



**Information
Society Commission**

Building the Knowledge Society

Report to Government, December 2002



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Chairman's Foreword

The emerging knowledge society presents a set of new imperatives for Government, and new challenges and opportunities for society as a whole. With between 70 and 80 percent of economic growth now estimated to be due to new and better knowledge, our future prosperity is critically dependant on policies that foster the continuous generation of knowledge and pursuit of learning.

The global influence of information and communication technologies is transforming our economy and society. But these technologies do not produce new ideas. All knowledge and learning ultimately depends on people. Our approach must therefore be one that puts people at the centre.

This report identifies three key challenges that Government must address in building the foundations for future economic and social prosperity:

- Developing broadband networking connectivity as a key 21st century infrastructure
- Fostering a climate of innovation, building on world class research and an advanced science and technology base – including innovative public sector organisational and service delivery arrangements
- Investing in people and skills to promote a culture of lifelong learning, while realising the potential of information and communication technologies to deliver new learning solutions.

We have experienced a recent period of unprecedented economic success, including an increase in employment of over 54 percent between 1987 and 2001. But the conditions for continued success have changed. Government's approach must be characterised by the resolve and agility needed to respond accordingly. In an increasingly networked and competitive global economy, there is absolutely no room for complacency.

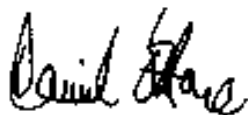
The overall message is straightforward: while we are making some progress, we are not doing well enough. We must be alert to the real danger that our recent success has in fact made us complacent, and that we have not yet grasped the scale of the challenges and opportunities presented by the emergence of the global knowledge society.

In the key area of broadband connectivity, we are losing ground on our leading competitors. Levels of investment in research and development are improving, but the gap to leading countries remains significant. We are lagging too in terms of participation in adult education and training, and embracing the lifelong learning challenge.

We have already demonstrated our capacity to be a world leader. However, it is clear that new levels of commitment are needed if we are to develop and sustain a leadership position moving forward.

This report is therefore a call to action.

I would like to take the opportunity to thank the members of the Commission for their contribution to date. A word of acknowledgement is due also to those who kindly agreed to serve on the Commission's working groups, and to the Secretariat for their support. I look forward to the continued help and enthusiasm of all concerned in the months ahead.



Dr Daniel O'Hare

Terms of Reference

The second Information Society Commission was appointed by Government at the end of 2001. The role of the Commission is to contribute to the formulation of Government policy by:

- Highlighting the challenges and opportunities presented by Information Society developments
- Monitoring Ireland's performance in its evolution as an Information Society, both nationally and internationally
- Identifying areas of co-operation with other jurisdictions, including establishment of links with the Northern Ireland Information Age Initiative, and
- Establishing working groups, as required, to provide expert advice on specific areas of public policy development.

The Commission will serve for a three-year period until the end of 2004.

Executive Summary



Executive Summary

1\ The Emerging Knowledge Society

The emergence of the knowledge society, building on the pervasive influence of modern information and communication technologies, is bringing about a fundamental reshaping of the global economy. Its significance goes well beyond the hyping of the Internet or the dramatic declines in the dot.com sector. What is underway is a transformation of our economy and society.

Knowledge has always been a factor of production, and a driver of economic and social development. Earlier economies depended, for example, on knowledge about how to farm, how to build and how to manufacture. However, the capacity to manipulate, store and transmit large quantities of information cheaply has increased at a staggering rate over recent years. The digitisation of information and the associated pervasiveness of the Internet are facilitating a new intensity in the application of knowledge to economic activity, to the extent that it has become the predominant factor in the creation of wealth. As much as 70 to 80 percent of economic growth is now said to be due to new and better knowledge.

Information and communication technologies (ICTs) are also facilitating a rapid globalisation of economic activity. In an increasingly global economy, where knowledge about how to excel competitively and information about who excels are both more readily available, the effective creation, use and dissemination of knowledge is increasingly the key to success, and thus to sustainable economic and social development that benefits us all. Innovation, which fuels new job creation and economic growth, is quickly becoming the key factor in global competitiveness.

