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

Working Party on the Information Economy

ICT DIFFUSION TO BUSINESS: PEER REVIEW

Country report: Korea

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FOREWORD

In December 2003, this report was presented to the Working Party on the Information Economy (IE). It was recommended to be made public by the Committee for Information, Computer and Communications Policy in April 2004.

The report was prepared by the Korean National Computerization Agency and Graham Vickery of the OECD Secretariat. The series of peer reviews of ICT diffusion to business is co-ordinated by Graham Vickery. It is published under the responsibility of the Secretary-General of the OECD.

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BACKGROUND

The OECD Growth Study concluded that information and communications technology (ICT) is a key input to productivity and growth performance (OECD, 2001*a*; 2001*b*; 2003*a*). 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 the policy experience and its main challenges in one country at a time. Once a critical mass of countries has been reviewed, a cross-country comparative synthesis report will be prepared with a view to identifying policy benchmarks. The review has been conducted in the Working Party on the Information Economy (WPIE) on 4 December 2003. The discussion and comments made at the meeting are reflected in this document.

This report reviews the status of *diffusion of ICT to business* in Korea by examining the available indicators and describes current and previous policies aimed at ICT uptake in firms which is the focus policy domain for the peer reviews. It is one of the five pillars of the ICT policy framework that is used in the *Information Technology Outlook 2004* Policy Questionnaire, as reproduced 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 as they are important elements in the diffusion of ICT to business (R&D, procurement, payment systems, standards, broadband, trust and security).

Table 1. ICT Policy Framework

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

The report presents recommendations for possible policy actions based on the strengths and weaknesses observed in the Korean policy approach. Policies to encourage ICT diffusion to business cover traditional areas such as awareness-raising and publicly financed business services to develop ICT readiness in small and medium-sized firms, and also more general business environment policies such as competition policies. The review does not focus directly on broader aspects of Information Society policies aimed at citizens' and household's uptake of ICTs. Furthermore, the review should not be seen as a comprehensive evaluation of the effectiveness of the most recent initiatives, but as a guiding tool for facing the challenges and setting the priorities that new initiatives should address.

SUMMARY

Korea is facing the challenges of moving from high levels of new ICT infrastructure availability to ensuring effective use and reaping the economic benefits from ICT diffusion to business. It has had very high rates of growth and labour productivity growth, led by manufacturing, and most recently by R&D-intensive manufacturing and has high levels of R&D in ICT industries. In terms of ICT diffusion across the economy, levels of basic ICT "readiness" in telecommunications and PCs are around the OECD average, although it is clearly the world leader in broadband infrastructure and has high levels of consumer use. However business diffusion appears uneven despite rapid progress, ICT investment and use remain around the OECD average in general, and ICT impacts on business may be lower than expected. This is partly due to the size distribution of Korean business, with small and very small establishments making up a very high share of total establishments and employing around one-third of total workers. Less than one half of small businesses had a computer and Internet access, and even when equipped the smallest often did not use them in business operations and processes. Small businesses are not fully exploiting the advanced broadband environment, for reasons including awareness, lack of skilled personnel and lack of specialist services.

Small and micro establishments are an increasing focus of policy, as it is clearly recognised that they trail larger enterprises. The emphasis on the supply side, particularly on broadband infrastructure and the ICT supply industry has been very successful, and the emphasis is now on demand pull strategies. This means placing more emphasis on business use and exploitation of ICT, software and content and more fully exploiting the potential of the advanced broadband infrastructure. The next steps in policy could be to further strengthen initiatives to pursue market-based solutions to diffuse ICT to business, allowing business-strategy driven integration of ICT in business processes. Particular attention should be paid to measures that reach large numbers of small businesses, using simple programme structures and delivery, further improve evaluation, and involve the business sector more broadly in programme design and delivery. The following Summary Table presents the analysis and recommendations developed in more detail in the report.

Table 2. Recommendations

Policy domain	Current policy priority	This priority should be	Recommendations
Co-ordination of initiatives	Medium	Continued	Maintain current high level co-ordination mechanisms. Further strengthen prioritisation, quantitative goals and evaluation.
Infrastructure	High	Increased	Focus on broadband infrastructure is very successful. Continue to exploit business potential with policies for business use.
R&D	Medium	Increased	R&D focuses on infrastructure and the supply-side. Further efforts needed to improve effective low-cost ICT adoption in small businesses.
Equipment	High	Continued	Investment in equipment and software is supported through tax incentives, but further focused incentives may be required for small businesses.
Public procurement	High	Continued	Programmes appear effective and may have strong pull-through effects; no further action required.
ICT skills	Medium	Increased	More priority needed particularly to develop specialised ICT skills and spread established accreditation system.
Business organisation	Low	Increased	More attention to adapt and reorganise business processes and value chains to make optimal use of ICT including in services
Content creation	Medium	Continued	Industry-led content creation clearly recognised. More effort may be needed for public content, *e.g.* education and health.
Trust/security/ regulation	Medium	Continued	Frameworks established, more information required on diffusion, business adherence, and business impacts.
Demonstration/ awareness	Medium	Increased	Strengthening of established efforts may be needed, including market-based initiatives and attention to the service sector.
Small firms	High	Increased	Further develop mechanisms to reach large numbers of small businesses to adopt e-business; increase use of business and market-led mechanisms, increase attention to services.

PROMOTING ICT DIFFUSION TO BUSINESS IN KOREA

Introduction

ICT has great potential to bring a wide range of economic and social benefits. ICT is a major contributor to economic growth in terms of output of the ICT industry itself and as an enabler of growth across the economy (OECD, 2003a). However, governments face serious challenges in adjusting policies and legislative frameworks in a timely fashion to the new economy in general and ICT in particular.

Korea, along with all OECD countries, is introducing various measures to help exploit the potential of ICT as a driver of productivity and growth. The Korean government has a very wide range of policies for ICT production and diffusion, from basic ICT skill training and enhancing the environment for e-business, to legislative changes to promote on-line security and trust. Small and micro businesses are the main target of the government policies for ICT diffusion to business. This review briefly summarises the current status of ICT adoption by business in Korea, the main government policy directions, and describes in detail specific initiatives that facilitate ICT use by business, followed by sections on evaluation and assessment and conclusions.

Industry structure and economic performance

The Korean economy has grown very rapidly in the past 30 years, with an average annual growth rate of 7.4%. Different industries have led economic growth in each decade. Labour-intensive industry such as textiles led in the 1960s, heavy industry such as steel and petrochemicals in the 1970s, assembly and processing industry such as automobile and shipbuilding in the 1980s, and increasingly service and IT-related industries led growth in the 1990s.

Korea has a large share of manufacturing and high and medium-high technology manufactures compared with the average for OECD countries. High and medium-high technology manufactures made up over 13% of gross value added in 2000, the second highest in OECD countries and well above the OECD average of 8.5%. On the other hand, knowledge-intensive market services are a very low share of the economy around 13% of gross value added (the third lowest) compared with almost 19% on average for the OECD. Labour productivity growth (GDP per hour worked) was the highest in the OECD area in the period 1980-1990 at over 6% per year, and second highest in the period 1990-2002 at around 4.5% per year, with some slow-down on average to 4% for the period 1995-2002. Labour productivity growth mainly came from manufacturing, with business sector services contributing only 1.2% of the total growth of 4.2% in average annual labour productivity in the period 1995-2001. GDP per hour worked is still about 40% of the US level in 2002, indicating that the catch-up process is not yet over. (All comparable data from OECD.)

To support the growth and structural transformation of industry towards ICT supply industries, Korean business has rapidly expanded R&D expenditures. Korea has the second highest share of R&D in ICT manufacturing (after Finland) at close to 0.9% of GDP in the year 2000, although ICT services R&D is somewhat behind the leaders. The focus on ICT research is also reflected in ICT-related patent applications, where it is the third most specialised OECD country in ICT patenting compared with total

patenting. Venture capital is also growing very rapidly, and it has a considerable share (around 40%) in ICT areas, although this is somewhat below the OECD average. (All comparable data from OECD.)

The size distribution of Korean industry is concentrated in medium and small establishments (less than 50 employees). There were 3 132 016 establishments in Korea as of December 2002 (Korea National Statistical Office, KNSO). Among total establishments, only about 2 400 are large with more than 300 employees. There are 2 630 000 micro-establishments with fewer than five employees, and these account for 84% of the total number of establishments. In terms of total employment, Korea has almost two-thirds of employment in small and micro-establishments (less than 50 employees) and less than one-third in medium- and large-sized establishments (50-99 employees) as shown in Table 3.

