HIGHLIGHTS

OECD Information Technology Outlook

OECD

ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT

2002

HIGHLIGHTS

ICTs play a strong and increasing role in the world economy

ICTs play an increasingly important role in the economy.

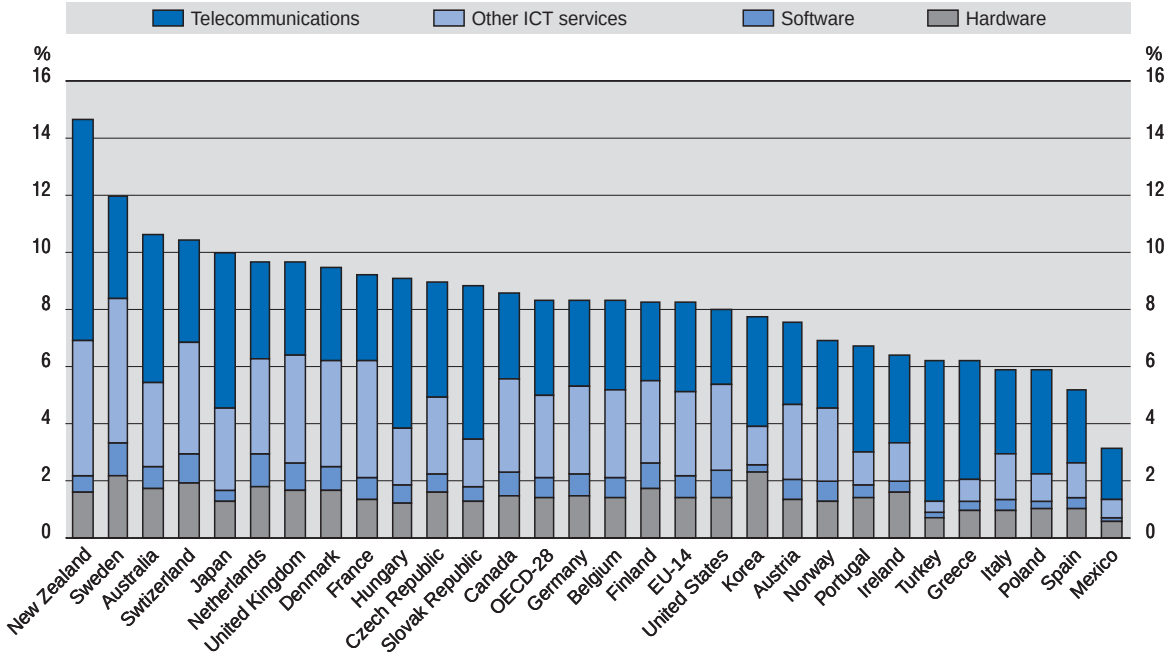
Information and communications technologies (ICTs) are increasingly ubiquitous and firms, industries and countries are reaping greater benefits from their ongoing investments in ICTs and the more widespread use of the Internet. This is true despite considerable changes in the economic landscape since the 2000 edition of the IT Outlook and questions about the existence of a "new", knowledge-based economy, in light of the recent sharp decline in technology stocks and the slump in the ICT equipment industry.

ICTs account for a large share of investment and contribute significantly to output and productivity growth.

During the late 1990s, ICTs accounted for a large and growing share of investment and contributed significantly to output growth, particularly in the United States, Australia and Finland. The diffusion of ICTs throughout the economy has enhanced economic efficiency and substantially boosted productivity growth and the ICT-producing and ICT-using sectors have

ICT intensity in OECD countries, 2001

Total ICT markets/GDP, %



Source: OECD, based on World Information Technology and Services Alliance (WITSA)/International Data Corporation (IDC), 2002.

accounted for the bulk of overall productivity growth in a wide range of OECD countries.

