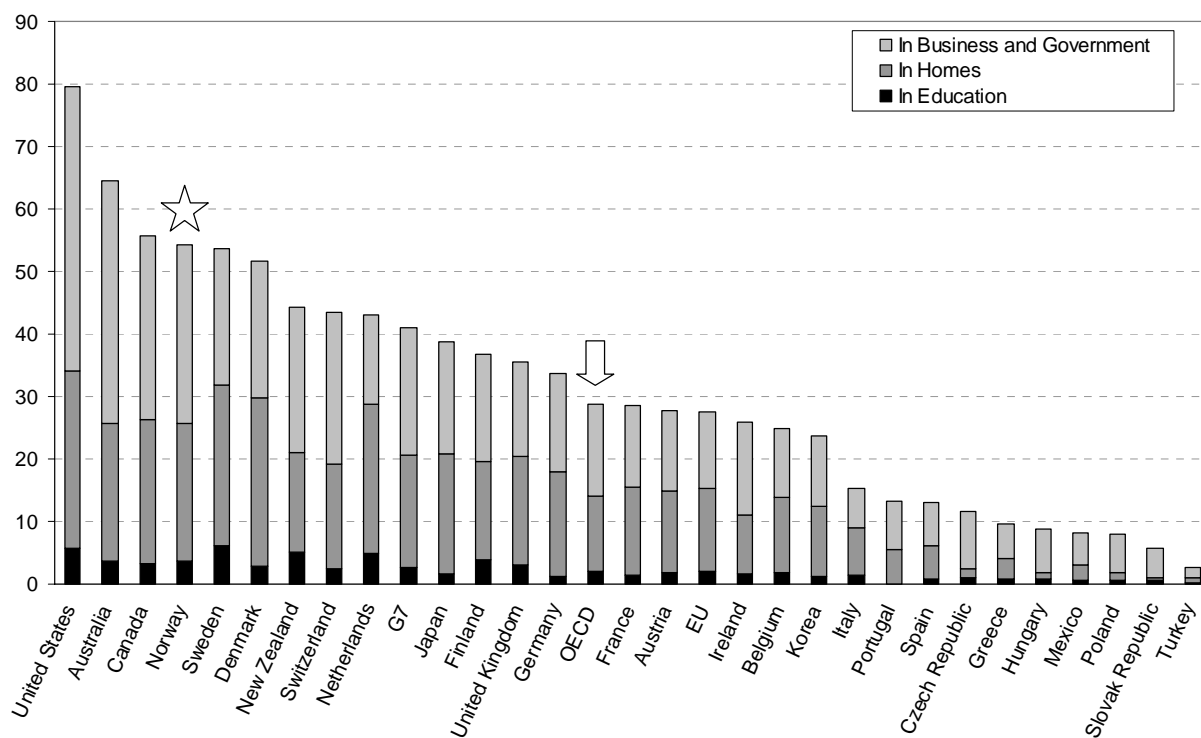


Source: OECD, 2004, based on data from IDC.

PCs

Norway ranks high in the number of PCs per 100 inhabitants, with almost twice the OECD average. The distribution between work, home, and school does not differ much from other OECD countries (calculated from IDC and WITSA, 2002, see Figure 4 for details). Elementary and secondary schools had 23 PCs per 100 pupils in 2002, 15 with an Internet connection, well above the OECD average, although the numbers in primary education are only half those at secondary level (NHD, 2003c).

Figure 4. PCs per 100 inhabitants, 2001



Source: OECD, based on *Digital Planet 2002* (IDC and WITSA, 2002).

Telecommunications

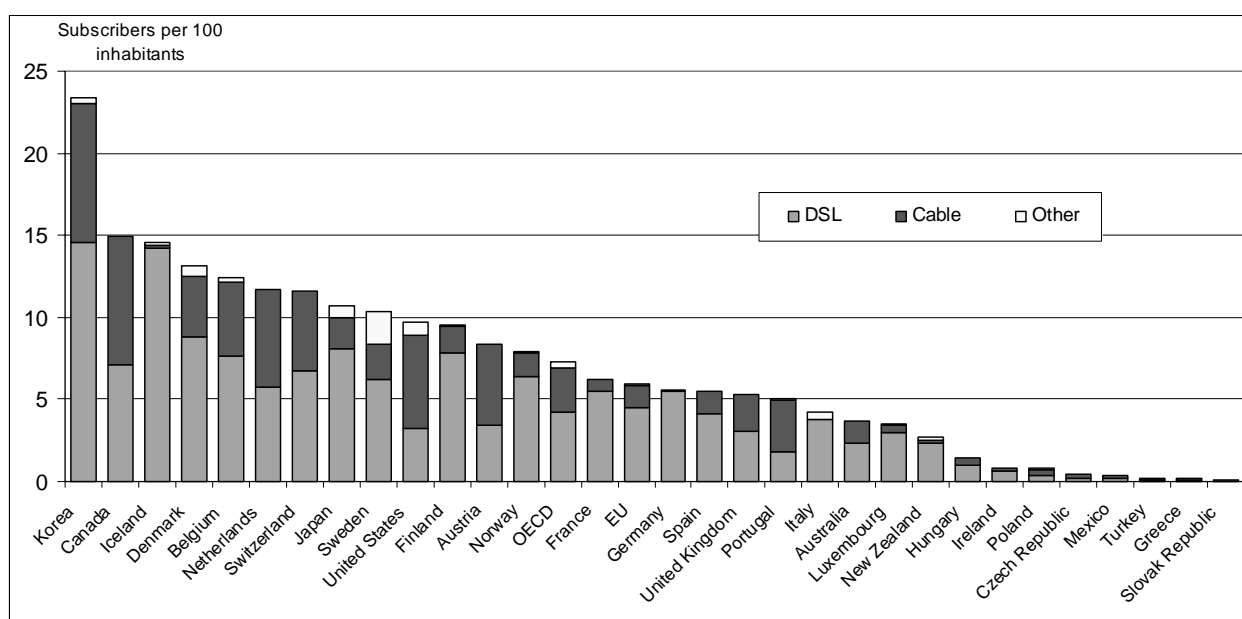
Most telecommunications channels (fixed telephone access, ISDN lines, mobile phones) are available wherever people live, actual access is high, and penetration has been rapid. Norway is the leading OECD country for ISDN with 35 channels per 100 inhabitants (Post- og teletilsynet, 2002).⁵

In the various broadband markets, development has been slower. DSL was first introduced in late 2000, in May 2003 coverage was around 64% and in August 2004, 81% of households had broadband coverage. The incumbent (Telenor) estimates ADSL coverage to be 92-93% by 2006. (Ministry of Trade and Industry.) Cable TV with general broadband capabilities is available mostly in residential city areas, thus not extending total coverage very much, but adding to platform competition wherever present (ECON Analyse, 2003). Because of the settlement pattern in Norway and inherent limitations in DSL technologies (signal decay over distance), DSL is unlikely to become commercially available to everyone. In this case, many schools will be without coverage. Alternative platforms requiring a new infrastructure may offer higher bandwidth, but topographical challenges mean that these are most likely to become commercially available in areas where there is already good DSL coverage.⁷ However, almost 100 local and regional developers of broadband infrastructure, many of which are local power companies, have emerged, possibly

applying lower annual capital depreciation rates to their investments than the nationwide commercial telecom providers. A number of high bandwidth local networks (mostly connected to the national infrastructure) improve the situation locally, some of them offering ‘triple play’ (TV/video, telephony, and Internet over the same wire) (based on Finne *et al.*, 2004 and updated information).

The penetration of broadband subscriptions is much lower than the availability, and Norway has around the OECD average in terms of subscriber penetration (see Figure 5). By the end of 2003 the share of households with a broadband subscription was 20% in Norway compared to 16% in Finland, 22% in Sweden, 30% in Denmark and 40% in Iceland (NHD, 2004). By July 2004, Norwegian household penetration had reached 24% (Teleplan, 2004b).

Figure 5. Broadband subscribers per 100 inhabitants, December 2003



Source: OECD, 2004.

ICT use in general

Norwegians are rapid adopters of new technology in general and new consumer electronics have penetrated rapidly. The ownership of mobile phones reached 86% of the population 9 years and older in 2003, steadily up from 58% in 1999, with the age group 16-19 now scoring 100% – and SMS usage is approaching 3 messages per day for the entire population (Vaage, 2004). The number of active mobile phones surpassed the number of fixed phone accesses in 2000 (SSB, 2003d). PC sales in 2003 totalled over 600 000 units, of which 60% in the institutional market and 40% in the consumer market. Portables now account for nearly 40% of numbers sold in both markets (PCWorld Ekstra, 2004).

In 2003, two out of three households had access to a PC at home and every other household had access to the Internet from home. Nine out of ten in the population aged 16-74 have used a PC at some time; two out of three at home and one in two at work. For Internet usage, the corresponding figures are 78% at some time, 60% from home and 40% from work. Broadband uptake is partly hampered by the relatively heavy penetration of earlier ISDN connections (SSB, 2003b). 1.1 million individuals (one third) submitted and signed their tax return forms electronically in 2003 (Skatteetaten, 2004), and 1.9 million customers had Internet bank accounts in 2002 (Norges Bank, 2003) - near the top internationally. Three in

five Internet users purchased goods over the Internet in 2003, but security is still a concern (NHD, 2003c). Thus the population is well versed in using ICT and this is definitely an asset for industry.

ICT skills

The output of ICT candidates from higher education almost doubled from 1997 to 2001, although Master degrees had a slow growth and Bachelor of electrical engineering declined (NHD, 2003a). In 2002, 4% of all higher education graduates came from ICT studies, ranking Norway seventh in the OECD and first among Nordic countries (NHD, 2003a). There are no statistics for ICT skills delivered through non-ICT candidates or for such skills among employees or the population at large. A multi-year competence reform financed jointly by collective agreements and the government has given on- or off-the-job training to 30 000-50 000 employees in all sectors. No statistics are available on the ICT components of this reform but almost three-fourths of the training courses have applied e-learning techniques (Døving *et al.*, 2003).

ICT skills are needed in jobs in all industries, and formal ICT education is not the only source of ICT skills. For many employees, ICT skills came on the training agenda long after they left school, and rapid changes in software and hardware contribute to obsolescence of already acquired skills. Many actors offer courses for continuing education in ICT, for example, the Norwegian branch of the European Computer Driving Licence scheme sold 28 000 licences in the peak year 2001 (NHD, 2003c).

Norwegian unemployment for ICT specialists is now back to about the average level of other occupations after the dot.com shakeout, but there is a shortage of a combination of business and ICT skills to apply better e-business solutions⁸ (NHD, 2003a). In a major survey of Nordic enterprises, half of the respondents in Norway and Sweden considered that the current candidates of business schools, engineering colleges, and institutions providing shorter continuing education IT courses did not have the ICT skills required to plan and implement e-business (PLS Rambøll Management, 2003). For Denmark and Finland, the corresponding figures were typically 30%. This could point to a mis-match between the content of ICT training offered by educational institutions and those needed by Norwegian industry.

ICT use in enterprises

In interpreting ICT use in enterprises, it is important to remember that productivity gains typically follow not from ICT use in itself but from concerted application of technology, upgrading of skills, appropriate organisational forms, and, crucially, management that orchestrates change processes (OECD, 2003a). Skills that go beyond narrow training for ICT-related tasks to a broader digital literacy will facilitate both minor and major innovations in organisation and business processes inside and between enterprises. Due to organisational inertia, however, it may take considerable effort and investment to implement organisational forms that allow these broader ICT skills to be applied and more flexible and productive work practices to be adopted. ICT solutions increase the availability of information across all jobs and thus underpin productive developments; however, much of this information cannot be used productively if decision-making is not appropriately distributed. Unfortunately, accounting practices usually do not count these crucial skills, organisation, and management as assets and it is difficult to find reliable statistics for these critical ingredients for productive ICT use.

Norway has the usual pattern of ICT diffusion with large firms better equipped than small ones and standard technologies (PCs, the Internet) more widely diffused (see Table 2). Intranet refers to Internet-type communication over a local area network (LAN); LANs themselves are more abundant.

Table 2. Diffusion of ICTs to business by size of firm, 2001.
% of all firms in each employment band

Technology	Size of enterprises (employment)					
	5-9	10-19	20-49	50-99	100+	All 10+
Computers	84	91	96	100	100	94
Internet	66	75	86	96	97	81
Homepages	35	46	60	74	81	55
Intranet	11	17	28	39	65	25
EDI	9	14	16	28	41	18
Extranet	7	9	12	16	28	12

Source: Nordic Information Society Statistics 2002, commissioned by the Nordic Council of Ministers (Leppälähti *et al.*, 2002).