Table 3. Number of establishments and employees by establishment size, 2002

Establishments with:	Number of establishments by size		Number of workers by establishment size	
	Number of establishments	% of establishments	Number of workers	% of total workers
1-4 employees	2 630 638	84.0	10 120 043	69.3
5-9 employees	286 081	9.1		
10-19 employees	119 261	3.8		
20-49 employees	65 789	2.1		
Sub total	3 101 769	99.0		
50-99 employees	18 938	0.6	1 285 580	8.8
100-299 employees	8 826	0.3	1 417 803	9.7
300 employees	2 483	0.1	1 784 896	12.2
Total	3 132 016	100	14 608 322	100

Source: Korea National Statistical Office.

Business use of ICT

Infrastructure: telecommunications and PCs

The communication network has expanded continually with the number of communication channels per 100 inhabitants surpassing the OECD average in 1999. However, it still has lower penetration rates compared with leading countries (see Figure 1). The number of fixed network connections has flattened or is declining as wireless and broadband access is offsetting them. Recent data suggests that the number of PCs per 100 inhabitants in Korea has grown rapidly over the past five years, particularly from 2000 (ITU, 2003a). The most recent comparable OECD data show that the percentage of households with access to a home computer was close to the level of the US in 2001, and somewhat above average levels for OECD countries.

Broadband and e-commerce

Broadband connectivity is a critical indicator of the level and potential of e-commerce – both in the business (B2B) and domestic (B2C) sectors – along with the number of PCs and servers that are technological enablers for e-commerce. The penetration of broadband connectivity in Korea substantially outpaces the OECD average.

Figure 1. Telecommunication channels per 100 inhabitants, 2001
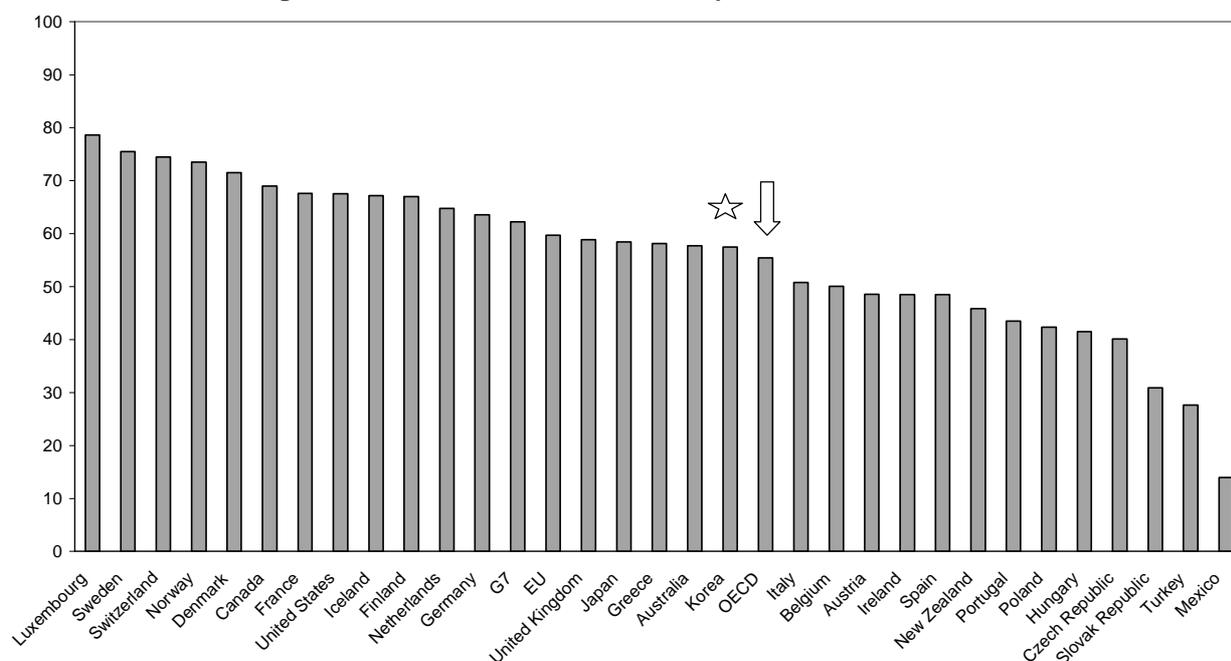
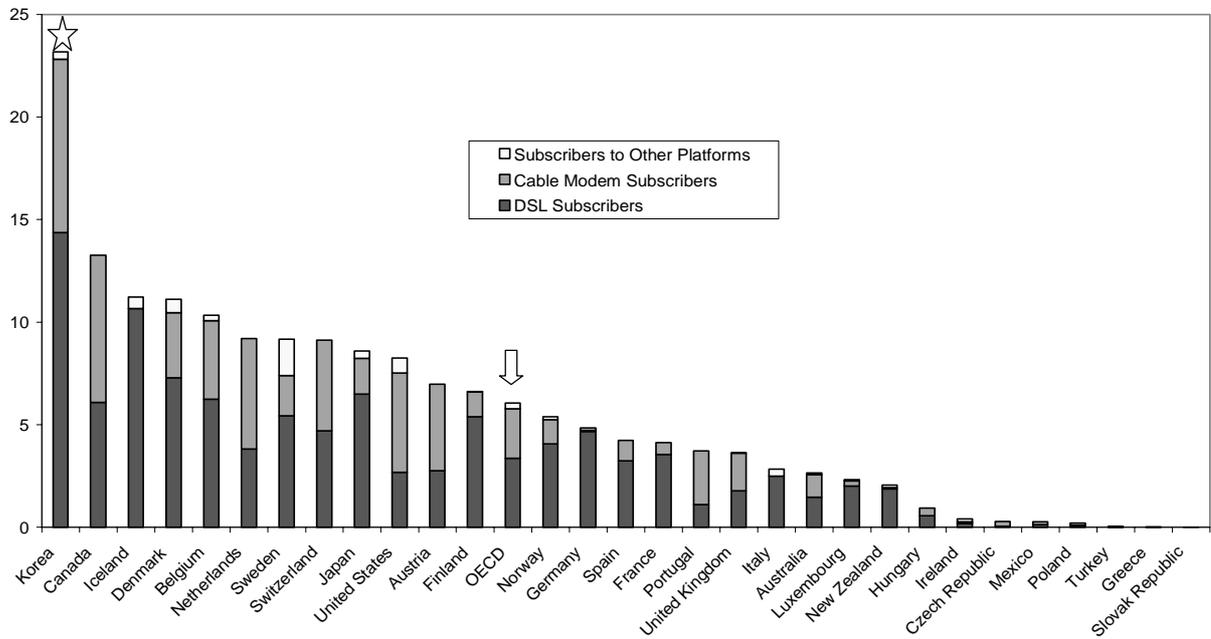*Source: OECD, Communications Outlook, 2003.*

Korea continues to lead in broadband network development with broadband penetration of 23.2 subscribers per 100 inhabitants in June 2003, almost four times the OECD average of 6.1 (see Figure 2). In general Korea has been one of the countries with high Internet subscriber numbers, with 23 million fixed Internet subscribers out of the total of 213 million active Internet subscribers in OECD countries at the end of 2001.

On the other hand Korea has a relatively low penetration of leased line connections, which is often used as a measure of business connectivity and e-business potential, with 23.2 connections per 100 000 inhabitants in 2001, slightly below the OECD average. This may be due to other options substituting for leased lines. DSL and cable modem services are available at low cost and with reasonable speed for most of the small and medium-sized enterprises, although surveys show that Internet access is only available to just over one half of very small firms (less than 10 employees), well behind the level of larger firms.

According to the most recent private data, the density of secure servers in Korea is also much lower than the OECD average (see Figure 3). Almost 58% of SSL certificate sales were in the United States in the second quarter of 2003, and over 10% in Japan (due to i-mode and secure mobile transactions), followed by 6.8% in the United Kingdom, giving one very recent indicator of the development of

supply-side readiness for e-commerce.[1] However, although the density of secure servers indicates readiness for e-commerce, it may not be a good indicator of actual e-commerce activity.

Figure 2. Broadband subscribers per 100 inhabitants, June 2003

Source: OECD, ICCP Division.