Despite current cyclical difficulties, trend growth of the ICT sector remains strong…

Since late 2000, however, the world ICT equipment industry has faced a severe downturn, although there are signs of an upturn on the horizon, as OECD economies begin to recover and demand and investment slowly pick up. Despite the short-term turbulence, prospects for the industry remain strong, as new products and services such as broadband continue to drive demand from firms, households and governments. In most OECD countries, the ICT sector accounts for a growing share of production, value added, employment and trade, owing to sustained price declines and continuing technological developments and venture capital investment in ICT firms.

… and the overall market for ICT goods and services continues to grow.

In the OECD area, ICT intensity (total ICT markets/GDP) increased, driven by strong growth in telecommunications services, to an average 8.3% in 2001 for goods and services combined. Software still represents less than 10% of the total ICT market, but is growing fastest, at almost 16% a year since 1992. Growth in non-member countries has been even more dynamic, and markets such as China and Brazil are now among the world's ten largest.

ICT producers are an essential part of the current trend towards globalisation of economic activity

The ICT sector is highly globalised in an increasingly globalised world economy…

The ICT sector is highly and increasingly globalised. Trade in ICT goods has grown at almost double the rate of trade in total goods, with exports of ICT equipment equivalent to well over 5% of GDP in a few OECD countries and trade in IT services growing faster than trade in equipment. Both are growing at much higher rates than GDP.

… with intra-firm trade playing an ever larger role.

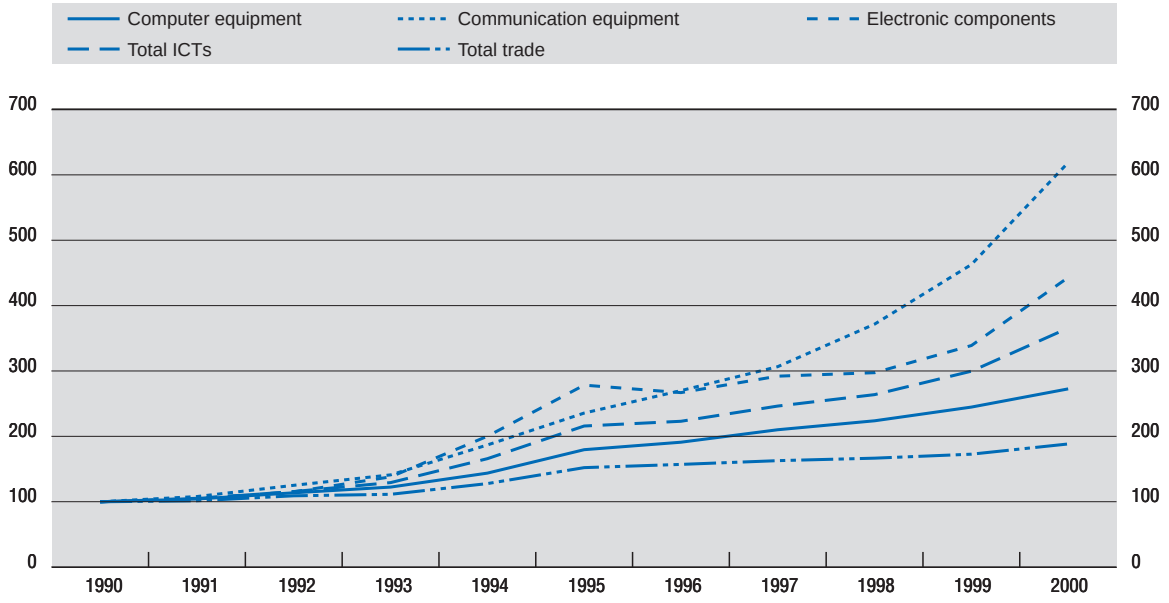
As cross-border investment increases, intra-firm trade is beginning to dominate trade, with ICT producers in the lead. US data show that ICT products represent over one-quarter of all imports of related parties and one-fifth of exports, shares higher than those of ICT products in total trade. Over two-thirds of all US ICT imports and one-third of US ICT exports are related party trade. Sales of ICT products by foreign-owned affiliates operating in the United States are of the same order of magnitude as imports of ICT products by related parties, and overseas sales by US foreign affiliates are approximately three times exports of ICT products by US related parties.