Total diffusion (100%) will not be achieved for all technologies and all sizes of firms. EDI (electronic data interchange, usually highly structured and directly integrated in a value chain) and extranets involve embedding a relatively low number of specific external relations into firms' computer networks. EDI may not be cost effective in many cases and there are functional alternatives to an extranet. The diffusion ceiling will depend on the nature of the value creation processes in individual businesses.

Norwegian businesses have been somewhat slower than their Nordic neighbours in the uptake of recent ICTs. Table 3 shows that Norway by 2001 had the lowest penetration of all the Nordic countries on all measured technologies except EDI (Leppälähti *et al.*, 2002).

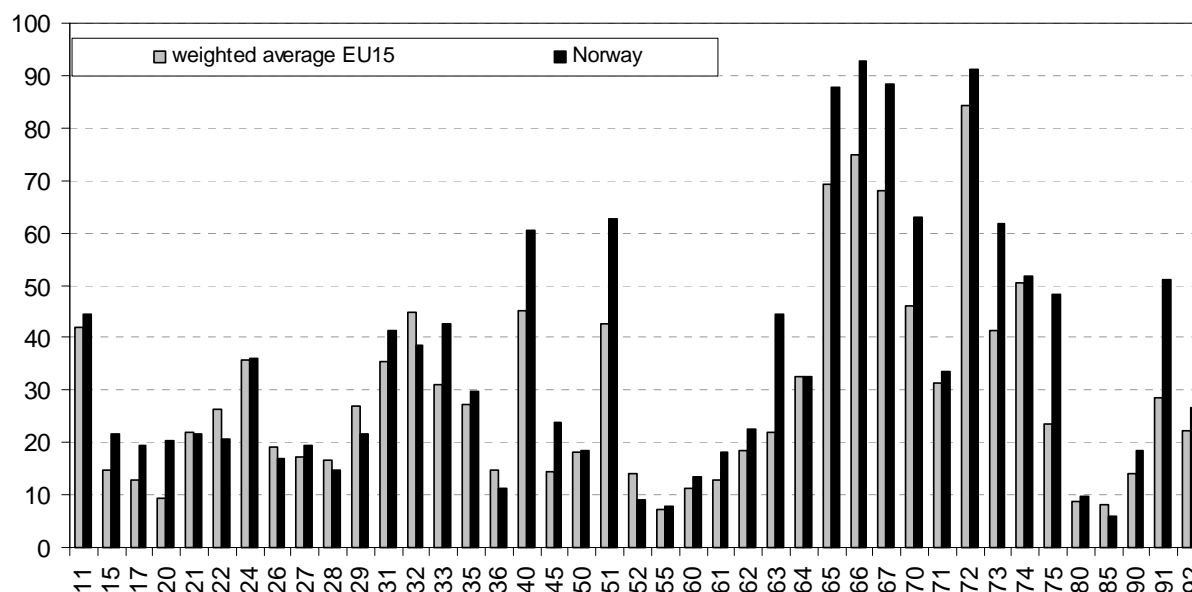
Table 3. Diffusion of ICTs to business in the Nordic countries, 2001.
% of all firms with ten or more employees

Technology	Denmark	Finland	Iceland	Norway	Sweden
Computers	98	98	98	94	98
Internet	94	94	92	81	95
Homepages	72	64	64	55	78
High speed connections	47	50	65	34	43
Intranet	29	33	54	25	40
EDI	21	14	12	18	17
Extranet	16	14	26	12	16

Source: Nordic Information Society Statistics 2002, commissioned by the Nordic Council of Ministers (Leppälähti *et al.*, 2002).

In 2003 Internet access was implemented in almost all large enterprises, in nine out of ten SMEs, and in three out of four micro enterprises. However, not all PCs in an enterprise are necessarily connected to the Internet, and many employees have no PC; thus only about half the workforce has Internet access at work. Regional differences are small but the figures are somewhat lower in retail and in hotels and restaurants. Every fourth large enterprise or SME has an Internet connection with a bandwidth of 2 Mbps or more. Four in five large enterprises/SMEs use virus protection software, half have a firewall, one fourth use a server with a secure external connection, and one in ten have implemented electronic signatures. Two in three have a web site and one in nine have at least one per cent of their turnover generated through Internet sales (SSB, 2003a).

The demand for ICT skills varies greatly between industries. Figure 6 shows the share of the jobs of different industries that are taken by ICT specialist occupations and occupations that are intensive users of ICTs in Norway and in the EU.

Figure 6. Share of ICT-using occupations in total employment by industry (NACE code), 2002. %

Source: OECD, 2004. Industry codes are NACE/REV1.

The average ICT skill intensity in Norway thus measured is roughly 1.2 times the weighted EU average. Industries where the Norwegian ICT skill intensity is high (*i.e.* more than 1.4 times the EU figure) include wholesale and commission trade except motor vehicles and motorcycles (NACE code 51) and research and development (73) among those industries characterised as highly ICT intensive. Among industries with a medium ICT intensity, Norway scores high in manufacture of food and beverages (15), manufacture of textiles (17), construction (45), water transport (61), and activities of membership organisations n.e.c. (91), and very high (more than twice the corresponding EU average) in supporting transport activities (including travel agencies) (63) and public administration and defence (including compulsory social security) (75). Among the low ICT industries, the Norwegian score is very high in manufacture of wood and products of wood and cork except furniture (20). Beyond this, the situation is around the EU average in practically the entire manufacturing base, and less than 0.8 of the EU average in the case of manufacture of radio, television and communication equipment and apparatus (32), publishing, printing, and reproduction of printed media (22), and manufacture of furniture and manufacturing n.e.c. (36). Retail trade (except motor vehicles and motorcycles) plus repair of personal and household goods (52), and health and social work (85) are also in this lower range. Overall this suggests that the supply and use of ICT skills across Norwegian industry is satisfactory in a comparison with the EU. A comparison with other Nordic countries reveals, however, that Norwegian industry lags in more advanced applications and combined ICT and business skills.

Table 4 below displays the distribution of Internet access technologies/bandwidths for enterprises of different sizes. It should be remembered that these data change rapidly because of the rapid expansion of broadband infrastructures.

Table 4. Internet access technology by enterprise size, 2003.
Percentage of all firms in each employment band (multiple technologies possible)

Technology	Size of enterprises (employment)					
	5-9	10-19	20-49	50-99	100+	All 10+
Fixed lines, >= 2 Mbps	11	18	28	41	58	26
Wireless	4	5	5	9	9	6
Fixed lines, < 2Mbps (ADSL etc.)	19	19	26	33	31	23
ISDN	49	51	45	35	24	46
Analogue modem	11	7	10	9	10	8

Source: Based on data from Statistics Norway (SSB, 2003a).

Faster connections are taking over from ISDN in all size bands, but increasingly so with enterprise size, and small firms are remaining with their established ISDN infrastructure. High speed connections being more preponderant than ADSL in all but the smallest categories also points to the need for higher speed than is usually provided over the existing telephone infrastructure.

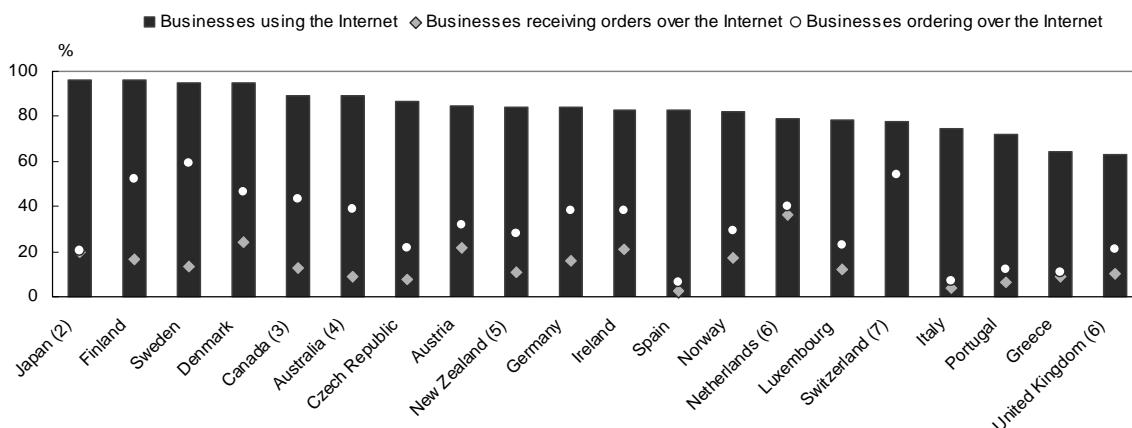
Studies have shown that the needs for high speed broadband applications (i.e., applications which require 2+ Mbps per user) are currently much more pronounced in public institutions (such as hospitals and schools) than in business, and that the consumer market will probably be several times larger than the institutional broadband market (Jordan *et al.*, 2002; Kristiansen *et al.*, 2003). However, the sheer number of simultaneous Internet users and the general growth in bandwidth requirements per user indicates that even many SMEs may soon find ADSL too narrow. This makes it difficult to define broadband coverage statistics for enterprises that actually reflect their increasing bandwidth needs over time, particularly because there is currently a huge drop in availability of bandwidths above 2 Mbps.

On the other hand telecom vendors complain that broadband uptake is much lower than availability. Indeed, only one in four ADSL-ready phone connections actually carries a subscription. Reasons may be that the cost of upgrading is too high for enterprises that already have Internet via ISDN or that the added benefit of ADSL over ISDN is not worth the extra cost. In the consumer market this is typically a problem, partly because the switching cost from ISDN for phone and data to ADSL for data and PSTN for phone (which would reduce phone subscription costs) is too high. Another reason may be linked to business requirements actually outpacing the bandwidths typically available with ADSL. If price is more important, which it may be for SMEs that do not depend crucially on high bandwidth, one may expect the situation to improve as competition contributes to achieving a critical mass of subscribers. In cases where bandwidth is essential, the lack of alternative infrastructures may be more of an obstacle.

E-business and e-commerce

Whereas e-commerce is defined as sales and purchase transactions with consumers or other businesses taking place by electronic means over computer-mediated networks, e-business is a wider concept, covering the use of ICTs for conducting or supporting operations across all business processes, often through integrated or continuous data flows between individual processes or systems. The greatest potential seems to lie in this second integrative part. Since this is a field which is changing very rapidly, the relevant statistical indicators do not always exist and the now widely collected e-commerce data are used to illustrate trends in Norway.

**Figure 7. Businesses using the Internet for purchasing and selling, 2001 or latest available year (1).
Percentage of businesses with ten or more employees**



1. Source for European countries is the Eurostat Community Survey on enterprise use of ICT. All other countries, unless otherwise noted, refer to enterprises at the beginning of 2001 for Internet use and to 2000 for purchases and sales.
2. Data refer to 2002 and to enterprises with 100 or more employees (excluding small firms). Agriculture, forestry fisheries and mining are excluded.
3. Data refer to 2002 and include the industrial sector.
4. Data for Internet use refer to 2002 while data for sales and purchases refer to 2001-02.
5. Data refer to 2001 and include enterprises with more than ten employees.
6. Orders received and placed refer to Internet and other computer-mediated networks.
7. Data refer to 2000 and include industry, construction and services.

Source: OECD, ICT database and Eurostat, Community Survey on ICT usage in enterprises 2002, May 2003

In 2002, Norwegian businesses ranked 4th (out of 20) in terms of receiving and 11th in terms of placing orders over the Internet, according to one study; see Figure 7. Within some sectors, there is a rapid development, for example, vacations and airline tickets are increasingly sold over the Internet and for one airline, this channel's share rose from 20% at the beginning of 2003 to 60% at the beginning of 2004 (Norwegian Air Shuttle, 2004). Table 5 gives a more detailed picture of orders received over the Internet over time (SSB, 2003a).