Figure 3. Secure servers per 100 000 inhabitants, 2002
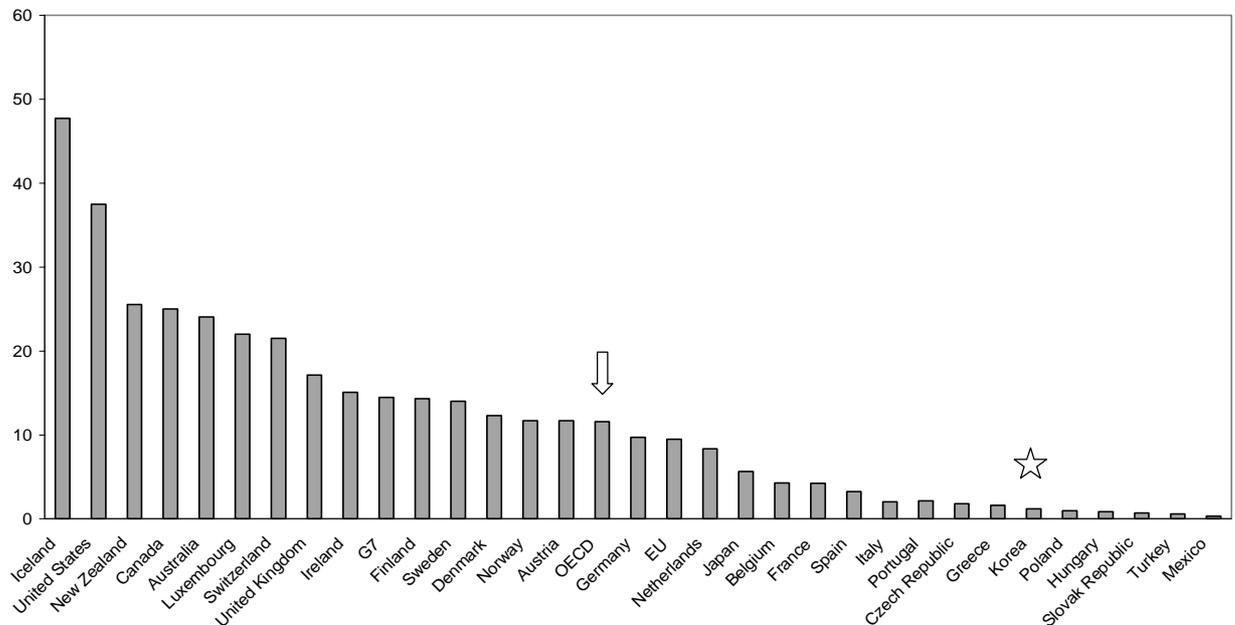
Source: OECD, *Communications Outlook*, 2003.

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[1] Data from Verisign at http://www.verisign.com/corporate/briefing/briefing.pdf accessed 13/11/2003.

The number of digital signature certificates is a complementary measure of readiness for e-commerce and here Korea is in a very strong position. There were 1.5 million Korean digital signature certificates issued in 2001 and the number of certificates grew to 7.7 million in October 2003 with 8.54 million people using them, accounting for 17.9% of the population. Korea appears to lead the world in the use of digital signatures, although comparable international data are not available to benchmark Korea.

According to the National Statistical Office, the country's e-commerce transactions were estimated to be worth KRW 177 trillion (USD 154 billion) in 2002, compared to KRW 30 trillion in 1999. E-commerce represented 12.7% of total transactions in 2002, showing substantial growth from 3.2% in 1999. The number of e-marketplaces and cyber shopping malls has increased from 30 to 260 and 1 580 to 3 320 respectively. There is very little readily available internationally comparable data that includes Korea to enable comparison with other countries. However limited private source data suggest that all countries approximately quadrupled their B2B transactions from 1999-2001/2, and that on a comparable basis the value of Korean B2B transactions was a little below the average for OECD countries for which comparable private source data are available.

However in Korea household PC access is relatively high, the share of Internet users is well above the OECD average, and B2C transactions are relatively much higher than the average for OECD countries, and the share of Internet users buying on-line is very high (data from WITSA/IDC, and Taylor Nelson Sofres).

Table 3. E-commerce transactions in Korea 1999-2002

	1999	2000	2001	2002
Amount (KRW trillion)	30	57	119	177
% total transactions	3.2%	4.5%	9.1%	12.7%

Source: Korea National Statistical Office.

Trends in ICT use in business

The National Computerization Agency (NCA) and Korea Network Information Centre have undertaken comprehensive statistical surveys of ICT adoption and use in businesses and households since 1999. The Informatization Statistics Yearbook covers indicators for the Internet, wire/wireless communication, ICT skills and ICT-related issues.

Less than half of all businesses had at least one computer and Internet access and most of the unequipped businesses were small according to the 2002 survey. Even when they were equipped, the smallest businesses were not necessarily using their ICT equipment to enhance business operations according to the 2003 study specifically focusing on small and micro business (1-49 employees). Less than half of those with at least one computer and an Internet presence used them directly in their business operations and processes (NCA, 2003c).

Of all businesses with Internet access, 62.7% connect via ADSL and 21.9% are using leased lines, with larger businesses overwhelmingly more likely to use leased lines. Internet access for micro businesses (1-4 employees) at around 50.7% is well behind larger ones and access and use of other advanced ICT by small businesses is even lower (see Table 4). Small businesses (including micro businesses) lag in ICT diffusion compared with larger businesses and are not fully exploiting the advanced broadband environment. Small and micro businesses surveyed say that the reasons include lack of funds and skilled personnel and many small businesses are not even aware of the business benefits of ICT. They also pointed

out that IT services designed to meet the specific need of small and micro businesses are not readily available (NCA, 2002a).

To address these challenges, recent policy has focused increasingly on e-business for small and micro businesses. Statistical data on micro businesses are now being collected to help assess their development and the impacts of government policy on them.

Table 4. Diffusion of ICT to business by establishment size, surveys 2002 and 2003

	Number of employees					
	1-4	5-9	10-49	50-299	300-999	Over 1000
PCs/workstations [1] (%) - Business use [2] (%)	47.1 21.3	71.5 52.6	91.6 65.3	97.9	100.0	100.0
Servers (%)	N/A	N/A	8.5	31.6	55.6	78.1
Intranet/groupware (%)	N/A	9.5	25.7	42.3	70.5	88.8
Access to Internet (%) - ADSL (62.7) - Leased lines (21.9) - Other (15.4)	50.7	58.8 69.7 13.9	85 60.1 24.4	94.8 41.2 49.2	98.8 14.6 78.3	100.0 4.2 94.2
Homepages	N/A	13.7	28.5	53.9	73.4	79.8

1. Does not include machines such as cash registers, POS terminals and calculators. Only main unit or terminal equipment incorporating CPUs is counted.

2. Use of software for document making, customer management, accounting, etc, which are directly linked to, and for, business processes only.

Source: Ministry of Information & Communication, National Computerization Agency.

General policy approach

The Korean government has established master plans for the development of the information society: the *1st Master Plan for Informatization Promotion* in 1996 and *2nd Master Plan (Cyber Korea 21)* in 1999. These plans outlined accelerated deployment of the ICT infrastructure and enhanced development of the ICT industry to become a new engine of economic growth. Because of the early achievement of major tasks defined in Cyber Korea 21, the 3rd master plan was introduced ahead of schedule in 2002. The 3rd plan *e-Korea Vision 2006* focuses on widespread informatisation including:

- Enhancing the capacity of all citizens to utilise ICT.

- Expansion of the reach of ICT to all industries and the public sector.

- Reforming rules and regulations in favour of the information society.

- Ensuring safety and reliability of cyber space.

- Advancing towards the next generation telecommunication infrastructure.

It has a major focus on promoting e-business, and efforts to promote e-business and ICT adoption across all industries can be found in many parts of the plan. For example, it presents plans to promote:

- ICT adoption across all industry: textiles, electronics, construction, finance, agriculture, fisheries, etc.

- ICT adoption by small and micro businesses, which have been lagging in seizing ICT benefits.

- Standard setting for networking between industries, IT-related industries, banking, distribution, transportation, manufacturing, etc.

Korea is seen to be well positioned to diffuse e-business by exploiting the developed broadband infrastructure. This view is also stated in the recent announcement *Advancing e-Business infrastructure for Small and Micro Businesses*, stressing the need of small and micro businesses to increase ICT uptake and exploit the infrastructure more fully. It is also increasingly placing attention on services and knowledge-intensive services where Korea trails relative to other OECD countries.

Co-ordination

Policies and programmes for ICT are planned and implemented by many government bodies. Each ministry (*e.g.* Agriculture and Forestry; Culture and Tourism) has ICT-related programmes in their area. The Informatisation Promotion Committee headed by the Prime Minister oversees and co-ordinates the activities and programmes for ICT diffusion by each ministry and office, with the Minister of Information and Communication as national Chief Information Officer. Three principal bodies are engaged in promoting ICT diffusion to business: the Ministry of Information and Communication (MIC), the Ministry of Commerce, Industry, and Energy (MOCIE) and the Small and Medium Business Administration (SMBA).

All three bodies closely co-operate to take initiatives to promote e-business. To support ICT adoption by SMEs, the MIC aims to foster IT suppliers such as application service providers (ASPs) and IT service companies, and the MOCIE aims at promoting diffusion on the demand-side.