The focus of international investment in ICTs is shifting from manufacturing towards services.

Foreign investment in the ICT sector is strong, and the focus of new international investment in ICTs is shifting from manufacturing to services activities. This trend is likely to continue as services undergo greater domestic deregulation and competition, as trade liberalisation continues and as marketed services take a larger part in economic activity. As deregulation has created new markets, telecommunication services have been at the forefront of investment and M&A activities. Owing, for example, to the large future cost of third-generation mobile networks and the substantial investments required in broadband, significant consolidation is likely. This will be tempered, however, by regulatory demands for competition and choice in national markets.

OECD trade in ICT goods, 1990-2000

Index: 1990 = 100



Source: OECD, ICT database, January 2002.

Mergers, acquisitions and strategic alliances focus on R&D and technology access.

Technology-oriented M&As and strategic alliances in the ICT-producing sector are being propelled by rapid technological change, as product life cycles become shorter and new markets open up for innovative products and services. Through M&As and alliances, ICT-sector firms are likely to continue to seek ways to exploit emerging technologies (*e.g.* in IP networking, radio and optical communications, broadband applications) and bring them rapidly to market. However, the sector has felt the impact of the business cycle, with significant reductions in the level of FDI, M&As and strategic alliances likely in 2002 and beyond. Despite the recent slowdown, the ICT sector's underlying structure and dynamics will ensure that it continues to play a leading role in industrial globalisation.

Strong growth in the software sector is due to its increasingly crucial role in the ICT sector and the economy

Software is one of the most rapidly growing and evolving sectors in OECD countries.

Dynamic growth and the impact of software investment on firm-level and economy-wide productivity and competitiveness underpin policy interest in the software sector. It is among the most rapidly growing sectors in OECD countries, with strong increases in value added, employment and R&D investment. Both packaged software and software-related services have a growing share in overall ICT markets. World packaged software markets were estimated at USD 196 billion in 2001, 95% of which in OECD countries. Businesses across all sectors of the economy increasingly invest in software, and the nominal share of software in business sector gross fixed capital formation has increased constantly since 1990. At the end of the 1990s, it

reached 13.6% and 11.9% for the United States and Finland, respectively. At the same time, market structures in the software sector have changed rapidly, owing to technical innovation and the emergence of new product segments, and new firm entry, alliances, M&As and fierce competition among incumbent firms.

Software that underpins network integration, interconnection and compatibility will be essential…

Many competing forces are thus shaping the software sector. The crucial importance of integration, interconnection and software product compatibility will test the rival approaches to software development and exploitation: open and proprietary source code software. Network computing and the ubiquity of the Internet are driving new software supply strategies by application service providers, reinforced by outsourcing-driven business strategies adopted by user firms of all sizes.

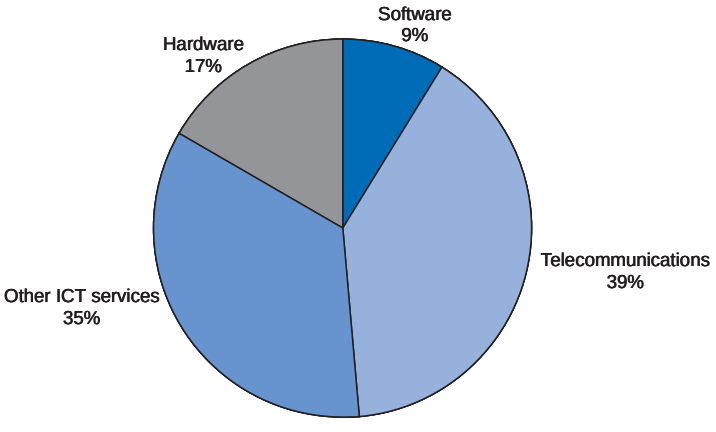
… and software-related patenting is increasing rapidly.