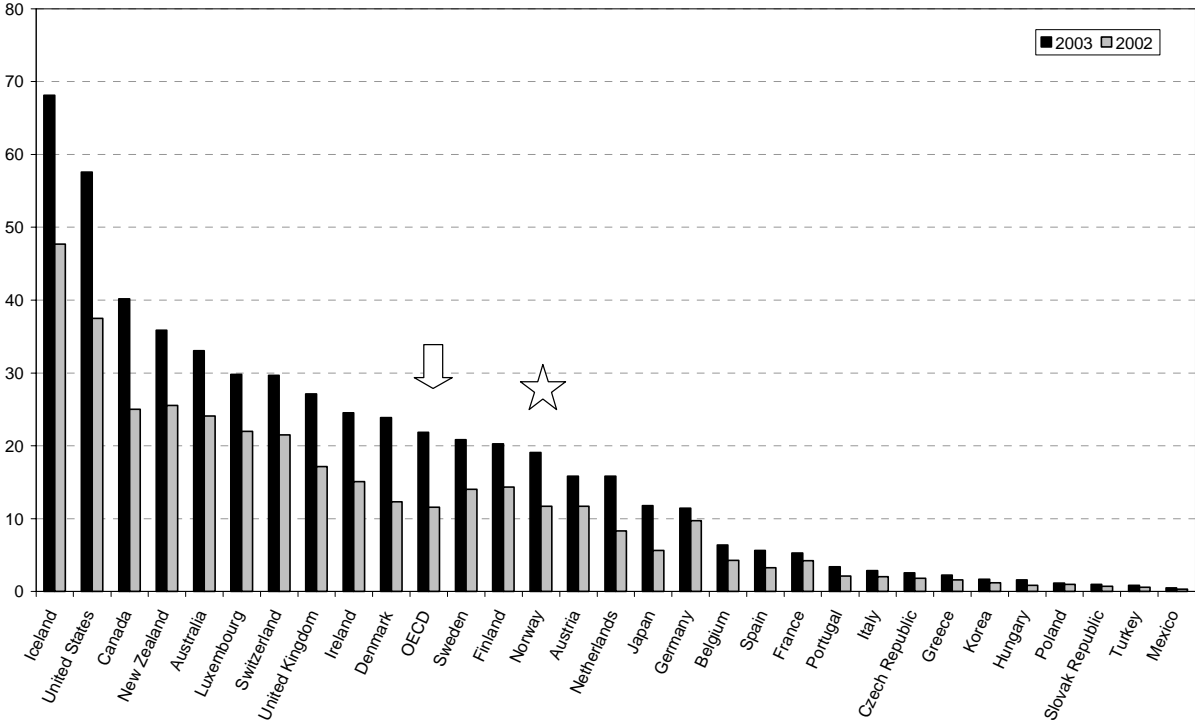
**Table 5. Share of firms with turnover from orders placed over the Internet, 1998-2003.
Percentage of all firms with ten employees or more**

Percentage of turnover from Internet sales	1998	1999	2000	2001	2003
1+	4	6	8	10	11
2+	2	5	5	7	10
5+	2	3	3	5	8
10+	1	2	2	2	5
25+	0	1	1	1	2
50+	0	0	0	0	1

Source: Based on data from Statistics Norway (SSB, 2003a).

Another indicator of e-commerce potential is the number of secure servers, which is shown for OECD countries for 2002 and 2003 in Figure 8. Norway's rank was 13th in both years, but the leading nations are moving faster, so Norway is now slipping below the OECD average.

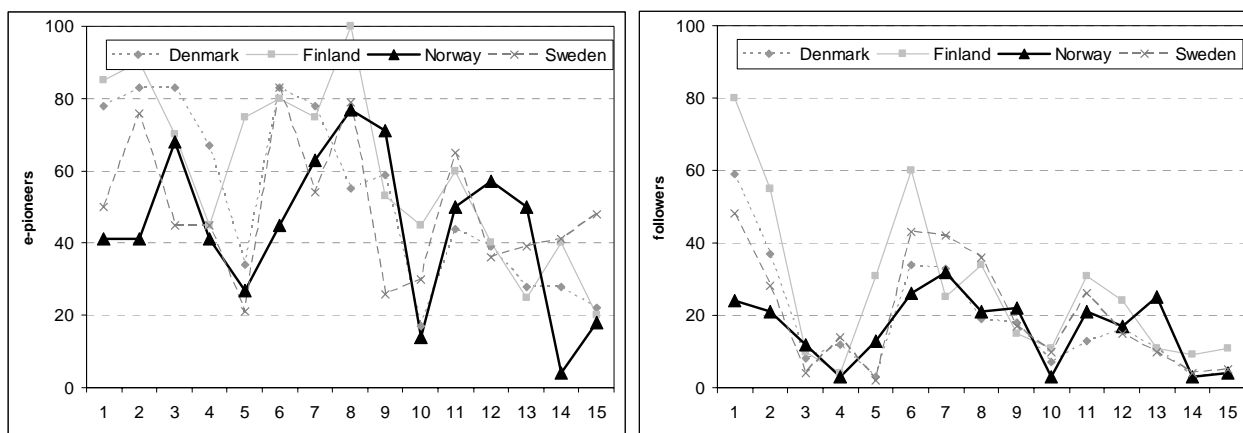
Figure 8. Secure servers per 100 000 population, 2002 and 2003



Source: OECD, 2004, based on Netcraft.

A Nordic survey in 2003 of some 4 300 firms concluded that integrated e-business was the project of larger firms, that Finland was the leader, and that Norway was behind the other countries in most respects. Figure 9 shows profiles for e-pioneers (defined as having succeeded in profitable deployment of highly integrated systems, high information sharing with external partners, and an appropriate skill base, representing about 10% of the respondents in each country) and the rest of the respondents over 15 dimensions considered important for e-business (PLS Rambøll Management, 2003).

Figure 9. E-business profiles for e-pioneers and followers among Nordic manufacturing enterprises, 2003.
 % of firms in each group



Legend:

1. Basic website as electronic business card
2. Automatic order intake
3. Digitalised supplier communication
4. Logistics and improvements to flow-of-goods
5. High business integration in the whole value chain
6. Digitalised marketing
7. High degree of integration in all IT systems

Source: Adapted from the e-business Nordic.com 2003 survey (PLS Rambøll Management, 2003).

8. IT supported knowledge sharing (knowledge management)
9. Systematic analysis of customer behaviour and preferences
10. Supplementary/further education and courses in e-business
11. Substantial investments in competence development
12. Focus on engineers as central to e-business
13. Focus on employees with short further education in IT
14. e-marketplace for procurement
15. e-marketplace for sales

Norwegian e-business pioneers are ahead of other Nordic pioneers in using web-gathered data to analyse customer preferences (9) and in considering engineers (12) and personnel with short further education in IT (13) to be essential to successful e-business, but far behind in web presentation (1), automatic order intake (2), digitalised marketing (6), substantial e-business training (10), and electronic procurement (14). Norwegian followers are ahead in emphasising engineering skills (12), but far behind in web presentation (1), automatic order intake (2) and digitalised marketing (6). The difference between pioneers and the rest is great on most dimensions. (PLS Rambøll Management, 2003).

Summary

Norway, as a whole, scores high on investment and use of PCs and telecommunications infrastructure. The broadband situation is around the OECD and EU average and below other Nordic countries. While public administration is ICT intensive and makes increasingly good use of broadband connections, full use of ICT in business lags, particularly in broad sections of manufacturing. There is a well-educated population and most likely a better than average general ICT skills situation. The situation for broader ICT skills in education seems to be picking up, although there is still a way to go before the entire adult population is well equipped. Because of the rapid diffusion of consumer ICTs, Norwegian employees have more experience with ICT than what they have accumulated in school and the workplace alone. Using ICT to restructure business processes, however, is something that requires a focus that can hardly be learnt at home, even though computer literacy and ease of use may help. There is evidence that the specific skills required to develop e-business, as opposed to using individual ICT tools, are not sufficiently imparted to students in higher education. Business investment in ICT may also be hampered by low availability of proven best practice usage patterns, deterring business from making early investments in e-business, but there are no detailed studies available to confirm this.

It is difficult to pinpoint why the Norwegian economy has slower implementation of modern ICT than neighbouring Nordic countries. Topographical challenges to building high bandwidth infrastructure and differences in public policy are important but probably not enough to explain the apparent lags. The

differences in the structural composition of industry (sector distribution and firm size) count, along with sunk costs in legacy systems. A lower degree of innovativeness in industry may also be a factor, and this may be an important consideration in the future development of ICT policies.

General approach to ICT policy

Strategy for an information society

In Norway ICT policy is a national concern. A single ministry is responsible for government co-ordination of ICT policies. From June 2004 this responsibility lies with the new Minister of Modernization; previously it was with the Ministry of Trade and Industry (NHD). Policies remain generally in line with OECD recommendations and follow the ambitions and formats of EU initiatives such as the Lisbon process and the eEurope plans. The “eNorge 2005” plan (*eNorway 2005*, see www.enorge.org) (Regjeringen Bondevik II, 2002) embodies the concerted governmental ICT policies and efforts. A new initiative for comprehensive co-ordination of policy areas related to innovation is in effect and ICT plays an important role in this initiative (Regjeringen Bondevik II, 2003). Responsibility for innovation and development support measures has recently been partly regionalised; this has so far had little impact on the distribution of roles in ICT policies. However, many municipal authorities are involved in local broadband initiatives.

Norway’s first national IT plan was put in effect in 1987-1990. It amounted to an overview of existing sector initiatives and its internal structure was very loosely coupled. It was, however, instrumental in increasing the funding for ICT in education and in raising the ICT awareness in many ministries. It also made clear that policy co-ordination might be a difficult task (Buland, 1996). In 1995, a committee of state secretaries was established and its first report “Bit by bit” (Statssekretærutvalget for IT, 1996) heralded the need for concerted policy action to put Norway at the forefront of the development in the ongoing IT revolution. Several green and white papers were prepared over the following years⁹ and a co-ordinated ICT plan (the first *eNorway* plan) backed by eight ministries was launched in 2000 by the minority labour government. The current plan *eNorway 2005* was adopted in 2002 by the minority centre-right government (Regjeringen Bondevik II, 2002, which is the primary source for the remainder of this section unless otherwise noted). The plan runs until 2005 but there will presumably be a sequel. Individual initiatives are run by respective ministries and may have shorter or longer time horizons.

The current government has a strong belief in not distorting markets. It does, however, recognise that government historically has played an important role in ICT development in many leading countries. It has therefore developed a concerted ICT policy as documented in the *eNorway* plan, expressly considering its role to be both a facilitator and a driving force.

The government has three overarching and interlinking objectives for its ICT policy:

- *Value creation in industry.* Development and use of ICT is to contribute to value creation through increased innovation and competitiveness in Norwegian industry.
- *Efficiency and quality in the public sector.* ICT is to be applied to improve efficiency in the public sector and to offer new and improved services to users.
- *Involvement and identity.* Everyone is to be enabled to use the possibilities of ICT, and ICT is to contribute to the safekeeping and further development of Norwegian cultural heritage, identity, and languages.

A range of measures for achieving the objectives are collected under five major headings, each of which contains elements of importance for the three major objectives:

- Government will create technology neutral *good framework conditions* through updated rules and regulations, improved conditions for effective competition, and financial incentives for increased R&D and innovation in ICT.
- In the area of *availability and security* in information systems, services, and networks, authorities will be a driving force for broadband services and electronic signatures, and take responsibility for securing nationwide access to telecom services and the securing of information systems.
- Authorities will contribute to the availability of user and specialised *ICT competence* in the labour force and in the population at large.
- Government will also contribute to increasing the availability of *attractive content* adapted to Norwegian circumstances. This includes improving availability and user friendliness of public sector electronic information and also a responsibility for digitising and making available the shared cultural heritage. Illegal and harmful content will be fought.
- Finally, ICT will be used in the creation of a *modern public sector* that is cost effective and offers new and improved services. As a large market actor, the public sector may also stimulate the demand and development of ICT-related products and services.

In addition to the concerted action plan, there is also the initiative for a comprehensive innovation policy. Launched jointly in October 2003 by five ministers, this effort at identifying policies in many areas with an implication for innovation addresses framework conditions, competence, R&D, entrepreneurship, and electronic and physical infrastructure as areas where multi-sector policy efforts are required for the enhancement of Norwegian innovation strategies (Regjeringen Bondevik II, 2003). As a follow-up of this plan ten Innovation-projects have been identified and will start during summer 2004. Although ICT is not a particular focus among these projects, ICT will play an important part in many of them, for instance in the projects aiming at increasing innovation in private and public services.

Focus of government policies and programmes

Adhering to policy recommendations by the OECD and others, the current Norwegian government has chosen to prioritise reviewing the role of public administration in the Information Society rather than increasing its intervention in the private sector, where they expect market forces to function more effectively. This means a lot of effort is focused on changing public regulations to bring out what is believed to be better framework conditions for enterprises and consumers operating in markets. It also means emphasis on the use of ICT in education, health, and other services mostly provided by public institutions. Furthermore, it means using the purchasing power of public institutions to speed up market processes of technology diffusion and uptake. Finally, the production of public goods, such as research, whose volume will be suboptimal if left to the market alone, is still subsidised.

The legal framework has undergone a major revision to eliminate any discrimination against electronic media for communication in business and between business and government. Some legal barriers are still being discovered. For example, municipalities planning to share personnel resources through broadband connections discover that they often cannot legally treat cases for citizens outside their own municipality. School children can legally cut and paste information for their project work presented on paper in the classroom, but the IPR ramifications of presenting work on-line are not well known.