Innovation fundamentally means coming up with new ideas about how to do things better or faster. It is about making a product or offering a service that no one had thought of before. And it is about putting new ideas to work in enterprise and having a skilled work force that can use those new ideas.

It is a further feature of the knowledge economy that it increasingly relies on the diffusion and use of information and knowledge, as well as its creation. The success of enterprises, and of national economies, becomes increasingly dependent on the information infrastructure that is necessary for the gathering and utilisation of knowledge. The importance of broadband telecommunications infrastructure in this context must be recognised as no less significant than the importance of electricity to 20th century industrial development.

Knowledge has become the key resource. Knowledge has value, but so too does knowledge about knowledge. Creating value is about creating new knowledge and capturing its value. The most important property is now intellectual property, not physical property. And it is the hearts and minds of people, rather than traditional labour, that are essential to growth and prosperity. Workers at all levels in the 21st century knowledge society will need to be lifelong learners, adapting continuously to changed opportunities, work practices, business models and forms of economic and social organisation.

In this changing environment, holding the status quo is not an option. We move forwards and embrace the conditions necessary to underpin higher value economic activity, better jobs, and new social prosperity. Or we prepare to fall into relative decline.

2\ Ireland's Strengths and Weaknesses

Relative Strengths

Ireland's relative strengths in addressing the challenges of the emerging knowledge society are as follows:

- Our relatively small size as a country enables us to respond quickly to new developments, and this has been a key factor in underpinning our competitiveness and economic success to date.
- The Cabinet Committee on the Information Society, and the appointment of Ms Mary Hanafin TD as Minister of State at the Department of the Taoiseach with special responsibility for the Information Society, give us the policy framework needed to coordinate and drive forward this agenda at the highest level of Government.
- The Broadband Strategy approved by Government in March 2002 reflects a new level of public policy engagement with the underlying importance of broadband as a key 21st century infrastructure, and is being underpinned by the appointment of the new Commission for Communications Regulation (ComReg).
- The €2.5b investment in R&D that is being supported through the National Development Plan (2000-2006) reflects a new commitment to the importance of an advanced science and technology base, and recognition by Government that sources of competitive advantage will increasingly depend on knowledge-based innovation.
- The establishment of Science Foundation Ireland to administer the Technology Foresight Fund will underpin the creation of a critical mass of world-class research in niche areas of ICTs and Biotechnology and is widely acknowledged as a key and strategically progressive public policy initiative.

- We have established a global leadership position in fostering the creation of an innovative and high-tech indigenous enterprise sector.
- Our performance in attracting Foreign Direct Investment is excellent and one of the strongest in the world relative to the size of the economy.
- We have a strong reputation for our well-educated, highly-skilled workforce and have an established responsiveness to the skills needs of the high-tech sector.

Relative Weaknesses

Ireland's relative weaknesses in addressing the challenges of the emerging knowledge society are as follows:

- Levels of broadband connectivity are very low both in absolute and comparative international terms.
- We have traditionally low levels of investment in research and development and a relatively low level of patenting activity.
- General societal engagement with Internet technologies is weak relative to leading countries, reflected in both a low residential Internet penetration rate and significantly shorter amounts of time spent online by the average user.
- We have poor rates of participation in adult education and training by international standards, pointing to a bigger challenge in embracing a culture of lifelong learning.
- We are behind leading countries in the application of ICTs to the education sector.
- Our relatively high VAT rate in an EU context tends to undermine our attractiveness as a location for distribution of digital content – a market that is growing at an annual rate of around 30 percent and developing an increasing strategic importance.

3\ Key Messages for Government

The strategies we adopt now are critical to underpinning our success in the next phase of national socio-economic development. There are three key challenges facing Government in the areas of supporting broadband connectivity, innovation capacity and skills development:

(a) The Broadband Challenge

Whereas economic progress in the 19th and 20th centuries was driven primarily by the discovery and use of electric power to drive agricultural and industrial production, it is evident that economic productivity in the 21st century will depend on enhanced application of information and knowledge to economic activity. Broadband is the enabling infrastructure through which information and knowledge will be accessed, used and shared. Future economic development, including our sustained attractiveness to increasingly mobile foreign direct investment, is therefore critically dependent on it.