Innovation is a particularly important driver of change, and software firms are the most R&D-intensive of ICT firms, important recipients of venture capital (up to 20% of total technology venture capital in the United States, over 30% in Europe) and increasingly active in patenting. In the United States, for example, the number of software-related patents has grown much faster than total patents granted and now account for between 4% and 10% of all patents, depending on how they are counted.

Trade in software is dynamic but difficult to measure.

Trade in software goods and services is growing strongly but is difficult to measure, partly owing to the increasing diversity of delivery channels. The value of software goods traded on physical supports gives an indication of cross-border sales of software goods. Ireland and the United States accounted for more than 55% of OECD exports of software goods in 2000. Ireland has become the European manufacturing and distribution centre for the software of many of the world's top software vendors, accounting for over 40% of all packaged software and 60% of all business software sold in Europe. In 2000, Ireland also ranked first in the value of software services exports (mostly computer and information services) (USD 5.48 billion, followed by the United States with USD 4.9 billion) and in terms of the national share of software in total

OECD ICT spending by segment, 2001



Total: USD 2.1 trillion

Source: OECD, based on World Information Technology and Services Alliance (WITSA)/International Data Corporation (IDC), 2002.

services exports (33%). Software trade is significantly underestimated because it is usually based on the value of physical supports (CD-ROM, diskettes) rather than content and is often bundled with computer hardware, while digitally delivered software is not measured in trade statistics. On the services and intangibles side, software and copyright trade are poorly measured.

Electronic commerce is growing, but is still in its infancy, especially among consumers

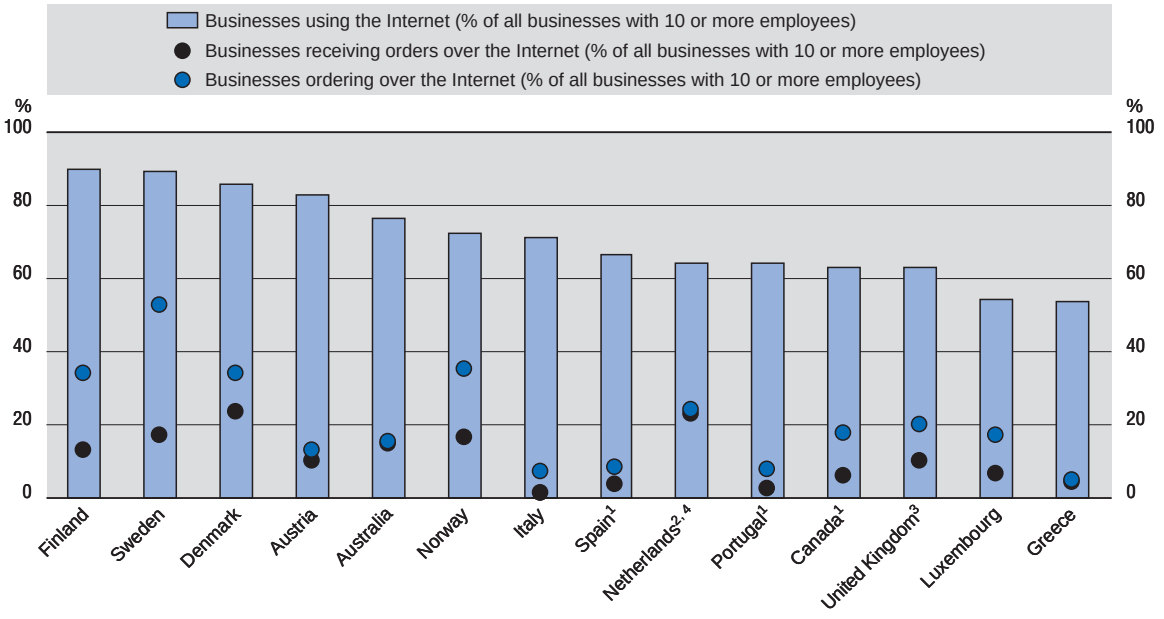
Electronic commerce has the potential to transform economic activity, but transactions are taking off more slowly than predicted.