Policy co-ordination

Late 1997, a Royal Decree moved the responsibility and operative tasks for co-ordination of the government's IT policy and IT security to the Ministry of Trade and Industry. The operative tasks for co-ordination of IT and IT security in government administration remained with the Ministry of Labour and Government Administration. The responsibility includes being a driving force and adding value to other ministries' work in important areas, initiating and following up cross-sector IT questions and measures, preparing overviews and strategies for overall IT policy, and co-ordinating the work on IT security. In 2000, operative tasks related to broadband policy and electronic commerce were added. However, each ministry remains in charge of IT questions within its own domain. This means that a major task for the Ministry of Trade and Industry has been to create synergies and add value to efforts of individual ministries. Following a cabinet restructuring in June 2004, the newly appointed Minister of Modernization (who basically is in charge of the Government Administration part of the previous Ministry of Labour and Government Administration) is charged with all of the above ICT responsibilities. This is also expected to strengthen the efforts to develop e-government.

The committee of state secretaries established in 1995 is still in operation, supported by an advisory group of senior civil servants (the eContact group). At the operative level, the Ministry of Trade and Industry has organised the co-ordinating role with its department of IT policy (with a staff of 18) acting as the eNorway secretariat. This department has three sections, covering IT infrastructure and security, e-commerce and the information economy, and ICT industries.

The eNorway plan has so far totalled more than 100 named projects and other actions involving 13 of the 16 ministries. More than one third of these actions have involved multiple ministries. This is an impressive roster in an administration traditionally dominated by a strictly sectoral division of interest and labour. Bringing intersectoral co-ordination to the forefront in this manner illuminates and to some degree reflects the inherent network character of ICT and its enabling potential for restructuring old patterns of behaviour and interaction in industry and government. It also highlights the governmental challenges of facilitating and being a driving force for ICT development and diffusion.

However, individual schemes or programmes are still the responsibility of the individual funding ministries. This also means that co-ordination may come to play a relatively passive role vis-à-vis largely intra-sectoral initiatives. The operation of programmes aimed at business or public institutions outside the state administration are typically left to institutions such as Innovation Norway charged with running business support services. In some cases, research institutes or private consultancies bid for administering and running the programmes. Schemes aimed at a single public sector such as hospitals or schools are more frequently operated by designated institutions or the appropriate directorate.

The eNorway plan is mostly characterised by qualitative objectives rather than quantified targets. This may seem suboptimal for a plan but it may be impossible to achieve anything more specific on a broad front. In principle, this way of stating visions and directions rather than fixed targets gives a degree of flexibility in the use of available resources that may be useful if external conditions change more rapidly than the plan itself.

Where targets exist, schemes for reaching them are not necessarily goal-congruent in their design. The broadband policy is a good example. The plan states, *i.a.*, that all municipal administrations ("town halls") and elementary schools should have access to broadband at competitive prices by 2005 (but not necessarily be connected; that would be an individual purchase decision). This target depends strongly on the existence of a nationwide infrastructure, and as in many other countries, there are great geographical challenges in achieving this. Government's major broadband initiative, the HØYKOM programme (with its General (1999-2004) scheme for all public institutions, School scheme (2002-2004), and District scheme (2004)) is

designed to stimulate public institutions to *connect* to broadband networks for using and sometimes developing broadband application for the purpose of making public administration more efficient and service oriented. This scheme is charged with *contributing* to the national availability target, but nobody knows how much, partly because commercial providers may need little or much stimulus to build the necessary infrastructure, and partly because the government may *in principle* implement other means than HØYKOM to provide either stimulus or direct intervention. In the case of town halls, the General scheme may not finance infrastructure.¹⁰ No tally of the number of town halls connected through the scheme is requested; the total coverage is counted by other means. In the case of elementary schools, local infrastructure may be financed through the School scheme, and the programme board reports on the number of schools connected. HØYKOM is, however, the government's only visible broadband initiative, meaning that public expectations run high for it to achieve also a roll-out that it is not allowed to pay for. As of 2004, projects for building infrastructure in remote communities are permitted through HØYKOM District, financed by the Ministry of Trade and Industry.

This kind of discrepancy occurs by distributed design. That is, the two ministries funding broadband projects for town halls and elementary schools through HØYKOM have different opinions of what and when to finance. To the Ministry of Education and Research, which finances HØYKOM School, it is imperative that schools get connected, so they foot the bill even if it means building broadband infrastructure. To the Ministry of Trade and Industry, it is important not to disturb broadband markets, so they have adhered to the original criteria of not financing broadband infrastructure in town hall projects until 2004. (Finne *et al.*, 2004). The co-ordinating body has not been able to harmonise this design, even though the programme is to a large extent funded by the Ministry of Trade and Industry.¹¹

In terms of smaller schemes where the eNorway secretariat itself is in charge, they do of course have a greater say in direct target setting and operation. By nature, however, these schemes have fewer resources available or else they would probably have to be outsourced as for HØYKOM and other large schemes. A dilemma arises between being able to achieve impact through the use of more resources in various ministries and being able to co-ordinate more tightly and achieve the overarching objectives of the eNorway plan (Pedersen, 2004). Tight co-ordination with the co-ordinating body in charge can work very well as in the case of the removal of legal obstacles to electronic communication, involving review of 400 laws and changes in 39 of them over a two-year period.

It is also a question of to what extent a mono-ministerial co-ordinating group can provide sufficient guidance to implement multiple sectoral interests across sectors, even with the strategic support of the eContact group and the committee of state secretaries above it. For example the HØYKOM broadband initiative has potential and actual impacts on many activities including modernisation of public administration (a policy concern primarily of the Ministry of Labour and Government Administration and the Ministry of Local Government and Regional Development), for regional development (a policy concern for a different department in the Ministry of Local Government and Regional Development), for industrial development (Ministry of Trade and Industry), for education (Ministry of Education and Research), for improved efficiency and quality in hospitals and other parts of health services (Ministry of Health), for public libraries (Ministry of Culture and Church Affairs), for availability of public geographical information data (Ministry of the Environment), and for the availability of broadband infrastructure and services (Ministry of Transport and Communications). Such is the cross-cutting character of broadband networks, applications and impacts, a group with representatives of all these ministries and some other institutions was established in connection with the HØYKOM programme. An attempt to give the group the status of a programme board never materialised, and it serves as an information exchange with an informal influence on the operational strategies of the scheme. Its influence on related initiatives in the participating ministries, however, appears to have been weak in part because it has no mandate for this (Finne *et al.*, 2004).

On several occasions, the co-ordinating ministry has been awarded extra funding to distribute to activities in other ministries to achieve either more rapid progress or a more concerted action. The increase in capacity of university level ICT programmes around 1999 and the digitisation of geographical maps were two initiatives benefiting from this prioritisation.

Specific initiatives

In the following section, a selection of the initiatives of the current eNorway plan are highlighted, the selection criteria being the government's giving them highest priority and/or our assessment of their direct or indirect relevance for ICT diffusion to business.

Infrastructure: telecommunication markets

The telecommunications sector was deregulated in 1998 and the state monopoly was partly privatised and put on the stock exchange with a "people's option" for individuals to acquire discounted shares. The incumbent holds the only nationwide fixed line network and the "last mile" was opened in 2003. 84 service providers competed for traffic as of April 2003 (NHD, 2003a).

Both the two nationwide GSM networks have been opened to other service providers. Coverage is around 97% of the inhabited ground for each of the two networks but mobile users also request access both on and off roads where access is uneven. GPRS and HSCSD have been generally available since 2002. After an overoptimistic start in 2000, three of the four planned UMTS licences are now ready but no services are so far available.

Telephone traffic charges dropped dramatically in anticipation of deregulation, but local call charges were abandoned in favour of a nation-wide tariff and a start-up charge per call. Subscription prices have increased, to the detriment of low volume customers (typically low income households). Northern Norway has had the greatest cost increase. New service providers have essentially maintained this price structure, competing marginally on cost or with selective discounts. Mobile phone charges are still falling. The competition regime has thus worked to the consumers' advantage in some areas and to their disadvantage in others (Skogerbø and Storsul, 2003).

Competition in the fixed and mobile phone markets is followed closely by the Norwegian Post and Telecommunications Authority. At the moment, there are no political initiatives for major changes in the current competition policies in this field.

The situation is very different in broadband markets. Availability varies greatly between regions. Some city quarters have up to ten competing providers and large parts of the country have none. The first public broadband initiative, "HØYKOM"¹², was launched in 1999 and is still in operation. Its budget for the first year of operation was NOK 12 m and this grew rapidly to NOK 101 m in 2001 and has since declined slightly. This programme provides money and competence to stimulate public institutions (schools, hospitals, town halls, libraries, etc.) to develop and/or implement broadband demanding applications to directly improve performance in the public sector (which includes the provision of new or improved services) and to indirectly prompt commercial providers to extend their infrastructure to new areas (Finne *et al.*, 2004). As of March 2004, over 130 actors provide broadband services in the consumer market, probably close to 100 of them with their own infrastructure, but many of these have a very limited geographic scope (Teleplan, 2004a; Norsk Telecom, 2004). In addition, there is growing competition based on local loop unbundling.

A white paper on broadband (St meld nr 49, 2002-2003) was adopted by Parliament in March 2004. The policy of stimulating broadband demand from public institutions will continue, and stronger measures for accumulating local demand will be developed in order to increase supply and lower prices. Parliament

vowed to secure broadband access to everyone by the end of 2007, without elevating access to a universal service obligation. There is in principle agreement to let market actors undertake the bulk of the investment in infrastructure, but the debate showed strong disagreements as to the criteria for direct interventions outside the reach of the market and the will to commit large increases in public expenditure. No official estimate has been published but a potential NOK 3 bn fund has been the topic of political discussion. The parliamentary decision one month earlier to recommend the construction by 2007 of a mandatory digital wireless TV replacement for the analogue network caused controversy, as critics said that this would undermine the market for TV over fibre and greatly delay expansion of new broadband infrastructures. Furthermore, the idea of building a return channel into the TV net to provide broadband access in certain peripheral regions received only vague recommendation. There is also some concern that the large number of uncoordinated broadband networks with different technical standards may not operate optimally as a single, transparent infrastructure. (Stortinget, 2004; Norsk Telecom, 2004).

A new Act relating to electronic communication has replaced the telecommunication law and other regulations as of 2003. It gives the authorities a greater flexibility in applying measures for improving competition and it harmonises regulations towards those in the EU, for the benefit of industry.

R&D

There has been a political consensus and a government target since 2000 for total R&D as a percentage of GDP to reach the OECD average by 2005. Over the period 1995-2001, this share has moved from 1.7% to 1.6% in Norway, from 2.1% to 2.3% in OECD countries, and from 2.4% to 3.0% in the Nordic countries. It is particularly industry's share of R&D that is lower than the OECD average. (NIFU *et al.*, 2004). It is still not considered impossible to attain this target, although most observers doubt it.

A tax incentive was introduced in 2002 which gives an enterprise an 18-20% tax credit on R&D expenses for qualifying projects up to NOK 4 m per year, and up to NOK 8 m if an authorised domestic or foreign research provider is involved (see www.skattefunn.no for details). This amount is on top of the regular deduction of expenses from current income and the tax authorities reimburse the amount if the company is not in a tax-paying position. The usual ceilings on combined public support still apply. In 2003, over 3 500 new projects were approved., the Government revenues foregone for 2003 are estimated at NOK 1.4 bn, including multi-year projects approved the year before. A large share of the incentive went to ICTs - 26% of the planned project costs were related to ICT software and systems projects and another 13% to electronics and computers hardware (Rønneberg 2004.) This amounts to approximately NOK 550 m public support for ICT and electronics R&D in 2003. The research content threshold is relatively low but it is unclear how far the scheme reaches into such fields as e-business projects where the major new knowledge components are often organisational, not technological. However clear criteria have been set in order to exclude applications without real R&D content. For instance, training in the use of newly acquired ICT equipment does not qualify. It has also been ensured that the scheme is in compliance with Norway's EEA/EU and WTO obligations with respect to government subsidies. The additionality of this scheme is one of the topics for an ongoing continuous evaluation.

ICT is one of the four thematic R&D areas defined by the 1999 white paper on research (St meld nr 39, 1998-1999). Government funding for ICT R&D through the Research Council of Norway was NOK 445 m in 2001, 433 m in 2002, 446 m in 2003, and the 2004 budget is 452 m (Norges forskningsråd, 2002; 2003; 2004). The Ministry of Trade and Industry has published a two-year (2003-2004) strategy for ICT research, prioritising micro and nano systems, broadband, security and trust, mobile applications and services, semantic knowledge systems, IT in business management and the public sector, and e-health. Previously the ministry left it to the Research Council of Norway to develop such strategies. The present strategy is aimed at linking Norwegian ICT research with the European Commission's 6th Framework Program in R&D (FP6) and the European Research Area, and underpinning the *e*Norway plan.