The importance of broadband connectivity to the knowledge society will be no less significant than that of electricity to 20th century industrial development. Broadband investment must therefore be guided by a clear sense of its importance as a key 21st century infrastructure, and a key determinant of future socio-economic development, both nationally and regionally.

(b) The Innovation Challenge

In the globalised knowledge society, sources of sustainable competitive advantage increasingly depend on knowledge-based innovation. Continuous market-driven innovation is the key to competitiveness, and to economic growth. This requires not only a strong science and technology base, but equally importantly are the capacities to link fundamental and applied research, to convert the results of that research to new products, services or processes, and to bring these innovations quickly to the market.

The key role of information and communication technologies in this context will be as facilitators of innovation – including innovation in public sector organisational and service delivery arrangements.

(c) The Skills Challenge

The emergence of the knowledge society means an ever-increasing demand for a well-educated and skilled workforce across the whole economy. The countries that succeed in the 21st century will be those with citizens who are creative, adaptive and skilled. Investment in people and skills is vital not only for children and young people. The skills required for many conventional occupations are changing rapidly, and it is estimated that 80 percent of people who will be in our workforce in 10 years time are in the workforce already. Lifelong learning must become a key public policy focus, and highlights the mutually reinforcing importance of the economic and social strands to successful knowledge society development.

General familiarity with digital technologies throughout society, and ready availability of the new skills needed by high-tech and knowledge-based enterprises, is becoming critical to supporting innovation and underpinning sustainable economic development. And the knowledge society in turn can deliver better jobs and higher standards of living to support enhanced social prosperity. It is imperative that we foster a learning environment that supports and facilitates the process of adapting to ongoing change.

4\ Initial Recommendations to Government

The following are the Commission's initial recommendations to Government:

Broadband

Accelerating Progress

- 1 Government needs to accelerate significantly the pace of progress in implementing its broadband strategy, including putting in place as quickly as possible the PPP-type arrangement to integrate management of the Metropolitan Area Network (MAN) projects.

Coherence

- 2 There should be a clear sense of overall strategic direction by Government to ensure that the various agencies that have an involvement in the area of telecommunications infrastructure development act coherently to achieve its objectives.

Backbone Infrastructure

- 3 The potential role that the fibre assets of semi-state bodies might have to play in meeting broadband policy objectives and stimulating competition needs to be given careful consideration.

Regulation

- 4 The Minister for Communications should provide a clear policy framework and strategic direction to underpin the work of Comreg, including its role in realising policy objectives. The legislation underpinning the new regulatory regime must also be kept under review to ensure that it is adequate to support public policy needs and is sufficiently responsive to any changes in the external environment.
- 5 The Minister for Communications should ensure that ComReg includes as part of its remit a focus on an independent complaints procedure for dispute resolution between operators and customers.

Planning Process

- 6 As highlighted by Forfás, Government needs to quickly complete work on the development of a consistent set of regulations for use by local planning authorities in order to provide certainty as to costs and administrative requirements, underpinned by appropriate legislation. Common guidelines for managing telecommunications infrastructure needs in the context of new planning permissions should also be finalised and put in place as soon as possible.

Information on Infrastructure

- 7 Government should put appropriate arrangements in place to ensure that good quality independent information on telecommunications infrastructure is available, including quality mapping, to support ongoing planning and policy development.

Aggregating Public Sector Demand

- 8 Government should adopt a clear strategy regarding its role in stimulating demand for broadband services and should commit the public sector to broadband adoption. This commitment should embrace innovative ways of aggregating public sector demand to support the development of critical mass and the commercial case for network investment, as well as innovative applications in areas such as e-health and e-learning.

Radio Frequency Spectrum

- 9 The Minister for Communications should conduct an early review of the regulatory framework for managing radio frequency spectrum and should bring forward proposals as soon as possible aimed at increasing the public benefits from use of this resource.

Universal Service Obligation (USO)

- 10 Government should consider extending the Universal Service Obligation for telecommunications services to embrace digital data traffic and should bring forward early proposals for public consultation.