Electronic commerce has the potential to alter economic activity and the social environment. In the aftermath of the "dot com" crash, many start-ups that sold and/or purchased exclusively on line have disappeared, and growth in electronic commerce transactions has been less spectacular than predicted. Nevertheless, the volume of electronic transactions is growing and the Internet is increasingly used as a transaction channel, particularly for purchases.

However, electronic transactions are growing, the Internet is increasingly used for purchase and EDI remains important.

Recent official surveys show that while Internet and electronic commerce transactions are rising fast, they still play a small role. In the few countries that currently measure the value of Internet or electronic sales, total Internet sales in 2000 ranged between 0.4% and 1.8% of total sales. Electronic sales (including those over all computer-mediated networks) were over 10% in Sweden. In most countries, sales via electronic data interchange (EDI) are at

Proportion of businesses with ten or more employees using the Internet for purchasing and selling, 2000



1. All businesses.
2. Use, orders received and made refer to Internet and other computer mediated networks.
3. Orders received and made over the Internet and other computer mediated networks.
4. Expectations for the year 2001 measured in 1999.

Source: OECD, ICT database and Eurostat, *E-Commerce Pilot Survey*, December 2001.

least twice sales via the Internet. Use of the Internet to carry out transactions varies according to whether the business is a customer or supplier, with purchasing more common than selling.

Internet transactions remain concentrated in a few sectors and the relation between Internet use and firm size is complex.

Internet sales and purchases tend to be concentrated in a few sectors. The nature and type of transactions that typically take place in these sectors strongly determine the characteristics of Internet transactions. Available statistics show that Internet sales are mainly domestic or regional. Results for eight EU countries show that European companies have a high propensity to sell over the Internet to locations within Europe. The relation between Internet use and firm size is complex, and industry-specific factors play a considerable role. Smaller Internet-using businesses have roughly the same propensity to sell over the Internet as larger ones in Australia, Denmark and Sweden. However, use of the Internet for purchases seems to be more sensitive to firm size in all countries. Businesses that do not conduct transactions electronically perceive electronic commerce as ill-suited to the nature of their business. Other reasons vary. While Canadian firms seem to prefer to maintain their current business model, the major concerns in Europe relate to security in handling payments, uncertainty over contracts and an insufficient customer base.

Business-to-consumer Internet sales remain low with lack of consumer interest a common reason.

Business-to-consumer Internet sales have not taken off. The share of Internet users buying over the Internet and the volume of transactions remain quite low and vary widely across countries. Computer products, clothing and digitised products such as music, books and software often constitute the major sources of Internet sales to consumers. However, the best-selling products vary, reflecting the nature of the product and consumer tastes and habits. For consumers, the main reasons for not purchasing over the Internet are "lack of interest or no use for the Internet" and cost of access.