An international peer review found Norwegian ICT research to be of high quality but consistently sub-optimally funded, particularly long-term basic research (Risch *et al.*, 2002). For 2004, allocations to user-controlled (applied) ICT research are slightly increased at the expense of strategic (basic) initiatives, as authorities find the quality of the former to be lagging behind the latter. Two out of 13 recently funded centres of excellence work within dedicated ICT fields.

Product development: Two long-lasting programmes of Innovation Norway (the merged body set up in 2004 to rationalise funding arrangements) fund R&D in connection with product development in user-producer relationships, one for projects with users in the public sector (OFU) and one where users are private firms (IFU). Project costs are typically split evenly between user, producer, and the public fund. Over the last few years, public funding has been up to NOK 150 m for the two schemes together, and ICT has been a core issue in over half the projects.

Venture capital funding is a bottleneck. A public scheme for financing spinouts from academic institutions is funded jointly by Innovation Norway and the Research Council. Its total annual funding has risen to almost NOK 100 m. 40% of new firms supported and 21% of the licenses transferred are in the ICT sector (Bolkesjø *et al.*, 2004.)

Equipment, software, and services

There is a major incentive to equip employees with ICT at home. Employees can get a tax relief on home ICT equipment (PCs, printers, software, broadband and Internet subscription etc.) if it is used for work-related tasks including training. The employer makes the purchase and deducts about 80% from the employee's gross salary, the basis for social costs being reduced accordingly. The rest is covered through reduction of social cost. This scheme lowers the employee's cost for ICT equipment by 30-50%, depending on marginal income tax. If the employer chooses to pay the whole cost the employee is not taxed for the advantage.

The Ministry of Trade and Industry and the Ministry of Labour and Government Administration requested in early 2004 comments on a report (Teleplan, 2003) on potentials and pitfalls in open source software for municipalities and other actors. The report stirred broad interest and many commentators requested a more active government role in increasing applications available for Linux, creating a broader experience base, and other measures to help lower switching costs from current dominant software platforms, while others urged the government not to disturb market mechanisms. The ministries will use this feedback to further develop policy in this area.

An electronic public procurement marketplace (www.ehandel.no) has been operating since 2002. Its original goal was that 50% of all procurement transactions and 20% of all procurement value be committed electronically by the end of 2003 (AAD, 2000). This was overly optimistic, but it contributes to increasing trust and competence in e-business use among its users. 25 public institutions (municipal, county, state administration, universities etc) and many private suppliers take part. Awareness campaigns for public e-procurement have been conducted and some have specifically targeted suppliers as potential users of this channel. The need to contribute to specific competence building initiatives is continually being considered. Recently the government is pushing state institutions to more actively use e-procurement to increase procurement efficiency and demonstration effects (Torsøe, 2004).

A language-independent nomenclature for e-commerce, a semantic structure that many consider important for the visibility of SMEs in electronic marketplaces, is an area where market forces apparently are not converging on a single standard in Norway and a private foundation is attempting to establish a public domain translation of The United Nations Standard Products and Services Code (Wettre-Johnsen,

2003). The robustness of such a solution without its application in government procurement systems remains to be seen.

Skills

Great emphasis is placed on systematically developing and improving ICT competence through education at all levels. Programmes are directed towards teachers as well as students. Over 30 000 teachers in primary and secondary education (one in three) took courses on pedagogical use of ICT in 2002 and 2003 (UFD, 2004a). Over the period 2000-2003, almost NOK 1.1 bn was invested in ICT in education, 43% of which was spent on competence development for teachers, 21% on R&D, 19% on pedagogic facilitation, 12% on broadband infrastructure, and 5% on miscellaneous (NHD, 2003a). Comprehensive measures that cover hardware (including broadband infrastructure), software (including increased use of open source systems), skills, teaching methods, ICT use in all subjects, digital learning resources (content), increased accessibility, and mandatory use of on-line administering of national tests are part of a major five year programme for *digital competence* at all levels of education, in effect from 2004, with ICT skills recognised as one of five basic skills. The estimated budget for 2004 is NOK 140 m (UFD, 2004b).

Recruitment to higher education requiring skills in mathematics and sciences is waning. This is seen to also impact on what is considered the recruitment to fundamental ICT training and a strategy has been adopted to ameliorate the situation. Reviews of capacity and quality in IT education have been conducted in co-operation between private and public stakeholders and annual competence accounts are produced in order to better follow trends.

The procurement awareness campaign tied to www.ehandel.no has been given high priority as a way of improving ICT competence in existing enterprises. Learning on the job and continuing education are important for upgrading competences along with recruitment of newly educated personnel, and are considered most important by employees and employers (Skule and Reichborn, 2002). Thus designing an ICT learning effort around an electronic marketplace seems a good idea. Whether this marketplace will have a large number of users (number of enterprises times number of users per enterprise) and whether it can function for learning ICT related skills, has not been assessed. Other measures may have more impact in terms of raising relevant ICT competence. The general competence reform in the workplaces is expected to pick up the actual training needs and finance them if market mechanisms are inadequate.

Business organisation

Since 1992 the FRAM programme has delivered consultant-based training in strategic competence and business development to 200-500 small firms per year. Originating from the earlier BUNT programme, FRAM is constantly renewing its orientation. With its budget down to NOK 25 m in 2003, focus is going in the direction of organisation appropriate for innovation, development based on social dialogue, and entrepreneurship, rather than organisation and process for e-business. Increased next-year profitability has always been a hallmark target for FRAM participation. (Innovasjon Norge, 2004.)

Content and electronic Government information

A strategy for electronic content for 2002-2004 (NHD, 2002) is in place and a mid-term review (NHD, 2003d) has been published. Pilot projects have been launched dealing with spatial information, language technology, on-line information sources in Norwegian, re-use and deployment of electronic information in the health services, and issues involving the Sàmi community. Even with the reduction of regulatory barriers to using digital media, certain IPR issues still remain. The state will make a considerable share of its data available to business and will not enter the market for value added services. There is awareness that pricing principles (*e.g.*, average cost or marginal cost) for the supply of electronic content from the public sector vary greatly between agencies for historical reasons. Harmonisation would obviously require certain changes in budgetary appropriations.

The highest priority issue in this field is currently the consideration of new practices and regulations for the updating and cross-referencing of public registers containing personal data, where interests of efficiency and privacy are sometimes at variance.

More recently, the government has set forth the objective to establish a coherent framework for access to Public Sector Information (PSI). An interministerial report containing recommendations on the implementation of an EU-directive on PSI and related policy issues has been published (AAD, 2004b).

The government's digital geographic information services are of great use to both public and private users. Broadband applications for on-line delivery are under development and some aspects of the information service themselves have been transferred to private industry.

A study has been conducted to look at competition and questions of frameworks and solutions for micro payments for electronic content. The relationships between private and public content providers and telecommunication operators are particularly important to achieving progress in this area.

Trust and security

The benefits of having a common public key infrastructure (PKI) have been widely recognised. A public-private PKI forum was established in 2001 with the objective of catalysing the establishment of one or more such infrastructures appropriate for secure and simple electronic transactions. In 2003, it backed a project to propose common standards for PKI in Norway. A number of important private suppliers, large users (banks) and public actors have joined forces in this project. The state-owned games company is planning to issue its 2.1 million customers with a smartcard based solution for electronic identification, signature, and payment over the Internet and other channels in 2005 (Buypass, 2004).

A co-ordination body for the use of PKI in the public sector has been established. This body will raise the awareness in public institutions of the benefits to users and institutions of a common approach to electronic IDs and signatures. It can co-fund projects where institutions want to plan for solutions that other institutions also use (AAD, 2004a). The newly appointed Minister of Modernization has decided to develop requirement specifications and framework agreements for the public sector's use of ICT by July 2005, with PKI as an important prerequisite for providing new public electronic services.

A national strategy for information security has been developed. An awareness campaign aimed at small businesses and households will be launched in the beginning of 2005. An independent advisory board has been established, charged with expanding the existing warning system for threats to the digital infrastructure and with continuous monitoring and analysis of threats. See www.norsis.no for details about the Centre for information security.

Demonstration and awareness

Lack of appropriate competence rather than legal barriers seems to be the greatest obstacle to using electronic media for formal communication and transactions among businesses (Braadland *et al.*, 2002). Several activities in awareness and diffusion of good practice are under way in the fields of e-commerce, e-content and payment solutions. International work on e-business is being monitored closely. The public-private partnership Fellesforum (“Joint forum”) operates the www.handel.no portal aimed at raising awareness and competence, particularly in SMEs, on topics of e-commerce and e-business. The portal posts news and features on a daily basis.

Some commentators report a tendency for some public measures to be an alliance between a state agency and one or more ICT solution providers (after competition for selection) that consider the large number of potential user firms as a target market for a fixed service or solution, rather than as a common constituency of problem owners with its own ideas about appropriate directions for the development of ICT solutions. Awareness campaigns could be directed towards assisting potential user firms in articulating their needs and requirements, rather than providing standard solutions.

Small firms

Public measures for innovation support to businesses are increasingly concentrated around services where markets do not function well such as research and knowledge transfer. As a consequence less public funding is allocated where private financing is available. In 2004 Innovation Norway was established (see www.invanor.no) following reorganisation of several major organisations to reduce the fragmentation of available resources and measures for innovation. A common entry-point to all relevant public measures is being planned. Surveys had found that small firms in Norway tend to trust and use public support services less than expected (Hauge, 2002; NHO, 2002), and the recent changes are hoped to contribute to improving the quality of outreach to small firms. In 2003 SND, the government’s fund for industrial and regional development and the largest of the forerunners of Innovation Norway, disbursed some NOK 30 bn in loans and NOK 100 m in grants for innovation, and 88% of these funds went to SMEs (St prp nr 1, 2003-2004).

SND has had several initiatives aimed at improving the uptake of ICT in general, e-commerce and other aspects of e-business in small firms. They reached their peak around 2001 and have since all but disappeared. The BIT programme has since 1994 worked with IT consultants and SMEs to provide industry-adapted common IT solutions for many aspects of IT in general and e-business in particular, some of which also link firms with their suppliers. 15 industries have been involved and close to 3 000 firms have adopted parts of the solutions developed, with penetration ranging from 4-90% in different industries. Organisational development and skills have been emphasised. The annual budget up to 2001 was in the range of NOK 45 m. In 2003 government direct funding for the scheme was down to NOK 13 m but the programme operator raised a similar amount from other sources. A study showed better than average development in operating profits among pilot firms than in each industry as a whole. The VeRDI (translated: VALUE) programme implemented from 2001 was to provide tools and concepts to SMEs preparing to make their first strategy for e-commerce. Planned with an annual budget of the same order as BIT, VeRDI was essentially over before it started due to changes in priorities with change in government. The BIT programme has picked up some elements and is also linked to a Danish e-preparedness monitoring scheme (SND, 2003a; SND, 2003b).

Some further initiatives

The Altinn portal (www.altinn.no, “everything in”) has since November 2003 been accepting many common mandatory and voluntary data inputs from business to various public institutions (company information, tax accounting, etc.). Input can be provided manually on web pages or from many widely

used business systems. The portal is an expression of the priority initiative “A simpler Norway”, which has 150 measures to reduce administrative complexity for business (NHD, 2003b). The portal provides an input medium for 59% of the total business reporting burden (business register, VAT reporting, tax returns), its use is picking up rapidly (Wettre-Johnsen, 2004) and it has stirred much international interest.

Finally HØYKOM co-funds projects where public sector applicants (municipal authorities, schools, etc.) develop good ideas for a broadband applications, besides attempting to indirectly step up commercial broadband supply through increasing demand from public institutions. This creates a number of interesting applications (and new uses for standard applications) or content from local sources and enhances the chances of productive use of broadband. Few will become killer applications, but the scheme stimulates local development and participating institutions will be more likely to seize the benefits, more qualified to assess alternative applications, and provide a broader spectrum of user-defined applications for other institutions to adopt and adapt (Finne *et al.*, 2004).

Policy evaluation

With a co-ordinated plan as the basis, the government is well equipped to provide co-ordinated and well structured reporting. High quality annual or semi-annual progress reports are published and thematic reports of achievements are disseminated up to ten times per year. The *eNorway* plan receives an annual review where targets and activities may be revised, and this review process plays into the annual budgeting process. Its authors vow to go beyond the usual hardware counts and into usage and benefits achieved. So far, there is a challenge in making these more systematic.

The Ministry of Trade and Industry has over the years established several forums where organisations in the private and public sectors engage in policy development through providing input and suggestions. Their inputs frequently have an evaluative character. During the summer of 2004 a new forum has been organised, as part of the *eNorway* initiative, led by the Minister of Modernization.