Specific initiatives

Infrastructure

The government's plan for broadband deployment in Korea was launched in 1995 (KII Project). The plan had three sub-projects: KII-Government (G), KII-Public (P), and KII-Test bed (KII-T or KOREN, Korean Advanced Research Network). KII-G interconnects metropolitan areas and small cities with ATM switched fibre optic cables. It provides low-cost access for government agencies, local governments, schools, libraries and research agencies and has had a high level of early uptake (see Table 5).

Table 5. KII-Government broadband diffusion, 2000-2003

	2000	2001	2002	2003
Bodies connected	28 686	34 160	30 214	31 976
Bandwidth (Mbps)	24 931	41 559	76 741	99 395
Average bandwidth per body (Kbps)	869	1 217	2 540	3 108

Source: National Computerization Agency, 2003.

KII-P with private investments enables general service access with high-speed data transmission in the private sector. To promote the use of network, the government has begun issuing certificates to buildings equipped with broadband access. As of March 2003, 2 146 certificates had been issued, including preliminary certificates.

Table 6. Number of buildings with broadband certificates, March 2003

	1st grade	2nd grade	3rd grade	Quasi 3rd grade	Total
Residential buildings	207	632	35	270	1 144
Business buildings	18	93	8	-	119

Note: preliminary certificates are not included.

Source: National Computerization Agency.

On the common carrier side, government regulation and recommendations and competition from late-entrants have encouraged the common carriers to rapidly expand the ADSL subscriber network, and high levels of advanced infrastructure have been rapidly built up.

In addition to measures to spread infrastructure in general, the government has also implemented programmes targeted specifically to business use. The SMBA has identified 10 areas with a concentration of SMEs and is assisting in adopting LAN and broadband for their internal use. The MOCIE has launched a pilot *Digital Industrial Complex* project. The project aims to transform the traditional industry complex with analogue business processes into digital industry complexes.

The *BcN (Broadband Convergence Network) Plan* introduced in 2003 is designed to advance high-speed infrastructure. The goal of BcN is to deliver a 100 Mbps broadband network to 10 million households and businesses by 2010. The BcN is a next generation integrated network that can deliver high quality multimedia services in an environment where wire/wireless communication and broadcasting services converge. This comprehensive plan is aimed at overcoming technological barriers and addressing the saturation of PSTN/mobile phone markets.

Research and development

Korea has very high levels of ICT manufacturing R&D which provides a potentially strong base for development of ICT applications across the economy. KOREN (Korea Advanced Research Network) is a shared network for research and development on which broadband network technologies and applications are pilot-tested before they are applied in the national backbone and public ATM networks. KOREN covers five major cities and it will develop services such as e-climate and e-medicine. In 2003, the government also allocated budgets for the development of e-business technology and promotion of the ebXML standard.

Technologies, equipment, software

On the supply side, gross output of the ICT equipment industry accounts for 70% of all ICT related industries. Telecommunication equipment, mobile phone and PC manufacturers have all benefited from rapid expansion of mobile telecommunication services, the Internet, and new Internet–oriented applications. With the wide dissemination of ICT equipment, e-commerce and digital content have emerged as new businesses. Wireless communication and Internet services have grown very rapidly and technology development, competition and platform convergence are likely to lead to the creation of new services, and to more generally drive the restructuring of business activities and the uptake of e-business.

Tax deductions are used to encourage investment in ICT equipment. A certain ratio of ICT equipment and services expenditures is regarded as a tax credit to be deducted from taxable income. For investment in enterprise resource planning (ERP), a 3% tax credit deduction rate is applied to corporate/income tax and the rate is 7% for SMEs. For investment in point of sale (POS) systems and information security systems, 3% is applied only to SMEs. Recently coverage has been extended to supply chain management (SCM) and customer relationship management (CRM) investment with deduction rates of 3% for all firms and 7% for SMEs.

The *software* industry is expected to grow rapidly and is forecast to account for 2.13% of GDP in 2007. Growth is being driven by the adoption and utilisation of new software products and related services. Each ministry has programmes for the development and distribution of software products. The MIC focuses on enhancing competitiveness in emerging markets for new flagship software, supporting the start-up and management of software developers, and the readjustment of regulations.

In many programmes for promoting ICT adoption the use of certain software and methods are encouraged. For example, the *ASP based e-business project for small business* (discussed below) encourages firms to use IT services provided by application service providers (ASPs) and rent software online for business use. The *e-Manufacturing* project encourages the wider use of e-business and manufacturing information system software such as CIM (Computer Integrated Manufacturing), MES (Manufacturing Execution System) and POP (Point of Production) software.

In the *SME IT implementation* scheme, MOCIE, the Small Business Corporation and the Korean Chamber of Commerce and Industry diffuse basic information software and provide ERP as well as training and consulting services. As of August 2003, 28 000 SMEs (equivalent to 5.9% of establishments with 5-49 employees) had received basic information software and 2 000 SMEs (equivalent to 0.4% of establishments with 5-49 employees) had implemented ERP through this programme.

Public procurement

To facilitate public e-procurement, the government revised laws concerning procurement and national contracts, including the 'Ordinance Decree of National Contract Act' and 'Ordinance Decree of Procurement Service Act' in 2002. An electronic procurement system for the Ministry of National Defence is being implemented, which will be linked to the G2B e-procurement system.

Table 7. E-procurement services as a share of the number of public procurement services (%)

	PPS - public organisations	PPS – supplying companies	Total
2001	67.5	79.7	75.7
2002	85.9	90.6	88.5

Source: Korea National Statistical Office. Average of number of e-procurement services as a share of total procurement services.

Table 8. The value of government e-procurement

	Goods and services (KRW billion)	Construction (KRW billion)	Total (KRW billion)
2001	4 735	2 303	7 038
2002	6 792	9 840	16 631

Source: Korea National Statistical Office.

Electronic procurement has shown rapid growth. In terms of numbers, electronic procurement represented about 75.7% of the number of public procurement services in 2001, 88.5% in 2002, and had grown to 91.4% of the number of public procurement services as of September 2003, with remaining biddings at least announced electronically. The value of e-procurement represents around 25% of total government procurement expenditure of around KRW 67 trillion annually (Tables 7 and 8). As e-procurement becomes widely used, product classification information and electronic catalogues are being increasingly used. This has a strong pull-through effect on ICT use in the private sector.

Standards

The government announced the Direction of Next Generation e-Business Standardisation Policy in 2002 to support e-business development. The Integrated Forum on Electronic Commerce (ECIF) plays a leading role in setting e-business standards. The ECIF is a non-profit private organisation, backed jointly by the MIC and the MOCIE. The Forum provides opportunities for discussion and co-operation for private-sector led e-business standardisation nationally, and in co-operation with international initiatives.

To promote early adoption of the generic ebXML specifications as the e-business standard in Korea, the ECIF is involved in implementing ebXML test bed and conformance testing. ECIF is also planning to implement a system for issuing certificates for e-business solutions. A public Web service for Universal Description, Discovery and Integration (UDDI, an international multivendor business process standards initiative) will also be put into operation. These efforts are designed to boost the active participation of the private sector in e-business standard setting.

Open source

The approach to open source is still in its early stage for both the public and private sectors. The government is paying attention to fostering developers and programmers of open source and supporting open source communities, rather than using mechanisms such as government purchase of open source software. To increase diffusion, the government is planning to abolish the barriers that impede the spread and use of open source, and to set up a database covering government and university research on open source software, to share results more widely.

ICT skills

The government ICT skills programme aims to reduce qualitative and quantitative mismatches between skill demand and supply. It focuses on technical assistance and e-business management training.

> *IT training for vocational high schools* (see Appendix for details)
>
> This programme, supported by high schools and the government, provides advanced ICT training courses (such as ERP and other e-business solutions) that are not taught in regular school education. Courses are offered online using ASPs via the nationwide broadband network. As of 2003, teachers from 51 of the total 251 vocational high schools and 2 400 students have benefited from the programme. Programme coverage will be extended to college curricula since some colleges have expressed interest in including such courses in their class offerings. The numbers currently involved are relatively low, equivalent to around 0.54% of the estimated 462 300 employees working in all ICT specialised occupations in Korea (OECD calculations for 2002, based on the Occupational Employment Survey). Numbers could be very usefully expanded to cover a much larger share of the vocational and college populations.

Professional IT Consultant Programme

This programme is designed to develop IT consultant skills in IT and brick-and-mortar firms. It is based on the idea that a high-level view of digitisation is required for businesses to utilise IT effectively, and IT consultants with comprehensive knowledge and hands-on experience of business and IT can provide these skills. System integrating companies and consulting firms are designing curricula for employees from IT and brick-and-mortar firms, who can then help their firms adopt e-business. The programme is currently carried out with government support, but later the private sector including colleges and private educational institutions will lead.