The need for ICT skills at all levels of competence is of continuing concern

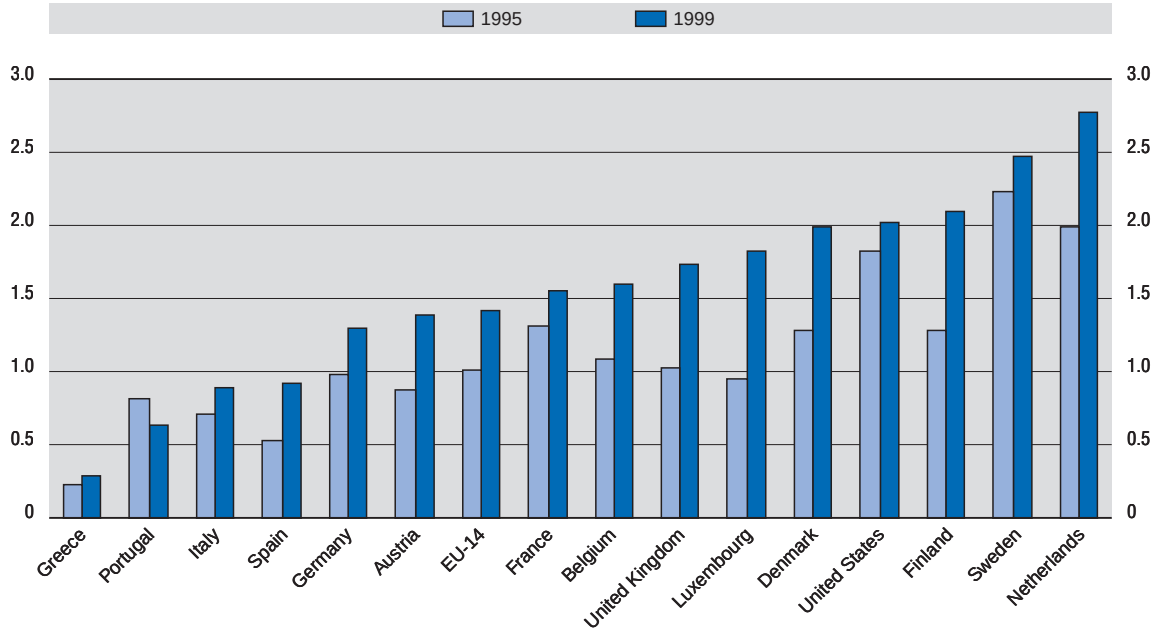
The demand for ICT skills continues to grow, creating concerns about possible labour shortages and gaps in worker skills.

Given their role in the current transformation of advanced economies, ICTs offer the promise of new business and employment opportunities along with higher productivity gains, but also make new demands on skills. OECD countries are confronted with the dual challenge of ensuring that the growth of new industries and activities is not stifled by labour bottlenecks and skill mismatches and that their population is equipped to master the basic ICT skills which these transformations require. Despite recent claims of a widespread ICT worker shortage, the analysis suggests that although there is indeed some evidence of tightness in labour markets for particular categories of such workers, the main issue of concern for policy makers and firms should be the gap between the current skills of some IT workers and those sought by firms.

Governments, firms and educational institutions in OECD countries are taking measures to meet changing skill demands in the IT workforce.

Both short- and long-term private-sector strategies can be implemented to address the rapidly changing skill requirements for ICT jobs. OECD firms appear to be taking similar measures, but they also emphasise the need for better data to measure the IT workforce and for new kinds of partnerships. It is broadly agreed that all stakeholders have a role in implementing short-term solutions and in facilitating development of longer-term strategies. Various supply- and demand-side measures are being deployed. On the supply side, these include providing more information to students,

Computer workers as a percentage of total employment in selected OECD countries/regions 1995 and 1999



Source: OECD estimates based on data from the European Labour Force Survey (Eurostat) and US Bureau of Labor Statistics.

developing stronger IT skills in secondary schools, assisting in teacher training, making IT careers more attractive (in particular to under-represented groups such as women), ensuring better integration of educational programmes with "real world" problems, helping workers maintain up-to-date skills. On the demand and user side, these include better use by employers of the existing workforce (both in terms of recruitment and retention), more information on skill needs and opportunities (including new pathways to IT jobs), adequate training programmes for various categories of workers (including unemployed and older workers) and governments taking a lead role as employers of IT workers.

Immigration is one means of increasing the short-term supply of IT workers. Many countries favour this solution, but immigration alone cannot address the need for cyclical adjustments to the labour market, and, by dampening wage growth, it can send conflicting signals to firms, workers and students.