Independent evaluation is a statutory requirement and is routinely undertaken for government initiatives of some size, regardless of field. However, because there are not many large ICT schemes and they may last many years before assessment, the number of studies is not large and they vary in scope and size. Furthermore these exercises are overseen by the ministry responsible for individual initiatives, and only exceptionally do they carry the mark of the secretariat of the *eNorway* plan (NHD). Independent studies funded under the auspices of research programmes also contribute to the knowledge base. Overall there is a need for more systematic evaluation across all of the ministries involved, more clearly aimed at assessing policy benefits and the complexity of impacts on business and economic performance, taking account of policy priorities and programme goals when programmes were designed and how these change with changes in government and over time.

The *eNorway* plan itself has not been independently evaluated. It has, however, been the subject of a study of the development of horizontal innovation policy (Pedersen, 2004). That study commends the comprehensiveness and consistency of the plan itself. It also finds evidence for Grande’s (2001) hypothesis that in the past IT policy was under-complex vis-à-vis the challenges of IT and industrial competitiveness, and is now over-complex vis-à-vis the challenges of co-ordinating sectoral and other institutional interests in a highly fragmented public administration. ICT bears promise to increase productivity in existing organisational structures, and to restructure them for even better results. The question posed is whether a reorganised state system is needed to implement a well-co-ordinated ICT policy?

Conclusions

General remarks

Norway has a clearly expressed policy aim of being in the forefront of developments towards an Information Society. Achieving this aim requires a well co-ordinated and effective policy framework and efficient policy initiatives. By choosing to limit public measures to those that are market-led and will not distort markets, that adhere to government budgetary targets and give major funding priority and responsibilities to regional distribution goals, the Norwegian government has a difficult task. This has resulted in inventive initiatives in some areas. In other areas policy appears hampered by the importance given to co-ordination and consensus without a strong will to intervene, for example in the case of establishing certain technology standards (digital/electronic identification, nomenclature for commerce, the lower layers of broadband communication) that could become public goods on which market actors can build. There is also a question of the total amount of public resources allocated to ICT policy initiatives, which in some areas is not transparent under the present unified policy framework.

The principle of not intervening unnecessarily in markets is firmly established, but within this framework a large number of ministries have their own ICT-related agendas and funding which directly and indirectly shape the development and use of ICTs in the business sector. For ministries supporting business development and regulating competition, the task is particularly challenging. The Ministry of Trade and Industry (NHD) has a major co-ordinating role in ICT policy without necessarily having the financial resources to fund ICT initiatives, and in some cases is obliged to attempt to harness much larger resources in other ministries. For ministries providing services such as health and education, implementing policies and reaching health and education targets are paramount. Impacts in markets for ICT services and broadband are incidental even though they can be major, for example in driving broadband rollout in municipalities. Regional funding is also a major force driving ICT infrastructure development and ICT demand. But decentralised responsibility means that it is difficult to harness coherently, to know the structure of ICT-related expenditures, and to evaluate impacts. Throughout, the conservative effect of putting fiscal policy targets above other policies is important.

Strengths

Norway has a good track record in adopting and using ICTs widely and its ICT investment record is good. The strong engineering and technology base and geographical challenges have meant that despite competitive pressures linked to the high exchange rate, Norway has developed niche expertise and firms often directly or indirectly linked with the dominant offshore, maritime, construction and infrastructure sectors. It has a consistent market-led policy stance, and cautious budget policy. Ideally this would provide a stable framework for more focused ICT policies. The high priority given to education, and continuing policy concern regarding the need to shift to a knowledge-intensive economy after oil and gas resources are exhausted, suggests that Norway can position itself for the future. Important features of ICT diffusion and ICT policy that will help diffuse ICTs to business include:

- Total investment and use of ICTs is high, and broadband rollout has been satisfactory even though below political targets, considering the geographical challenges of achieving high coverage.
- Individual ICT use is among the world's highest, particularly new consumer applications (mobile phones, other consumer applications) that can be harnessed to achieve efficiencies in other areas such as facilitating filing of tax returns.

- A strong engineering and technology development tradition with strengths in the offshore, maritime, construction and infrastructure sectors, and strong educational and technical infrastructure and niche capabilities in ICT and software development in these areas.
- The co-ordination of ICT policies is clearly laid out in a Royal Decree and this co-ordinating role is actively led by the Ministry of Trade and Industry (to be followed by the Ministry of Modernization), which issues regular and detailed policy plans, progress reports and evaluations.
- There are innovative schemes attempting to harness markets to reach policy goals, for example stimulating broadband connection and application development in municipal authorities, schools, health services, libraries, etc., thereby attempting not only a useful exploitation of this technology but also a more rapid rollout through higher demand.
- The R&D tax incentive scheme is an important initiative particularly aimed at small and start-up firms and to some degree at fostering the use of external sources of expertise; it has a very wide reach and a relatively high share goes to ICT-related areas, and it is a popular mechanism aimed at raising R&D, taking into account the structural composition of Norwegian industries with a few large firms and very many small ones.
- There has been a strong upgrading of ICT education, and ICT skills were recognised as one of the five basic skills to be acquired and developed by all Norwegian students in the 2004 “culture for learning” white paper (St meld nr 30, 2003-2004).
- The government is actively exploring mechanisms to exploit public domain digital content, including pricing and payment issues.
- Public administration is leading ICT applications by example in some areas, such as developing individual and corporate electronic tax filing and a simplified and easy-to-use portal for corporate tax and VAT payments and an increasing range of other business information filing (the “Altinn” initiative).
- ICT diffusion to small firms is being pursued in a few areas via the BIT scheme that aims at developing common sector-specific e-business platforms to be jointly used by many participants in sector value chains.

Weaknesses

Policies to diffuse ICTs to business are constrained within the general market-led approach to policy in a budgetary framework that makes little distinction between capital and long-term investment expenditures and transfers for consumption. The sector and size composition of industry and the geographically dispersed population pose further challenges for policy-making. Policy has searched for consensus, co-ordination and equity rather than taking a leading role in areas where public policy can create “public goods” such as digital signatures and some areas of standards. Some of the points below are common to other OECD countries and lessons learned in meeting these challenges will be very valuable. Specific points include:

- Norway is in the middle ranks of developments that have gained in importance in leading OECD countries -- including broadband, and e-business, and extensive adoption of e-government, despite a strong early business ICT base and widespread consumer ICT use.
- Industry use of ICT in general and the implementation of e-business in particular is trailing behind consumer and household use of ICTs. This is acknowledged, but policy initiatives have only partly reflected this lag.

- Despite the clear co-ordination of ICT-related policy, the large number of ministries with ICT-related agendas and funds and the major role of decentralised regional spending makes clear prioritisation difficult, particularly when most discretionary spending is not located in the ministry responsible for co-ordination.
- Government needs to adopt a stronger role and take a firmer lead in areas where there are opportunities to build public goods such as digital signatures and wider use of digital records where there are major external benefits to be gained in public administration, healthcare, and education, as well as benefits across all business sectors.
- Norway's decentralised regional and municipal governmental structure leads to fragmentation in initiatives where there are network economies in more unified approaches. For example there are 130 broadband providers covering the scattered municipalities and there are standardisation and interoperability issues that need addressing.
- Business R&D is lagging relative to other developed countries, despite initiatives, and further efforts may be warranted to strengthen business R&D and innovation.
- ICT start-up firms in niche specialisations have problems growing to medium size and venture capital to support such firms is weak.
- ICT education needs renewal, not only reinforcement. In particular there is a lack of widely based e-business skills that are more comprehensive than the separate technical and business skills currently developed, with particular need to build business skill development into technical courses.
- More effort may be needed for example to build common e-business platforms that can be used by small firms. These will largely be business and sector-led, but there is still a strategic government role to start the process of building these "public goods" in areas of standardisation for example.

Recommendations

The strengths of Norway in terms of its policy commitment to the information economy, the high levels of ICT use in the population, its strong technical education system and strengths in some areas of the economy should be built on by addressing the areas identified for further strengthening. The recommendations that follow identify priority actions that should assist Norway to build on established strengths to further benefit from them.

- *Policy prioritisation:* Despite effective co-ordination of ICT-related policy, prioritisation of the policy agenda is needed to clarify and strengthen the role of government where it can count, for example in building public goods in areas of infrastructure and standards. It would be particularly helpful to increase the co-ordinating role to more effectively cover regional and municipal ICT-related programmes.
- *Learn from regional experience:* The decentralised regional governmental structure can be used to encourage experimentation and to learn from the diversity of local approaches that harness markets to reach policy goals, for example in infrastructure build-out where local power companies have been important in providing broadband infrastructure and services and increasing connectedness. Leverage experience from decentralised experimentation, and spread policy lessons and experience. More systematic evaluation would contribute to joint learning across all government and business stakeholders.

- *ICT research and development:* Further attention is needed to foster business sector R&D. A first necessary step is to analyse the impacts of the R&D tax credit on expanding business R&D and innovation and achieving additionality from tax expenditures.
- *ICT venture capital:* Further efforts are needed to encourage a stronger supply of venture capital.
- *Education and training:* New mechanisms are needed to develop more widely based e-business skills, particularly to build development of business skills and other necessary skills into technical courses.
- *Digital content:* Enhance efforts to make public sector content (maps, archives, educational, historical and cultural material) more accessible and develop pricing and payment mechanisms to extend its use where appropriate.
- *Digital signatures:* Government needs to adopt a stronger role and take a firmer lead in areas where there are opportunities to adopt digital signatures and use digital records more widely, to increase efficiencies in the public sector and enhance private sector use.
- *Business integration and value chains.* Policy needs to take greater consideration of more sophisticated organisational restructuring and integrating effects associated with ICTs, with more effort for example to build common e-business platforms that can be used by small firms.
- *Programme reach:* Upgrade programmes that reach the very large numbers of small and medium businesses through market-led e-business programmes, and design mechanisms that are easily accessible to SMEs at low cost.
- *Involving business:* Make greater efforts to include consumer sectors (distribution, retailing, etc) and involve these sectors in market-led programme design and delivery to increase ICT-enabled efficiency.

NOTES

- 1 Measured as annual volume changes in GDP at market prices, including petroleum products and shipping services.
- 2 Percentages calculated on the basis of employment data for 2002 published by Statistics Norway.
- 3 A nomenclature suited to Norwegian statistical categories is used in this report: micro-enterprises have 0-9 employees, small and medium-sized enterprises (SMEs) 10-99 employees, and large enterprises have 100+ employees. In most ICT statistics, micro enterprises with less than 5 employees are not counted.
- 4 The Norwegian definition includes ICT manufacturing (ISIC divisions 30, 31.3 and 32), wholesale and retail ICT trade (certain subdivisions under 51.4, 51.6 and 52.4), telecommunications (64.2), ICT consultancy (basically 72), publishing (22.1), information services (74.4 and 92.4), radio and television (92.2), and film and video (92.1).
- 5 Subscriptions may have either 2 or 30 channels.
- 7 Satellite broadband with a return channel is available for a large proportion of the country but it is costly and still technically inferior from a user point of view.
- 8 E-business is the use of ICTs for conducting or supporting operations across all business processes. See OECD (2004b).
- 9 These included green papers on media convergence (NOU 1999:26), electronic signatures in public administration (NOU 2001:10) and security issues (NOU 2000:24), and white papers on IT competence in a regional perspective (St meld nr 38, 1997-98), regulation in the telecom sector (St meld nr 24, 1998-99), R&D (St meld nr 39, 1998-1999), e-business (St meld nr 41, 1998-1999), security (St meld nr 47, 2000-2001; St meld nr 17, 2001-2002), digital TV (St meld nr 46, 1998-1999; St meld nr 44, 2002-2003), digital cultural heritage (St meld nr 22, 1999-2000), broadband (St meld nr 49, 2002-2003), and education (St meld nr 30, 2003-2004).
- 10 Exceptionally, infrastructure costs have been given a small subsidy when deemed essential. In most cases the actual infrastructure development has been performed by market actors.
- 11 Some school projects are funded by the appropriation from the Ministry of Trade and Industry. In these projects, infrastructure costs are not eligible for support. The programme has received a good evaluation on what it is charged with doing.
- 12 HØYKOM is an acronym for HØYhastighets KOMmunikasjon, which means HIGH speed COMMunication.