Enterprise Development

Investment in R&D

- 11 The scale of investment in Science Foundation Ireland must be sustained and increased over the longer term.
- 12 Government should consider the introduction of specific fiscal incentives to support business R&D investment.

Commercialisation of Publicly Funded Research

- 13 Government needs to prioritise introduction of clear arrangements to accelerate the level and pace of commercialisation of publicly funded research.
- 14 Government needs to introduce clearer policies in relation to the ownership of intellectual property arising from publicly funded research, informed by the objective of improved commercialisation outcomes.

eBusiness Adoption

- 15 There should be a strong focus on evaluating the outcomes of e-business support programmes completed to date and applying this learning to inform ongoing policy development and to enhance the effectiveness of new initiatives.
- 16 The Commission supports a continuation of programmes to support SME e-business engagement, with a particular focus on sectors where traditional business processes are likely to be significantly enhanced by the application of Internet technologies. A high priority should be accorded to the widespread dissemination of sector-oriented case studies that demonstrate clear returns on e-business investment.

- 17 It should be a requirement amongst all Government agencies involved in the support of enterprise start-ups and enterprise development that ICT training be included as an integral part of such support.
- 18 Government needs to consider the introduction of specific measures to promote greater societal engagement with Internet technologies as a key element of overall strategies designed to bring about greater engagement with these technologies in the enterprise sector.
- 19 Where it is appropriate to the workplace, support and assistance should be provided through the National Training Fund for the development of an ICT training plan to include basic computer skills and for the encouragement of companies to undertake training by alternate means such as distance and online learning.

eProcurement

- 20 The potential of the existing portal providing online information about public sector procurement opportunities should be developed quickly to support online catalogues, online tender management, and electronic ordering and payment. The process should begin with the establishment of a national level pilot project, which should be progressed as a matter of priority.
- 21 Government must explore the potential of Public Private Partnerships (PPPs) and similar arrangements in driving forward its e-procurement strategy, building on innovative examples of good practice available from experiences in other countries.

eGovernment

Service Delivery

- 22 The pace of progress in establishing the Public Service Broker is cause for concern and needs to be accelerated significantly.
- 23 Government must ensure that common standards and specifications are put in place as quickly as possible that will enable the service delivery strategies of individual Departments and agencies to be aligned with the overarching objective of integrating service delivery through the Public Services Broker.

eGovernance

- 24 The potential of e-government developments to support a transformation in traditional business processes has important implications that must be addressed as a key element of the overall process of public sector modernisation and reform.
- 25 There is a need for the establishment of a clear governance structure to support the development of e-government in the context of the wider modernisation process.

Development of Value Cases

- 26 Government needs to develop appropriate arrangements to ensure that the assessment of the return on e-government investments captures both tangible and intangible benefits.

Legal and Regulatory Issues

Awareness

- 27 Government should maximise the benefit of awareness programmes by addressing areas of trust and confidence as experienced by the citizen and the SME sector.

Data Protection and Privacy

- 28 Legislative proposals regarding Data Protection should be subject to public debate and clarification.

Unsolicited Commercial Email (UCE)

- 29 EU Directive 2002/58/EC should be transposed as soon as possible. The legal position relating to UCE, as a result of the conflict between Directive 2002/58/EC and other Directives, needs to be clarified.

Network Security

- 30 Government should establish a framework for the operation of Computer Emergency Response Teams.

Cyber-Crime and Law Enforcement

- 31 An in-depth qualitative and quantitative analysis should be conducted into the extent and impact of cyber-crime in Ireland.
- 32 Cyber-crime should be given a high priority by the Garda Síochána and adequate resources and specialist staff should be assigned to tackle the growing problem of cyber-crime.

Dispute Resolution

- 33 A study should be conducted into the feasibility of establishing an online court.
- 34 Government should continue to encourage the development of online dispute resolution models.

The European Union

- 35 A special group should be established to co-ordinate legislation at Commission level and so prevent contradictory provisions being included in EU legislation.

The International Environment

- 36 Ireland's approach to international regulatory co-operation in the Information Society field should be based on needs and priorities.

- 37 International co-operation mechanisms should include provision for technical back-up to policy makers and enforcement agencies, for stakeholder involvement and for transparency.