Electronic Commerce Resource Centre (ECRC)

The ECRC (run by MOCIE since 1997) in co-operation with local governments, colleges and research centres has 40 designated regional ECRC educational institutions to provide education, consulting and technical assistance to businesses intending to utilise e-commerce. The ECRC provides a variety of educational programmes, such as on-the-spot training and distance learning courses via the Internet. Its main targets are employees in SMEs and the public sector, job seekers and venture entrepreneurs. The e-Business Human Resource Development Centre in conjunction with industrial, academic and research groups is jointly developing curricula, educational programmes, publishing textbooks, and operating and managing educational initiatives. The ECRC also carries out research on the current status and future perspectives for supply of the e-business workforce.

e-Business Education Accreditation and Certification System

Private educational institutions have moved rapidly to supply training for the e-business workforce. The e-Business Education Accreditation and Certification system provides the foundation to evaluate and validate whether education institutions, including private e-business educational institutions, have systematic and well-designed educational programmes. Since most of the curricula of these institutions previously aimed at IT technician training, the system is intended to encourage institutions to provide high-quality e-business management courses.

Certified e-commerce manager/operator

The MIC and the MOCIE have jointly managed a system of certification tests for e-commerce managers since 2000, and the certified e-commerce operator test was added in 2002.

ICT training for CIOs and managers

The SMBA provides training courses in 158 authorised institutions, designed for 6 000 CIOs and e-business managers in SMEs. Courses usually have two streams: information leaders' academy for SMEs and basic skill training for employees. Numbers involved in training are relatively low equivalent to around 1.30% of the estimated 462 300 employees working in all ICT specialised occupations in firms of all sizes in Korea (OECD calculations for 2002 based on the Occupational Employment Survey). However numbers of training courses are relatively high (28.3%) compared with total managers in information and communications.

Organisational change

Awareness, management approaches and procedures have to evolve to reap productivity gains as the new technology develops. The *e-Korea vision 2006* discusses the changing needs for organisation and management skills under the title of *Creating the e-work environment*. To enhance organisational change the government is revising laws and regulations and striving to encourage organisational change directly and indirectly in informatisation plans.

The government aims to actively promote telework so that people can work without restrictions in space and time. It is planned to amend laws for labour contracts, wages and working hours to protect the rights and interests of teleworkers. In addition, to promote telework for government officials, the government is planning to prepare appropriate regulations, and it plans to introduce a mobile working system for social welfare fieldworkers.

Many policies and programmes for ICT use in business, including the MICs *ASP based e-business project for small business,* directly and indirectly influence managerial and organisational change. Two further examples are:

Information Management System (IMS)

This is intended to raise manufacturing management efficiency by converting existing management systems in traditional businesses into information-based IT systems. It is a consulting aid project, where experts are dispatched to business sites for about six months to convert established business cultures and reshape management and employee philosophy. The SMBA provides aid covering a certain percentage of expenditures.

Digital Innovation Consortium

The consortium is organised with the SMBA, regional universities, related agencies and consulting firms. The consortium assists SMEs in setting IT strategy and restructuring to use appropriate software for their business. About 40 separate consortia support around 1 300 SMEs (equivalent to around 0.3% of establishments with 5-49 employees). These consortia evaluate the informatisation levels of SMEs and consult on detailed IT implementation. By providing appropriate management solutions for SMEs, the programme aims to bring flexibility in management processes.

Content

The government is enhancing the creation of private content on the Web in many sectors. The government unveiled the *Online Digital Contents Industry Promotion Act* in 2002 as an industry-collaborative master plan to create and diffuse digital content and exploit the Internet and digital infrastructure. For example, to support remote learning and develop the educational content industry, core technologies and standards for operating systems for remote learning are being developed. The government also supports the standardisation of access protocols among mobile operators, wireless portals, and content providers.

There are many government programmes for business use of ICT that indirectly influence the creation of digital content:

The *ASP based e-business project for small business* is one example. ASPs offer Web content and applications for everyday business use, such as customer management and accounting tools. Applications and content unique to different business sectors (*e.g.* opticians, beauty shops, etc.) are serviced by ASPs and SMEs can select the services that they need.

The MOCIE also encourages Web content in many sectors. For example a cyber wholesale market for agricultural products was opened in 2002 and the functioning of an online farming product mall (www.a-peace.com) has been upgraded. Such systems are expected to reduce distribution costs and increase innovation in distribution channels, and the use of product category standards is encouraged. Database systems for local fisheries and wholesale markets are planned.

The Ministry of Health and Welfare is increasing efforts to adopt ICT in its processes, such as order placement for medical supplies, payment and health insurance processing, much of which involves digital medical content and digital administrative records. It sets a goal of cost reduction and increased transparency through e-transactions. The system will link together hospitals, suppliers, distribution agencies and the Korea Pharmaceutical and Medical Service.

The SMBA helps e-transformation of industry associations by building e-commerce portals aimed at facilitating online sales and group purchase by SMEs in the same industry (association networking). E-business models for business sectors such as flower shops and auto repair shops being developed.

Regulation

The government is readjusting laws and regulations to create a favourable environment for e-business and increase business ICT adoption and use. The government has reformed laws and regulations through the *Electronic Finance Transaction Act* and the *Copyright Act,* eliminated clauses that have restricted growth of the digital economy, and enacted the *e-Commerce Act* and *Online Digital Contents Industry Promotion Act*. Laws that permit electronic documents to have legal force in commercial activities (such as issuing invoices) are in the legislation process and expected to be enforced soon. The government is also eliminating contradictions in laws regarding electronic documents, electronic signature, electronic payment, etc., and consolidating definitions and legislation that overlap or contradict.

Demonstration, awareness, and advice

A range of programmes and channels are used to raise awareness of the benefits of ICT use. Basic IT skill training and e-business management courses are included in many government ICT adoption programmes. Programmes such as the *Digital Management Award* feature best practice dissemination and awards for successful cases.

One of the aims of the *ASP based e-business project for small business* is to raise awareness of ICT use. Guidebooks are distributed to SME-related associations and organisations nationwide. These describe how to get online and integrate e-business into business activities by using ASP services, and the benefits of being online. On-site training courses (visit-and-train) are offered since SME staff will often not attend training courses if they have to leave the work site.

Since 1997 the government has conducted evaluations of enterprise informatisation levels. These evaluations show the status of ICT adoption by business size and sector and awards are given to businesses with the best results. These efforts increase the awareness of ICT adoption and the evaluations are used for benchmarking. *Cyber ITR,* a portal administered by the Centre for IT Research and Consulting, is designed to offer online services for SMEs including evaluation of informatisation levels, consulting services and surveys.

The E-Commerce Research Centre (ECRC) diffuses and shares information on e-business and digitalisation through direct contacts, seminars, and exhibitions and through its Web pages. Besides these basic activities, the ECRC uses other avenues to share information via local government agencies and e-commerce-related organisations.

Specific measures for small firms

Small firms are generally slow in adopting ICTs and all new technologies. Reasons include lack of applicability, low awareness, and lack of skilled personnel and funds. Consequently many government programmes for ICT use focus on small and very small firms. Policies and programmes for ICT uptake by SMEs are run separately or jointly by the MIC, MOCIE, and SMBA. Programmes often target SMEs in the early stages of e-business adoption or those with no e-business experience. Programmes include:

ASP based e-business project for small business (see Appendix for details)

Application service provider software can offer IT services at lower cost, and the ASP project aims to provide cheaper and convenient information solutions for small (5-49 employees) and micro businesses (1-4 employees). Smaller firms are reluctant to invest in information technology and uncertain about benefits. Five consortia of major telecommunications and IT service firms provide software services, with government subsidies of over USD 26 million in 2003 going to training (almost one-third) and business model development and promotion (almost two-thirds). The project has seen rapid growth in numbers of subscribing firms since its launch in 2001 and had close to 150 000 users by end-2003. The number of using firms was equivalent to around 31% of establishments with 5-49 employees or 4.7% of establishments with 1-49 employees. Around two-thirds of participating firms had received government-subsidised staff training. Customer management and receipt/invoicing systems are the most common applications, and most users are in services (end-2002 less than 10% were in manufacturing), particularly wholesale and retail (over one-third of users) and personal and social services (almost one-fifth) and hotels and restaurants (over one-seventh).