BIBLIOGRAPHY

- AAD (2000): *Program for elektronisk handel i det offentlige. Programbeskrivelse*. Oslo: Arbeids- og administrasjonsdepartementet. http://www.ehandel.no/data/file/file_157.pdf
- AAD (2004a): "Koordineringsorganet for PKI i offentlig sektor." Arbeids- og administrasjonsdepartementet, <http://www.dep.no/aad/modernisering/tverrgaendeprosjekter/pkiorgan/index-b-n-a.html>.
- AAD (2004b): *Fra bruk til gjenbruk. Gjennomføring av direktiv 2003/98/EF om gjenbruk av den offentlige sektors informasjon og supplerende forslag*. P-0916 B, Oslo: Arbeids- og administrasjonsdepartementet.
- Bolkesjø, Torjus, Geir Møller and Knut Vareide (2004): *Evaluering av kommersialiseringsenhetene i FORNY-programmet. Kortrapport*. Rapport 212, Bø: Telemarksforskning-Bø.
- Braadland, Frode, Tom E Eikebrokk, Elisabet S Hauge, Øyvind L Laderud, Carl Erik Moe and Dag H. Olsen (2002): *Elektronisk forretningsdrift. Hindringer og tiltak*. FoU-rapport 11/2002, Kristiansand: Agderforskning.
- Buland, Trond (1996): *Den store planen. Norges satsing på informasjonsteknologi 1987-1990*. Trondheim: NTNU.
- Buypass (2004): "Pressemelding." Buypass, http://www.buypass.no/sider/pressemeldinger/pressemelding_040324.htm.
- Døving, Erik, Odd Bjørn Ure, Berit Teige and Sveinung Skule (2003): *Evaluering av kompetanseutviklingsprogrammet. Underveisrapport 2003*. SNF arbeidsnotat 58/2003, Bergen: Samfunns- og næringslivsforskning AS.
- ECON Analyse (2003): *Oppdatering av status for bredbåndsdekning og -tilknytning i Norge*. ECON-rapport 2003-056, Oslo: ECON Analyse.
- Economist Intelligence Unit and IBM Institute for Business Value (2004): *The 2004 e-readiness rankings*. London: The Economist.
- Finne, Håkon, Anders Ekeland and Yngve Seierstad Stokke (2004): *Bredt bånd i tynn tråd? Evaluering av HØYKOM*. STEP Rapport STF38 A03885, Oslo: SINTEF STEP.
- Gabrielsen, Ansgar (2004): *Innovasjon 2010*. Nasjonal innovasjonskonferanse, Folkets Hus, Oslo: Nærings- og handelsdepartementet.
- Grande, Edgar (2001): "The erosion of state capacity and the European innovation policy dilemma. A comparison of German and EU information technology policies." *Research Policy* Vol. 30 No. 6, pp. 905-921.
- Hauge, Elisabet Sørfjorddal (2002): *Fungerer virkemiddelapparatet? Småbedriftsledere forteller om sine erfaringer*. Prosjektrapport 32/2002, Kristiansand: Agderforskning.
- IDC and WITSA (2002): *Digital planet 2002. The global information economy*. Arlington VA: World Information Technology and Services Alliance (WITSA).

- Innovasjon Norge (2004): *FRAM-programmet. Årsrapport 2003*. Oslo: Innovasjon Norge.
- Jordan, Trygve, Sjur Huseby, Tor Wedde and Bernhard Larsen (2002): *Analyse av næringslivets behov for bredbånd*. Oslo: da Vinci Consulting.
- Kristiansen, Tove *et al.* (2003): *Skole for digital kompetanse. Om fremtidige behov for bredbånd i utdanningssektoren*. Oslo: Norges forskningsråd.
- Leppälahti, Ari, Mervi Niemi and Aarno Airaksinen (2002): *Nordic information society statistics 2002*. Helsinki: Yliopistopaino.
- NHD (2002): *Strategi for elektronisk innhold - Styrking av norsk innhold i elektroniske tjenester*. Oslo: Nærings- og handelsdepartementet.
- NHD (2003a): *eNorge. Tilstandsrapport juni 2003*. Oslo: Nærings- og handelsdepartementet.
- NHD (2003b): *Forenkling og tilrettelegging for næringslivet. Regjeringas handlingsplan for Eit enklare Noreg. Tilstandsrapport 2003*. Oslo: Nærings- og handelsdepartementet.
- NHD (2003c): "Samlet statistikkoversikt." Ministry of Trade and Industry, http://www.enorge.org/modules/module_109/oversikt_statistikk.asp
- NHD (2003d): *Status for elektronisk innhold 2003. (Oppfølging av Strategi for elektronisk innhold 2002-2004)*. Oslo: Nærings- og handelsdepartementet.
- NHD (2004): *Broadband in Norway. Policy and status, March 2004*. Oslo: Ministry of Trade and Industry.
- NHO (2002): "8 av 10 småbedrifter unngår SND." NHO, <http://www.nho.no/hovedweb/hovedweb.nsf/33d16105b2e36beac1256af7004c5d81/fe51efe65bca2db9c1256bc10029ab0a?OpenDocument>
- NIFU, STEP and SSB (2004): *Det norske forsknings- og innovasjonssystemet - statistikk og indikatorer 2003*. Oslo: Norges forskningsråd.
- Norges Bank (2003): *Årsrapport om betalingsformidling 2002*. Oslo: Norges Bank.
- Norges forskningsråd (2002): *Budsjett 2002*. Oslo: Norges forskningsråd.
- Norges forskningsråd (2003): *Budsjettbok 2003*. Oslo: Norges forskningsråd.
- Norges forskningsråd (2004): *Budsjettbok 2004*. Oslo: Norges forskningsråd.
- Norsk Telecom (2004): *Norske bredbåndsaktører vinteren 2004*. Oslo: Norsk Telecom.
- Norwegian Air Shuttle (2004): *Annual report 2003. Norwegian Air Shuttle ASA*. Fornebu: Norwegian Air Shuttle.
- NOU 1999:26 (1999): *Konvergens. Sammensmelting av tele-, data- og mediesektorene*. Oslo: Statens forvaltningstjeneste.
- NOU 2000:24 (2000): *Et sårbart samfunn. Utfordringer for sikkerhets- og beredskapsarbeidet i samfunnet*. Oslo: Statens forvaltningstjeneste.
- NOU 2001:10 (2001): *Uten penn og blekk. Bruk av digitale signaturer i elektronisk samhandling med og i forvaltningen*. Oslo: Statens forvaltningstjeneste.

- OECD (2001a): *Drivers of growth: Information technology, innovation and entrepreneurship*. Science, Technology and Industry Outlook Special edition, Paris: OECD.
- OECD (2001b): *The new economy: Beyond the hype*. Paris: OECD.
- OECD (2003a): *ICT and economic growth: Evidence from OECD countries, industries and firms*. Paris: OECD.
- OECD (2003b): *OECD Communications Outlook 2003*. Paris: OECD.
- OECD (2003c): *OECD Economic Outlook*. Paris: OECD.
- OECD (2003d): *OECD in figures. 2003 edition. Statistics on the member countries*. Paris: OECD.
- OECD (2003e): *Seizing the benefit of ICT in a digital economy*. Paris: OECD.
- OECD (2004a): ANBERD (Analytical Business Enterprise Research and Development) database. OECD.
- OECD (2004b): *OECD Information Technology Outlook 2004*. Paris: OECD.
- PCWorld Ekstra (2004): "PC-salget økte med 17% i 2003." IKT-Norge, <http://efpadm.telecomputing.no/Files/Files/100695/221.xls>; <http://www.ikt-norge.no/Default.asp?UID=4489>
- Pedersen, Trond Einar (2004): *The Norwegian information society case*. Oslo: NIFU STEP.
- PLS Rambøll Management (2003): *E-business Nordic.com 2003. Strategies and spreading of e-business in Nordic enterprises*. Aarhus: PLS Rambøll Management.
- Post- og teletilsynet (2002): *Det norske telemarkedet 2002*. Oslo: Post- og teletilsynet.
- Regjeringen Bondevik II (2002): *eNorge 2005*. Oslo: Nærings- og handelsdepartementet.
- Regjeringen Bondevik II (2003): *Fra idé til verdi. Regjeringens plan for en helhetlig innovasjonspolitik*. Oslo: Nærings- og handelsdepartementet.
- Risch, Tore *et al.* (2002): *Research in information and communication technology in Norwegian universities and colleges. A review*. Oslo: The Research Council of Norway.
- Rønneberg, Ragnhild (2004): *Årsmelding Skattefunn 2003*. Oslo: Norges forskningsråd.
- Skatteetaten (2004): "Hvem kan levere selvangivelsen over Internett, telefon og SMS?" Skatteetaten, <http://www.skatteetaten.no/Templates/Artikkel.aspx?id=9395>
- Skogerbø, Eli and Tanja Storsul (2003): *Telesektoren i endring. Mål, midler og marked*. Oslo: Unipub.
- Skule, Sveinung and Anders N Reichborn (2002): *Learning-conducive work. A survey of learning conditions in Norwegian workplaces*. Cedefop Panorama series 30, Luxembourg: Office for Official Publications of the European Communities.
- SND (2003a): *BIT effektmålinger*. Oslo: SND.
- SND (2003b): *BIT-programmet faktaark*. Oslo: SND.
- SSB (2003a): "Bruk av IKT (Informasjons- og kommunikasjonsteknologi) i næringslivet, 2003." Statistics Norway, <http://www.ssb.no/emner/10/03/iktbruken/>

SSB (2003b): "IKT i husholdningene, 2003." Statistics Norway, <http://www.ssb.no/emner/10/03/ikthus/>

SSB (2003c): "Røde tall for informasjonssektoren." Statistics Norway, <http://www.ssb.no/emner/10/03/regnikt/>

SSB (2003d): *Statistisk årbok 2003*. Oslo: Statistics Norway.

SSB (2004a): "Pensjoner og pensjonskommisjonen – Bakgrunn." Statistics Norway, <http://www.ssb.no/emner/00/02/pensjon/>

SSB (2004b): "Statistikkbanken." Statistics Norway, <http://statbank.ssb.no/statistikkbanken/>

St meld nr 38 (1997-98) (1998): *IT-kompetanse i et regionalt perspektiv*. Oslo: Det kongelige nærings- og handelsdepartementet.

St meld nr 24 (1998-99) (1998): *Om enkelte regulatoriske spørsmål i telesektoren*. Oslo: Samferdselsdepartementet.

St meld nr 39 (1998-1999) (1999): *Forskning ved et tidsskille*. Oslo: Kirke-, undervisnings- og forskningsdepartementet.

St meld nr 41 (1998-1999) (1999): *Om elektronisk handel og forretningsdrift*. Oslo: Nærings- og handelsdepartementet.

St meld nr 46 (1998-1999) (1999): *Digitalt fjernsyn*. Oslo: Kulturdepartementet.

St meld nr 22 (1999-2000) (1999): *Kjelder til kunnskap og oppleving. Om arkiv, bibliotek og museum i ei IKT-tid og om bygningsmessige rammevilkår på kulturområdet*. Oslo: Kulturdepartementet.

St meld nr 47 (2000-2001) (2001): *Telesikkerhet og -beredskap i et telemarked med fri konkurranse*. Oslo: Samferdselsdepartementet.

St meld nr 17 (2001-2002) (2002): *Samfunnssikkerhet. Veien til et mindre sårbart samfunn*. Oslo: Justis- og politidepartementet.

St meld nr 44 (2002-2003) (2003): *Om digitalt bakkenett for fjernsyn*. Oslo: Kultur- og kirke departementet.

St meld nr 49 (2002-2003) (2003): *Breiband for kunnskap og vekst*. Oslo: Nærings- og handelsdepartementet.

St meld nr 30 (2003-2004) (2004): *Kultur for læring*. Oslo: Utdannings- og forskningsdepartementet.

St prp nr 1 (2003-2004) (2003): *Forslag til statsbudsjett for budsjetterminen 2004. NHD*. Oslo: Nærings- og handelsdepartementet.

Statssekretærutvalget for IT (1996): *Den norske IT-veien. Bit for bit. Rapport fra Statssekretærutvalget for IT*. Oslo: Samferdselsdepartementet.

Stortinget (2004): "Møte tirsdag den 9. mars kl. 10 2004." *Forhandlinger i Stortinget* No. 138, Oslo: Stortinget.

Teleplan (2003): *Åpen programvare i Norge: Status, effekter, hindringer og drivere*. Oslo: Teleplan.

Teleplan (2004a): *Bredbånd - dekning og tilknytning*. Oslo: Teleplan.

Teleplan (2004b): *Bredbånd – dekning og tilknytning. Oppdatering, august 2004*. Oslo: Teleplan.

Torsøe, Eldbjørg (2004): "Hvorfor elektronisk handel?" Paper to Effektive innkjøp og fakturabehandling ved bruk av eget økonomisystem integrert med markedsplassen ehandel.no, Oslo 2004-04-21.

UFD (2004a): "Lærere har fått økt IKT-kompetanse." Utdannings- og forskningsdepartementet, http://odin.dep.no/ufd/norsk/publ/periodika/nett_aktuelt/045071-230113/index-dok000-b-n-a.html

UFD (2004b): *Program for digital kompetanse 2004-2008. Programbeskrivelse*. Oslo: Utdannings- og forskningsdepartementet.

Vaage, Odd Frank (2004): *Norsk mediebarometer 2003*. Oslo and Kongsvinger: Statistics Norway.