Skills and Learning

Taskforce on Lifelong Learning

- 38 The agenda set out by the Taskforce on Lifelong Learning must be embraced by Government as a strategic priority in addressing the challenges of the emerging knowledge society. The shift that is required in the education and training sector – where many current arrangements continue to predominantly reflect the needs of a different era – should be considered in terms corresponding to the significance of the introduction of free second level education in 1967.
- 39 Basic ICT skills training for adults should be established as a key component of the Back to Education Initiative and should also, as far as possible, be integrated as a core component of mainstream education and training provision.
- 40 Government needs to acknowledge the fee barriers that deter participation of adults in part-time courses. The Commission supports the recommendation of the Taskforce on Lifelong Learning that a grant-in-lieu-of-fees scheme should be introduced for part-time participants in courses in publicly funded further and higher education and training institutions.
- 41 The Commission wishes to highlight and endorse the eleven recommendations made by the Taskforce on Lifelong Learning in relation to workplace learning (Chapter 7), and emphasises a particular importance in Government addressing this area in the context of the new need for ongoing training and skills enhancement in the emerging knowledge society.
- 42 The National Adult Learning Council needs to be established on a statutory basis as soon as possible in the light of the role it is being given in coordinating, reviewing and reporting on the implementation of the framework set out in the Taskforce report.

eLearning

- 43 The Department of Education and Science needs to develop an overarching e-learning strategy that builds on and is responsive to the needs of all sectors.
- 44 Proposals for the development of a national e-learning platform should be expedited and should, as far as practicable, deliver an integrated solution across the education and training sectors.
- 45 Specific provision needs to be made for the building of ICT capacity in the further education sector, including capital investment in the purchase of hardware and development of an appropriate technical support solution.

ICT in Schools

46 The Commission wishes to express concern at the significant cut in capital investment in ICT in schools proposed for 2003 and urges that this area must continue to be accorded a high priority. Capital investment must also be supported by a clearer policy framework capturing high-level objectives, and by the establishment of recognised indicators to measure progress.

47 Government needs to make a high-level political commitment to establishing a broadband connectivity solution for schools. Priority should also be given in this context to integrating the connectivity needs of education centres, libraries, and other places of community-based learning.

48 Government must also make clear provision for an integrated technical support solution for the education sector.

49 While considerable progress has been made in the integration of ICT into the primary curriculum, the pace of progress at second level needs to be accelerated, including a review of the approach to ICT in existing teacher training provision. The professional development needs of teachers must also be clearly established and addressed in this context.

Taskforce on the Physical Sciences

50 The Commission supports the recommendations of the Taskforce on the Physical Sciences and urges early action by Government to address emerging deficits in the numbers of science, engineering and technology graduates.

eInclusion

Policy Coherence

51 Government needs to adopt a more strategic and coordinated approach to public policy objectives in the area of inclusive Information Society development. The Commission acknowledges that it can play an important role in supporting policy development in this regard and is working to bring forward specific proposals for consideration by Government in early 2003.

52 There should be a strong focus on evaluating the outcomes of e-inclusion initiatives carried out to date and applying this learning to inform ongoing policy development and to enhance the effectiveness of new initiatives.

Social Inclusion Context

53 Government should ensure that the National Anti Poverty Strategy (NAPS) and all other social inclusion measures include appropriate indicators to reflect new risks of social exclusion associated with the emergence of the knowledge society.

Community and Voluntary Sector

- 54** Government must ensure that policy development in relation to the role of community and voluntary organisations in inclusive Information Society development is underpinned by a process of dialogue and consultation with the community and voluntary sector.
- 55** The Minister for Community, Rural and Gaeltacht Affairs should bring forward early proposals in relation to the role of ICT in supporting wider community development objectives, building on the evaluation of the CAIT initiative.

Role of Community Champions

- 56** Clear priority must be given to progressing the Universal Participation initiative building on the leadership role of Community Champions as set out in the Government Action Plan. The creation of an engaging digital environment at the level of local needs should be key focus in this context.