Immigration is only one tool to increase short-term supply and must be part of a broader policy framework.

Reducing the digital divide among and within countries is another pressing issue

Differences in access to ICTs, such as computers and the Internet, create a "digital divide" between those able to benefit from opportunities provided by ICTs and those who cannot. Access to and development of the information and communication resources that these technologies enable is increasingly

Differences in access to ICTs create a "digital divide".

viewed as crucial for economic and social development. Network economics mean that the more the participants in ICTs the greater the value to all.

Household digital divides exist by income, education, age, family type, sub-national region.

There are considerable differences in the diffusion and use of ICTs and electronic commerce across, and within, OECD countries. Differences may create new kinds of social divides and accentuate existing divides relating to income, education, age, family type and sub-national regions. There are particularly striking differences by household income and education in household PC and Internet access, but these are greatly influenced by other access factors, particularly whether individuals also have access in the workplace.

The shape of the digital divide is changing.

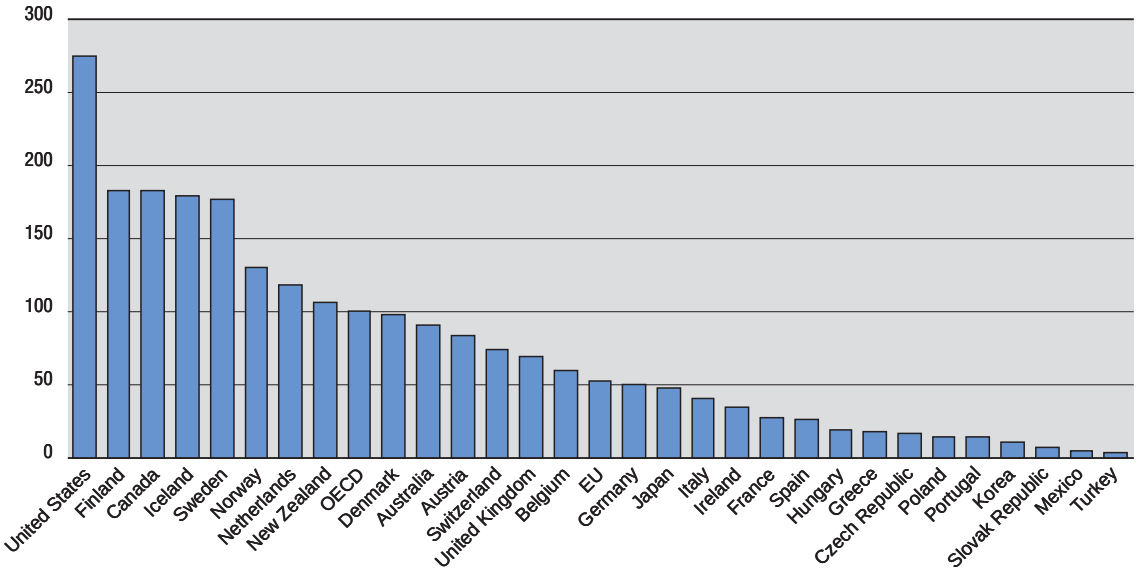
The digital divide may be said to be growing, as the access gap between those with the highest and lowest levels of ICT access is increasing. Conversely, the digital divide may be said to be shrinking, as rates of growth are much faster for lagging groups. Common measures of distributional inequalities such as Gini coefficients also show the digital divide to be shrinking.

Different kinds of firms have different rates of ICT use and e-government will affect the divide.

Differences in diffusion may also be creating new kinds of business divides. Sector-specific factors and firm size have an important influence on the uptake and use of ICT, and the regional concentration of particular kinds of firms and industries accentuates these divides. Government use of ICT is also increasingly important in OECD countries. As e-government is more widely implemented, it may both provide incentives to increase ICT use by citizens and businesses and accentuate existing digital differences.