Wettre-Johnsen, Egil (2003): "Kaos truer norsk ehandel." Fellesforum, http://www.handel.no/modules/module_111/news_item_view.asp?iResponse=3&iNewsId=2186&iCategoryId=87

Wettre-Johnsen, Egil (2004): "Altinn-prosjektet tar av. Eksport-suksess for Accenture?" Fellesforum, http://www.handel.no/modules/module_111/news_item_view.asp?iNewsId=2491&iCategoryId=87&iResponse=3

APPENDIX: LIST OF PERSONS INTERVIEWED DURING THE OECD MISSION

Mr. Hugo Parr, Director General, Ministry of Trade and Industry

Ms. Kari Bjørke, Assistant Director General, Ministry of Trade and Industry

Mr. Fred-Arne Ødegaard, Deputy Director General, Ministry of Trade and Industry

Mr. Nils Muri, Norwegian Tax Administration

Mr. Øystein Johannessen, Deputy Director General, Ministry of Education and Research

Mr. Jan Peter Strømsheim, Senior Advisor, Ministry of Education and Research

Mr. Hans Einar Nerhus, Senior Advisor, Ministry of Transport and Communication

Mr. Jørn Ringlund, Deputy Director General, Ministry of Transport and Communication

Mr. Per Morten Hoff, Secretary General, ICT Norway

Mr. Arild Haraldsen, Chief Executive Officer, NorStella, Foundation for e-Business and Trade Procedures

Mr. Paul Chaffey, Managing Director, Abelia, Association of Norwegian ICT- and Knowledge-based Enterprises

Mr. Geir Kuvaas, R&D Director, Federation of Norwegian Commercial and Service Enterprises

Ms. Agnes Beathe Steen Fosse, Managing Director, eForum

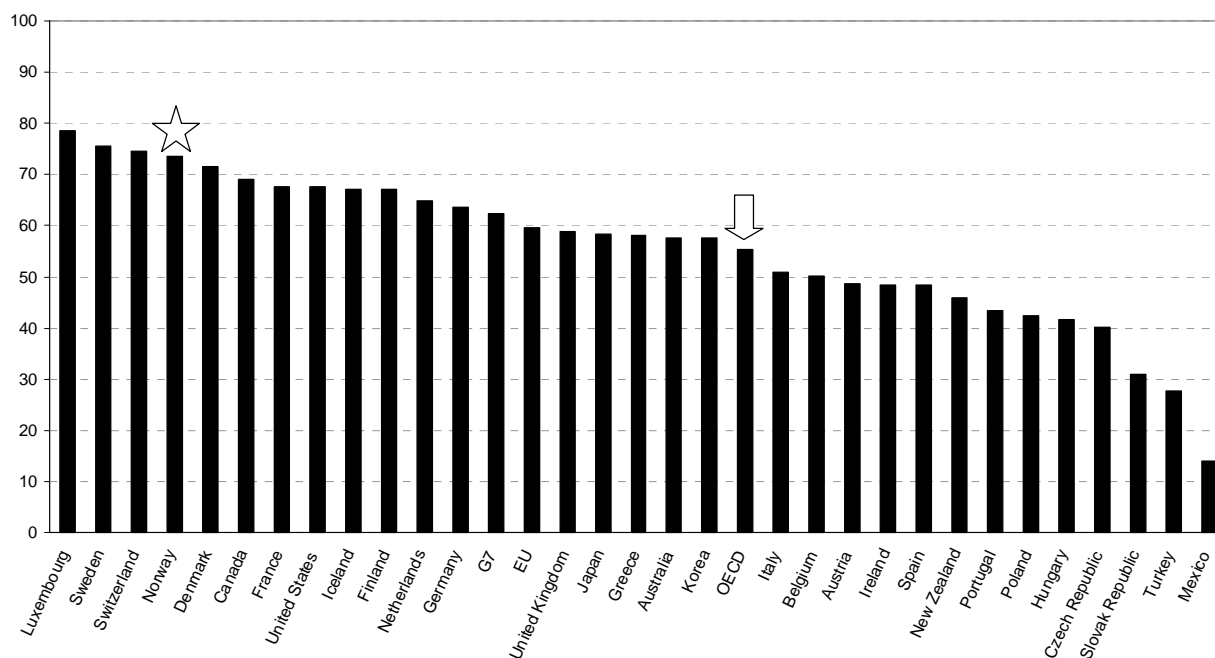
Mr. Torleif Hauge, Special Advisor, Skattefunn, Research Council of Norway

Mr. Geir Jacobsen, Technology Director, Innovation Norway

Mr. Eivind Petershagen, Special Advisor, Innovation Norway

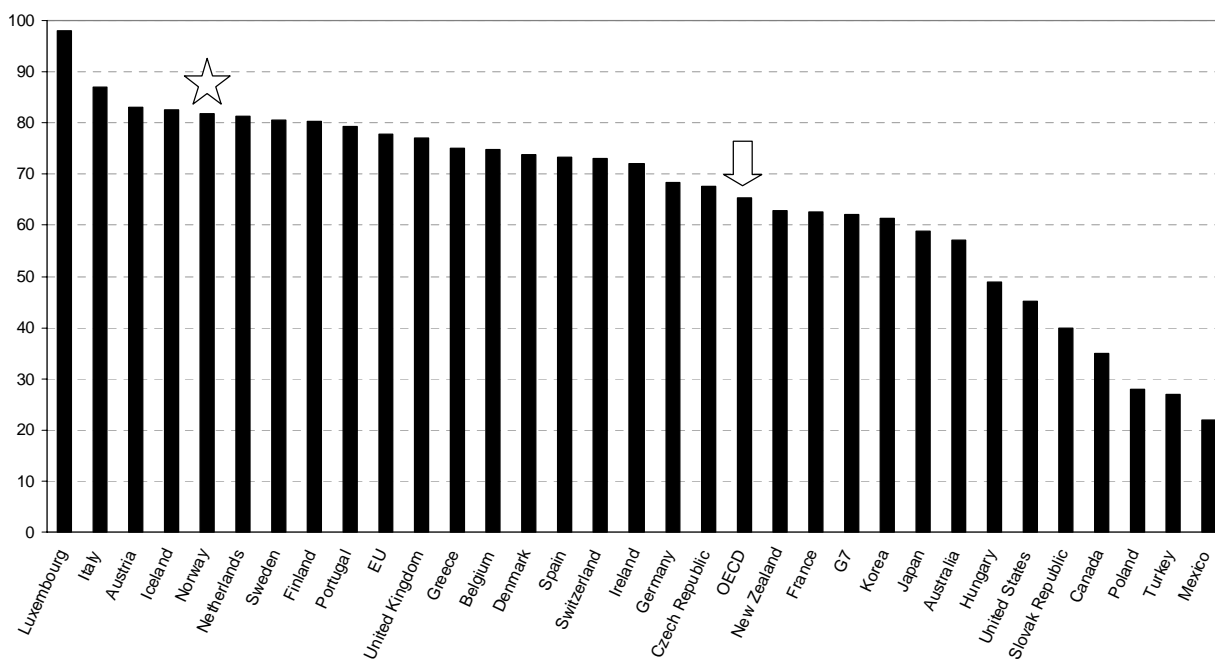
ANNEX

Telecommunication channels per 100 inhabitants, 2001



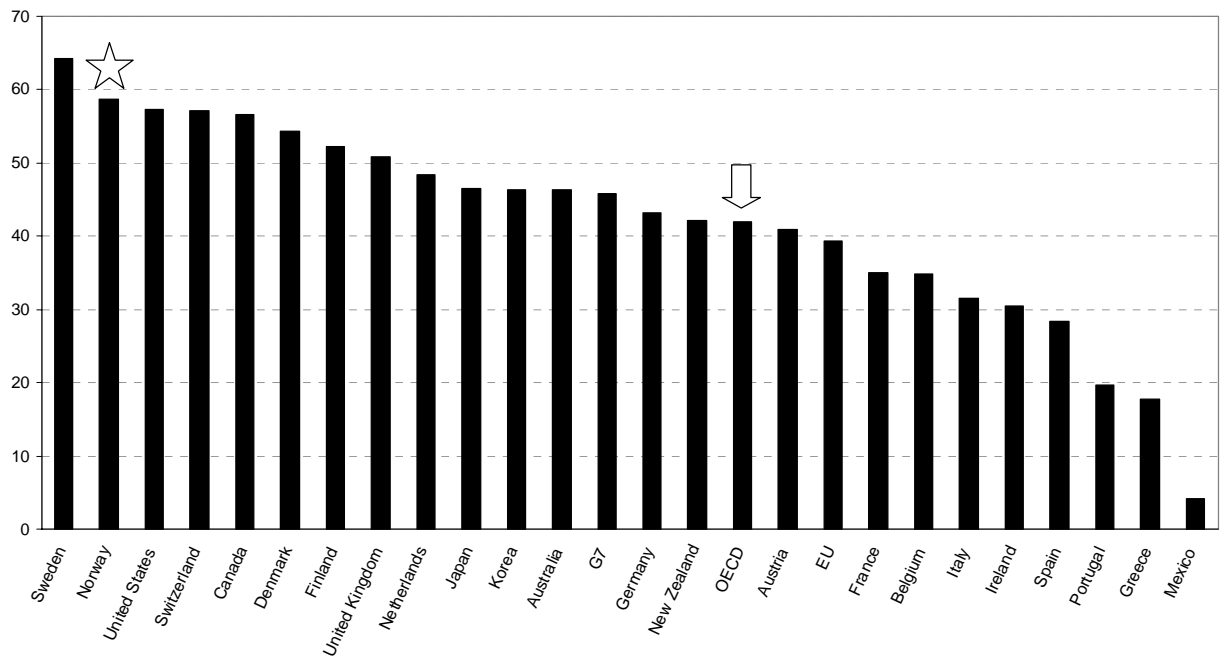
Source: OECD, *Communications Outlook*, 2003 (OECD, 2003b).

Cellular mobile penetration per 100 inhabitants, 2001



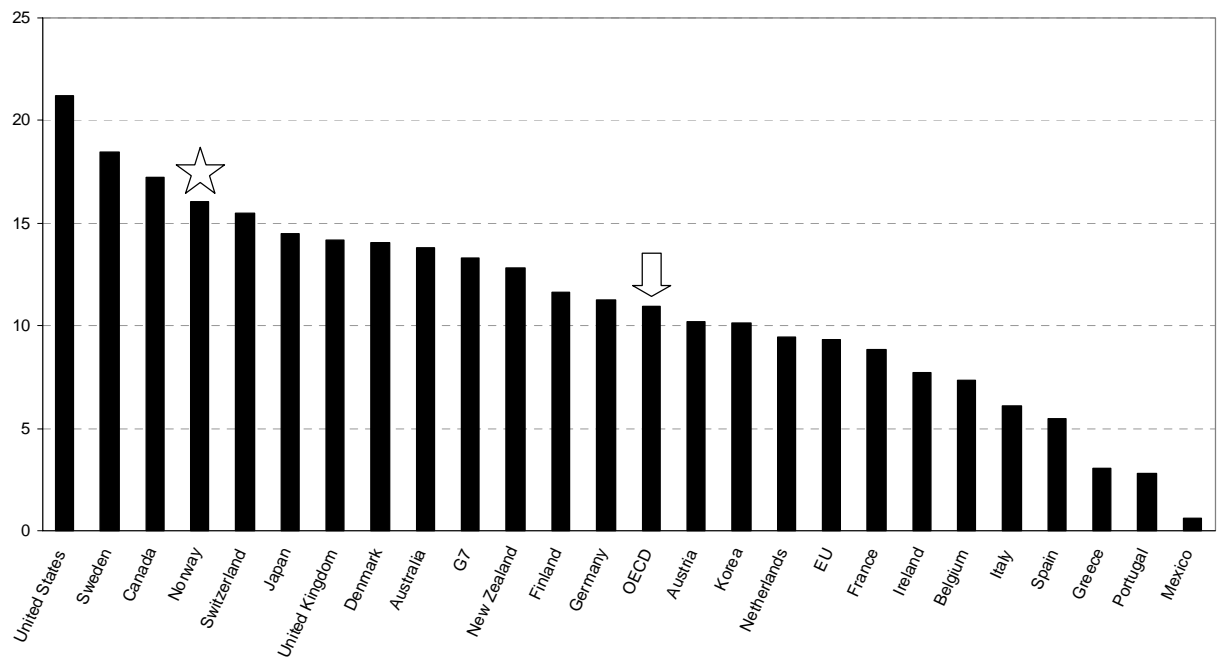
Source: OECD, *Communications Outlook*, 2003 (OECD, 2003b).

Number of Internet users per 100 inhabitants, 2001



Source: OECD, based on *Digital Planet 2002* (IDC and WITSA, 2002).

Number of Internet buyers per 100 inhabitants, 2001



Source: OECD, based on *Digital Planet 2002* (IDC and WITSA, 2002).