Promotion of the ASP industry (see Appendix for details)

The government aims to promote transformation of traditional industry through ASP diffusion. A leading role is given to application service providers (ASPs) and the development of ASP service models for different businesses (manufacturing, construction, health, education, etc.). The ASP industry is seen as a new services growth industry, an area where Korea has trailed other OECD countries. ASP certificates are issued to qualified providers and service level agreement (SLA) guidelines are implemented through the ASP Industry Consortium. ASPs then provide business users (mostly SMEs) with solutions and content designed for their business sector.

SME IT implementation

The SME IT implementation programme supports 80% of the cost of professional consulting, evaluation of ICT adoption and planning IT implementation at each adoption stage. Basic software is distributed by the Small Business Corporation and the Korean Chamber of Commerce and Industry. Consulting and training for ERP and production process software are included. 3 400 SMEs (equivalent to 0.7% of establishments with 5-49 employees) benefited during the period 2001-02. The second stage of the programme focuses on software use training, upgrading solutions that have already been implemented and promoting collaborative e-business among firms in the same value chain.

e-Manufacturing

This programme targets SMEs with 50 and more employees. It covers 50% of the total cost of deploying manufacturing information systems such as Computer Integrated Manufacturing (CIM), Manufacturing Execution Systems (MES) and Point of Production (POP). The cost also includes linking systems such as supply chain management (SCM), advanced planning and scheduling (APS), and product data management (PDM) information systems.

Total information management providers: TIMPS

TIMPs target SMEs with high possibilities of early returns on ICT investment. They evaluate the level of ICT adoption, and put their own resources (including funds) into consulting, system development and maintenance for SMEs' e-transformation. SMEs repay with 30% aid from the government only if the implementation is successful.

Industry association networking

Industry association networking promotes the deployment and the use of e-commerce systems by linking member companies online. Associations are encouraged to form consortia with IT service companies and ICT training institutions. Each consortium is backed with funds for system development (e-marketplace, industry portals, ERP) and training costs. In 2003 six consortia were organised.

Evaluation

The government's implementation of ICT-related programmes is directly linked with evaluation of results. The Informatization Promotion Committee has developed a master plan for National Informatization Evaluation. Criteria used for evaluation are the accomplishment of goals specified in the *e-Korea Vision 2006*, adequacy of the action plan, appropriateness of the execution process, etc. The evaluation working party is organised with professionals from the private sector.

The evaluation process is in two parts: evaluation of government programmes and evaluation of enterprise informatisation levels.

Overall evaluation is conducted in nine areas: finance, science and technology, agriculture, business and enterprise, labour force, geographic information system, marine affairs and fisheries, knowledge information resource management, and online citizen services. Individual programmes in the areas are selected and reviewed according to project size, spill-over effects and progress. In 2003, 81 individual policies and programmes were reviewed. Results of the evaluations of enterprise informatisation levels are targeted for central administrative organisations and local governments and are conducted in collaboration with the Office for Government Policy Co-ordination.

Policies and programmes are evaluated and scored by each evaluation indicator and a number of qualitative criteria. Evaluation results are forwarded to the Ministry of Planning and Budget. Recommended actions for reviewed programmes are addressed to each corresponding ministry and the budget for the next fiscal year allocated according to results. The best results are publicised and promoted. The government has paid special attention to the ICT adoption level of the private sector and has carried out evaluations of enterprise informatisation levels since 1997.

The *Enterprises Informatization Level Evaluation Programme* is carried out by the Centre for IT Research and Consulting. The programme aims to evaluate the level of ICT use by each firm and to acquire various types of quantitative data on ICT diffusion to business using Evaluation Indices of Industrial Informatization (EIII) (see Appendix point 4 for details). Such data are important sources for government policy and firm-level ICT take-up strategies. Based on the evaluation results, Presidential awards are given to firms with the best results and this award system is an effective measure to foster the awareness and understanding of e-business.

The informatisation level in 2002 was 50.92 on a 0-100 scale, an increase over the score of 49.84 in 2001, and the score has grown by 0.56 for large enterprises and by 1.69 for SMEs. Thus the overall improvement is mainly due to the progress in SMEs (see Figure 4). SMEs were still at the stage of integrating different functions (for example accounting with payroll), whereas larger enterprises were

integrating different business activities (for example production with logistics) The improved informatisation level for 2002 has been interpreted as a positive result of government policies.

Figure 4. Informatisation level, 2001-2002
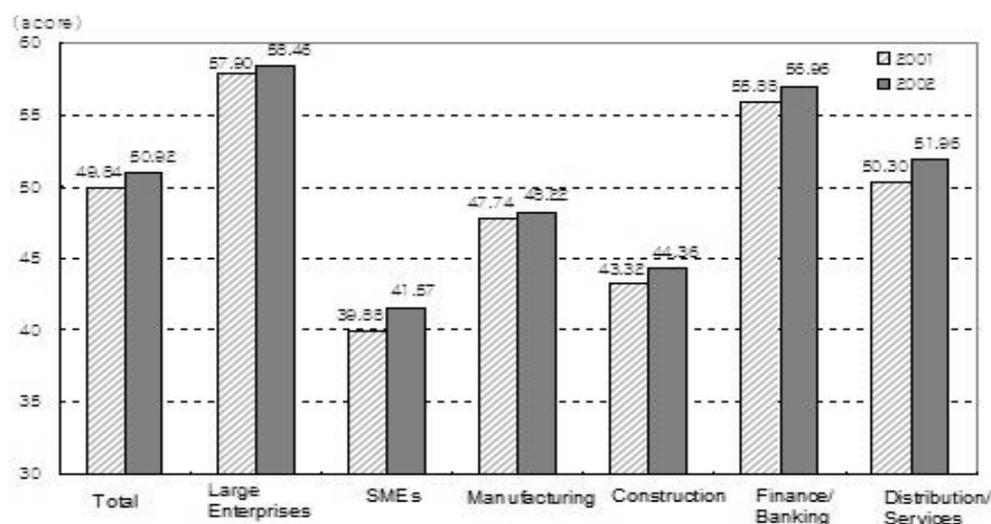
The NCA released an 'ICT investment analysis' study of small and micro businesses in 2003. The study showed that the *ASP based e-business project for small business* has generated overall business returns for subscribing firms compared with government investment expenditures of about 740% suggesting that the project has had significant impacts and provides a strong argument to move to ASP based e-business software for small and micro businesses. Increased small business revenue, decreased cost, faster processes, improved accuracy, better communication, and growing numbers of customers are taken into account for the ROI calculation (see Appendix for more details).

Conclusions

Strengths

Korea has a good growth track record and has consistently shifted resources from declining sectors into growing ones. The national priority given to education and training and increasing resource flows into R&D and innovation suggest that Korea is well-placed to continue its growth performance, provided the successful structural adjustment in the past can be continued in the future.

In the ICT area, Korea has made very rapid strides to become the leader in implementing key infrastructures. The ICT supply side is dynamic and growing rapidly, and has shifted into supplying ICT equipment and infrastructure (PCs and communications). Korea is the leader in the development of broadband networks following national policy priorities, government investment and large-scale investment by the private sector. The uptake of digital signature certificates is very high, suggesting that personal use of the Internet for transactions is advanced and this is borne out by other indicators of personal Internet use. Important features of policy that will help diffuse ICTs to business include:

- A clear ICT policy vision and strategy at the highest level including elements specifically targeting e-business. This policy vision also has practical visibility for example through national awards and prizes.

- Recognition that inter-ministerial policy and functional co-ordination are essential. The Prime Minister heads the Informatisation Promotion Committee, the Minister of Information and Communication is the national Chief Information Officer, and co-ordination of the three main bodies promoting ICT diffusion to business, the MIC, MOCIE and SMBA. Continuing efforts are made to clarify the roles of the public and private sectors in policy design and delivery.

- Government has played an important role as a model user of ICTs. This includes high levels of connection of government agencies, schools and local government to the broadband network, and the relatively high share of e-procurement in total procurement.

- Legal and regulatory frameworks are being changed in favour of e-business and regulation and contradictions that restrict growth of the digital economy are being eliminated.

- It is clearly recognised that SMEs lag in uptake and use of ICTs and they have been targeted in programmes to facilitate uptake. The application service provider (ASP) programme is a recent example of new policy specifically targeted for small firms. This e-business focused programme has a large uptake (150,000 small and micro firms) including in small services firms which are often hard to reach in government programmes, and appears to have generated high business ROI for government expenditures, and be effective in ICT adoption for SMEs.

- Specialised education programmes are being adapted to increase the supply of new ICT skills. There is a new accreditation scheme to ensure quality on the supply side, as well as certification schemes for individuals successfully completing training.

- Digital content creation is receiving attention and seen to apply widely across the economy. It is linked with exploiting the potential of the widely spread broadband infrastructure.