Internet hosts in OECD countries per 1 000 inhabitants, July 2001

(gTLD adjusted)



Source: OECD, from Netsizer (*www.netsizer.com*).

These issues are affected by the rapid evolution of ICT technologies

New computing potential and communication channels are being developed and are proliferating.

As computing power increases, unit price and size decrease and communication capabilities expand. These trends are likely to have widespread impacts, increasing ICT ubiquity and possible associated benefits, such as productivity growth. More devices will be fitted with computing and communication capabilities that will provide new functionalities for users. There will be more communication channels, and people will increasingly communicate with each other and with applications, while applications will increasingly communicate directly.

Many new technologies are being developed...

Efficient and more effective information exchange is a major aim of information technology (IT) innovation. The development and rapid diffusion of new communications technologies and channels are altering communications structures and providing possibilities for further economic and social gains through greater networking. The Internet is a vital infrastructure for communication, collaboration and information sharing and contributes to efficiency improvements and productivity gains. Updating capacity and other constraints in its architecture while retaining its open and relatively simple architecture will provide additional benefits.

... shifting the focus from a centralised to a decentralised model of information exchange.

With increasingly ubiquitous computing power and communications capacity, the dominant model of information exchange is shifting from a centralised and hierarchical model to one that is decentralised, horizontal and more equally distributed and democratic. Open source, Internet protocol version 6 (IPv6), wireless and peer-to-peer are examples of different aspects of the shift in the structure and nature of information exchange. The potential for encouraging decentralised information flows is just beginning to be realised and has already profoundly affected established structures.

New technologies present new policy challenges.

The development of new technologies is driven by the interplay of technological potential, commercial exploitation and socio-economic acceptance. The challenge for government is to foster innovation and technological development while attending to equity considerations (*e.g.* digital divide issues related to new technologies) and potential problem areas (*e.g.* system security, privacy and trust issues). Technological developments are moving rapidly and it is not easy to anticipate future policy impacts in detail.

OECD governments are addressing ICT issues through a wide variety of policies

OECD countries increasingly have broad action plans for the information society.

Almost all OECD countries have well-developed and clearly enunciated broad strategies and action plans for IT and an overarching policy approach to the information society. These usually cover technology development, technology diffusion, improving the IT environment and the global diffusion and distribution of ICTs. Policies to encourage broadband infrastructure investment and use are receiving more and more attention. The potential cost-effectiveness of public-private partnerships in promoting the development and use of ICTs is increasingly recognised.

Main OECD country IT policy areas

General policies
ICT policy environment and broad policy visions
Technology development
R&D programmes
Technology diffusion
Diffusion to individuals and households
Diffusion to businesses
Government services online
SMEs
Demonstrate benefits of ICT use
IT environment
Electronic settlement, authentication and security
Intellectual property rights
Globalisation
International co-operation

Source: OECD.

Governments are implementing policies to facilitate the supply of skills…

OECD governments recognise the importance of a skilled workforce, and are increasingly taking policy measures to support the efforts of business. While professional ICT skills are important for growth of industry in general, they are also increasingly needed throughout the economy. ICT skills have become a new type of "general" skill, like literacy or numeracy. Governments are implementing an array of policies targeting different segments of the population in order to promote basic and advanced ICT skills. Some government policies do not specifically target the development of IT skills but imply the need for them (*e.g.* e-learning, on-line job searching).

… and to overcome the digital divide.

Governments are also searching for ways to overcome the digital divide in order to spread more widely the potentially positive benefits of ICT use and digital opportunities. Fostering a healthy and pro-competitive ICT environment will enable ICT goods and services supply at competitive prices and quality. General and specific policies may be needed to target more specific goals and socio-economic groups that may be lagging. International initiatives will help countries to learn from the experience of others.

OECD PUBLICATIONS, 2, rue André-Pascal, 75775 PARIS CEDEX 16
PRINTED IN FRANCE
(00 2002 3C 1 P) – No. 81749 2002