- Evaluations of programmes are beginning to be a regular feature of policy. There are now annual reviews of government ICT programmes, as well as systematic analysis of the level of ICT use in the economy using evaluation indices of industrial informatisation (EIII).

Weaknesses

Policies to diffuse ICTs to business need to continue to maintain the balance between supply push and demand and use pull, which is a continuing challenge for most OECD countries' ICT policies, as is the balance between large and small firms and between sector and technology-specific support and wider cross-economy support. Some of the points below are common to a number of OECD countries and lessons learned in overcoming these challenges will be very valuable. Specific points for consideration include:

- Broadband infrastructure is widespread and ICT and e-commerce consumer use is relatively high, but there is some evidence that business use and e-business applications trail relatively and could be further increased. This is a challenge common to all OECD countries and policy may need to make further efforts on the awareness and training sides.

- It is unclear how well ICTs are integrating business processes, intra-firm organisational change and inter-firm collaboration along sector value chains. Policy may need to take greater consideration of the restructuring and integrating effects associated with ICTs, paying particular attention to market services and business services where Korea trails other countries.

- The aim of diffusion policy is to improve economic performance at firm and national levels. Impacts on performance and productivity may need more analysis to better shape policy initiatives.

- Legal frameworks for network security, transaction security, privacy etc. have been established. More information is desirable on the mechanisms for diffusion of information about these frameworks, business adherence to them and impacts on business behaviour and performance.

- High levels of broadband connectivity could be further exploited to increase efficiency of government contact with firms, particularly to involve firms in programme design and delivery.

- Programme evaluation is becoming widespread which is to be welcomed. Rigorous evaluation of performance of programmes on business uptake and economic impact should be continued. Evaluation results, including negative ones, should be widely available to further improve policy design.

- Performance evaluation on IT investment at firm-level by firms themselves is needed to promote more effective ICT uptake and better understand the impacts of IT investments. Policy to aid firm level evaluation needs to be developed.

Recommendations

The fundamental strengths of Korea in terms of high level political commitment to the digital economy, the high quality broadband infrastructure and strong supply-side should be built on by addressing those areas identified above for further strengthening. The recommendations that follow identify priority actions that should assist Korea to build on these established strengths to obtain maximum benefits from them.

- *Programme reach*. Continue to upgrade programmes that reach the very large numbers of small and medium businesses through market-led programmes, and design mechanisms that are easily accessible to SMEs at low price.

- *Business integration and value chains.* Policy may need to take greater consideration of the organisational restructuring and integrating effects associated with ICTs.

- *Awareness and training*. More efforts, in conjunction with business associations and intermediaries, are needed on awareness and training to exploit business use of broadband.

- *Impacts*. Impacts of ICT on performance and productivity may need more analysis to better shape policy initiatives. Policy is also needed to assist firms to self-assess the use and output of their own initiatives.

- *Legal frameworks*. Diffusion of information on legislation and regulatory change need to be strengthened, and business adherence and performance impacts evaluated.

- *Involving business.* Broadband connectivity could be further exploited to increase government contact and involve the business sector more in market-led programme design and delivery.

- *Programme evaluation*. Evaluation needs to be further strengthened to rigorously analyse the impact on business uptake, and results diffused.

- *Focus*. Continue to clearly focus programmes on market-led business diffusion, make information more readily available via the broadband infrastructure, and spread policy lessons and experience more widely, including outside of Korea.

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APPENDIX

This appendix provides more detail on some of the government programmes summarised above.

1. *ASP based e-business project for small business*

Some of the Ministry of Information and Communication (MIC) programmes focus on application service providers (ASPs) as IT enablers. The *ASP based e-business project for small business* aims to provide cheaper and more convenient solutions compared with other software packages, to help overcome shortages of IT specialists in small firms. The targets are the 3 million small (5-49 employees) and micro businesses (1-4 employees) that account for 99% of the number of all businesses. The characteristics of ASP provision compared with other IT applications are outlined in Table A1 below.

Table A1. Characteristics of different IT implementation strategies

	In-house	**Outsourcing**	**Application service provider model**
Software licenses	Customer owns and manages licenses.	Customer usually owns and manages licenses. Outsourcing firm can own and manage licenses.	ASP usually owns and manages licenses.
Hardware infrastructure:			
- ownership	Customer must purchase, install, and finance infrastructure.	Outsourcer or customer can own infrastructure.	ASP's infrastructure. Customers may not know what powers their applications.
- location	Customer's data centre.	Outsourcer's location or customer's location.	ASP's location or third-party collocation.
Infrastructure management:			
- physical	Customer manages everything.	Outsourcer manages physical infrastructure either from its own facility or remotely.	ASP or collocation vendor does all power, and physical security management and administration.
- computing	Customer manages everything.	Outsourcer manages infrastructure either from its own facility or remotely.	ASP does (or manages other providers) all systems and network (*e.g.* routers and switches) configuration, management, tuning, administration, applications.
Implementation	Customer customises software to own business processes.	Third parties customise software to customer's business processes. Usually paid separately and co-ordinated by customer.	Implementation costs for application customisation and/or personalisation included in monthly rental charges.
Contract terms and pricing	Yearly budget cycles.	Long, often 7-10 year contracts.	3-5 years but getting shorter.
Billing	Internal auditing and assessment.	Annual fees.	Per-user-month fees, plus subscription charges, etc.

Source: Ministry of Information and Communication, February 2004.

Structure and funding: The MIC oversees the project and policy development, and the National Computerisation Agency execution and management including development of detailed business plans and identifying business model developers (see below). Funding in 2003 was USD 26.2 million, comprising training, business model development and promotion.

The programme focuses on small firms that lag in adopting ICT, hesitate to invest and are uncertain about the benefits. Five consortia of major telecommunication carriers and IT service companies provide services such as accounting and customer management. The consortia provide user-training sessions up to a maximum of 7 hours; and the programme supports 60% of training expenses. End-2003, 83 business

software services were offered, including insurance, bookkeeping, CRM, homepage builder, e-business, and payroll management services.

To ensure that IT services for small businesses are more readily available, e-business solutions (business models) are being developed to cover different businesses and inter-industry transactions, focusing mainly on hub and business community models. These are being developed by consortia of IT firms and training agencies in conjunction with industry associations. Business model development is subsidised up to 70%; developers fund at least 30% in cash or wages. Business models must be new or upgraded and customised, and no particular business models or approaches are selected in advance.

Through the efforts of the government and the ASP industry consortia, since its launch in 2001, the project has grown rapidly to close to 150 000 subscribing firms in October 2003 (Figure A1). Subscription fees generally range from USD 4-30 per month, and customer management and receipt/invoicing systems are the most common applications. The distribution of ASP project subscribers is shown in Table A2. Small services firms are the major users, particularly in wholesale and retail services (over one-third of users), personal and social services (almost one-fifth) and hotels and restaurants (over one-seventh).

Figure A1. Number of ASP e-business project subscribing firms, 2002-2003

*Source:* Ministry of Information and Communication, 2003.

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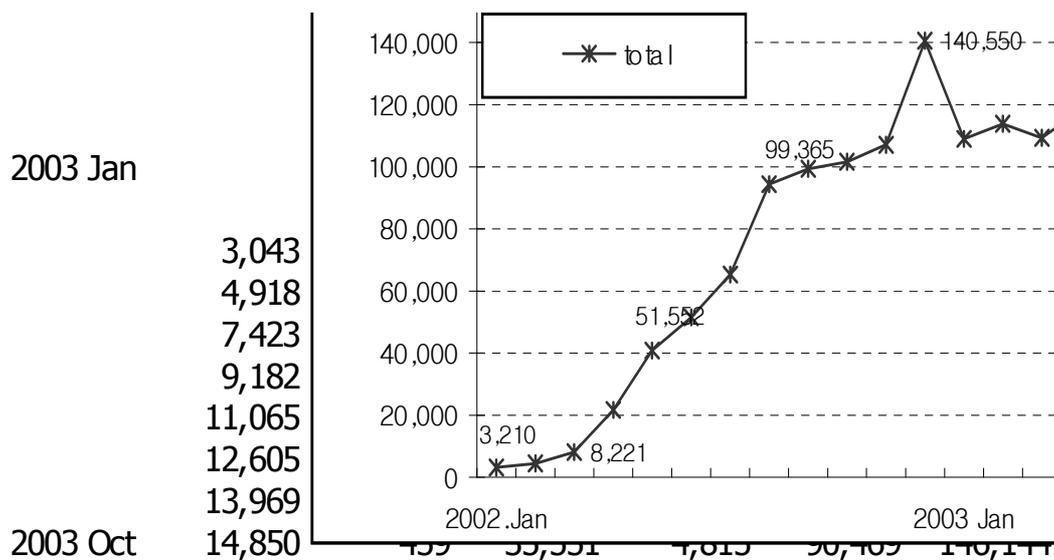
Table A2. Distribution of ASP e-business project subscribing firms

Industry	Share (%)	
Agriculture, forestry, fisheries	1.34	
Mining	0.02	
Manufacturing	9.97	
Utilities	1.40	
Of which: other utilities		1.13
Construction	6.42	
Services	58.48	
of which:		
Wholesale, retail, repair		36.22
Hotels, restaurants		14.84
Transport and communications		1.82
Finance, insurance		1.01
Real estate, business services		4.59
Education	1.91	
Health	1.74	
Social and personal services	18.51	
Household services	0.21	
Total ASP project subscribers end-2002		137 369

Source: Ministry of Information and Communication, 2003.

On-site training is an important part of the project. Training sessions are offered at the worksite since SME staff will often not attend off-site courses. To create more interest among potential subscribers, seminars are held at regional level and online sessions are offered. Training costs of USD 50 for each small business are paid to service providers if the firm completes a minimum 3 hours training and subscribes to services for more than 3 months. About 100 000 small firms had received training as of 2003. Providers follow standard fee and cost guidelines, with provider flexibility in terms of training time and structure.

Estimating returns on investment in the ASP e-business project: Returns on investment are based on government expenditures and estimated direct benefits to small firms. Total government expenditures are included (including ASP project management costs). Firm expenditures only include ASP subscription fees. Firm time and wage costs are not included (training sessions are usually on-site), nor are additional firm costs such as management and reorganisation costs. Quantitative and qualitative firm benefits were categorised into four main groups and seven key performance indices using the Balanced Score Card methodology (see Figure A2). These were further broken down into 20 measurable variables and ASP service subscribers were surveyed to provide quantitative estimates of benefits.

Figure A2. Return on investment estimations: Categories of benefits
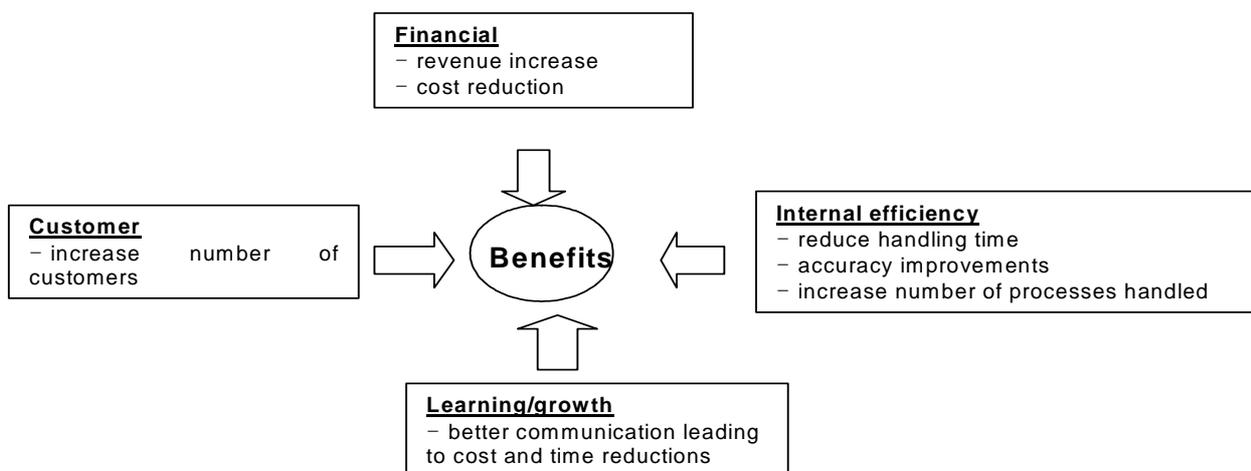
Based on this methodology of estimating business returns on government expenditures, the ASP programmes overall generated business ROI of 740% on government expenditures, and ROI for component activities were: ASP training 780%, business model development 402%, business model training 1 072%.

2. Pilot project for the promotion of the ASP industry

The government aims to promote transformation of traditional industry by giving a leading role to ASPs and developing ASP service models for different business sectors. The idea that ASP services are best practice solutions for SMEs has been diffused through the publicity efforts of the ASP Industry Consortium Korea. E-business services suited to the characteristics of each business sector and size are developed and applied to user firms having difficulties in implementing IT in their business. The government pays a part of the consortium's expenses for consulting and training.

The consortium issues ASP certificates to qualified providers and service level agreement guidelines on the quality and nature of services provided are distributed to improve services. ASPs provide business users (mostly SMEs) with appropriate solutions and content. By raising awareness and trust in ASP services, demand is increased and this in turn boosts the growth of the ASP industry.

3. IT training for vocational high schools

This programme, supported by high schools and the government, provides advanced ICT training courses (ERP and other e-business solutions) not taught in standard school education. A unique feature is that courses are offered online using ASPs via the nationwide broadband network. ASP-based online classes increase active student participation and interest. Students are evaluated based on participation and performance. The evaluation and certification system increases participation and can be used as guidelines when hiring new staff. As of the first half of 2003 teachers from 51 of the total 251 vocational high schools and 2 400 students had benefited from the programme.

Table A3. IT training in vocational high schools: results and goals 2002-2006

Year	2002	2003	2004	2005	2006	Total
Schools	40	60	60	80	100	340
Students	1 600	2 400	2 400	3 200	4 000	13 600
Teachers	60	90	120	150	180	600

Programme coverage is to be extended to college curricula as demand from colleges increase. Courses are to cover all business processes (*e.g.* production, human resource management, marketing, etc.) and other e-business solutions, while current courses only cover several ERP modules. The programme for teachers is to be reinforced to generate professional instructors. Through these approaches, educational effectiveness can be increased and the potential of broadband more fully exploited.

4.   *Evaluation Indices of Industrial Informatization: EIII*

EIII is an informatisation level evaluation methodology, developed in 1997 by the Centre for IT Research and Consulting. The methodology has six main ICT evaluation domains, covering goals of ICT adoption, ICT infrastructure, environment, application, supporting system and tools, and ICT use, and 13 sub evaluation domains to cover ICT-related areas as in Figure A3A. In each domain there are a variety of indices to measure the firm's ICT status. To reflect industry-specific features, EIII categorises industry into four groups– manufacturing, construction, finance and logistics/services, as in Figure A3B – and has developed different questionnaires to cover the common features of e-business within the same cluster.

Figure A3A. Evaluation domains of EIII; 3B. EIII questionnaires
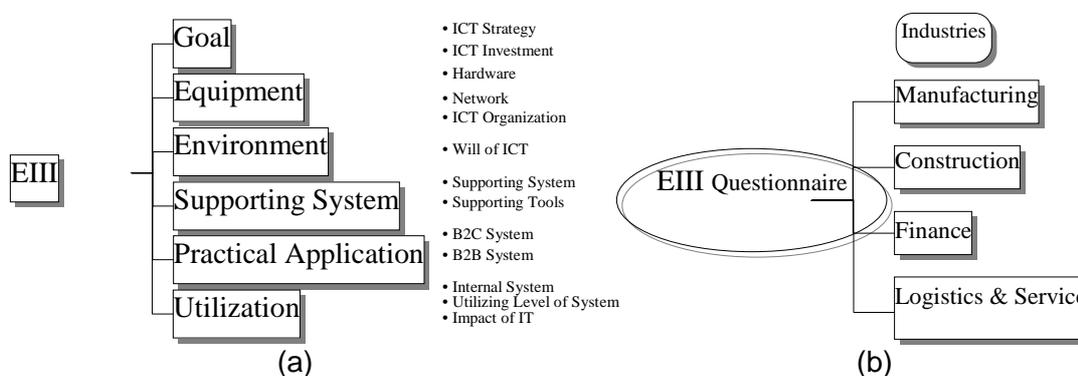
EIII uses an informatisation maturity model as shown in Figure A4. Each stage represents the level of informatisation maturity. The model helps firms interpret the results in practice.

Figure A4. The effective informatisation maturity model

	Level 1	Level 2	Level 3	Level 4	Level 5
Informatisation maturity level	ICT introduction	Function integration	Business integration	Industry integration	Business transformation
Evaluation result	0 - 20	20 - 40	40 - 60	60 - 80	80 - 100

The major characteristics of the EIII can be summarised as follows.

- Quantitative results: EIII presents the evaluation results as a score and it is easy for a firm to compare its level to others in the same industry.

- Effective Informatisation Maturity Model: The EIII reference model enables firms to understand the practical meaning of results. It is also an effective tool to diagnose weak points in ICT use.