ICT Literacy

- 57** Government must give a high priority to the establishment of a national ICT Literacy programme, building on the experience of the Equalskills pilot project.

ICT Accessibility

- 58** The NDA should establish a monitoring process to determine levels of compliance with the IT Accessibility Guidelines and whether further actions may be needed to promote their adoption.

DTT (Digital Terrestrial Television)

- 59** The Minister for Communications should bring forward new proposals for the DTT (Digital Terrestrial Television) platform as a matter of priority.

Northern Ireland Cooperation

- 60** The benefits of all-island cooperation insofar as the enterprise sector is concerned should continue to be pursued through InterTradeIreland. The value of extending all-island cooperation to knowledge society issues that go beyond the scope of the enterprise sector should also be explored, and the Commission will be including a focus on this issue in the context of its ongoing work programme.

1

The Emerging Knowledge Society



1\ The Emerging Knowledge Society

Those who think the New Economy was some late-90s flash-in-the-pan staked to the emergence of dot-coms are roughly equivalent to the great wits who shouted “Get a horse!” at early motorists broken down on the side of the road. In the early 1930s, people might have equated the bankruptcy of car companies with the end of the auto era. But obviously that was just the beginning.

The 2002 State New Economy Index, Progressive Policy Institute¹

1.1\ Introduction

The increasing significance of information and communication technologies (ICTs) has become a defining contemporary influence. We are experiencing a transformation in the nature of economic activity, with associated implications for the shape of society.

In an agricultural economy, land is the key resource. In an industrial economy, it is physical assets such as steel, factories, and railroads that are the dominant factors of production. In the current era, the key resources have become information and knowledge. The generation and exploitation of knowledge is now the predominant factor in the creation of wealth. *For countries in the vanguard of the world economy, the balance between knowledge and resources has shifted so far towards the former that knowledge has become perhaps the most important factor determining the standard of living – more than land, than tools, than labour. Today’s most technologically advanced economies are truly knowledge-based.*² It was estimated by the OECD in 1996 that over 50 percent of GDP in the major OECD economies had become knowledge-based.³ And as much as 70 to 80 percent of economic growth is now said to be due to new and better knowledge.⁴

¹ <http://www.neweconomyindex.org/states/2002/index.html>

² *World Development Report 1999, World Bank*

³ *The Knowledge-based Economy, OECD 1996*

⁴ *Joint Research Centre of the European Commission, Futures Project Synthesis Report, January 2000 (<http://www.jrc.es>)*

The industrial revolution laid the foundation for the transformation from agriculture to industry-based economic production. Living standards were raised, and patterns of living changed too.

The significance of the current revolution around the importance of information and knowledge is no less profound. In addition, the pace of change currently being experienced – driven by the technology advances of the late 20th and early 21st centuries – is without precedent, and presents new sets of challenges for government and the management of public policy development.

1.2\ The Knowledge-Based Economy

Knowledge has always been a factor of production, and a driver of economic and social development. Earlier economies depended, for example, on knowledge about how to farm, how to build and how to manufacture. However, technology-related developments have fundamentally transformed the degree to which knowledge is being integrated into economic activity, to the extent that we are witnessing a shift in the very basis of competitive advantage.

Unlike capital and labour, information and knowledge have many of the characteristics of what economists call public goods. Once discovered and made public, knowledge can be shared at zero marginal cost and its value is not depleted in consumption – it is non-rival. Indeed, the economic and social value of information and knowledge actually increases as it is shared with and used by others. *Just as the importance of land in production changed dramatically as the economy moved from agriculture to industry, so too does the movement to a knowledge economy necessitate a rethinking of economic fundamentals.*⁵

There is a real danger that this underlying significance has been clouded by developments of the past couple of years. It is clear that the emergence of the Internet and related technologies during the 1990s generated an over-hyping of expectations. The major stock market correction of April 2000, and its subsequent impact on the technology sector worldwide, was perhaps an inevitable consequence. As with most major technological advances, progress is occurring neither smoothly, nor as originally envisaged. *If we consider the history of other technological revolutions, none of this should be a surprise. Of nearly 1,000 US companies that tried to build and sell gas-powered automobiles before 1927, only 200 survived long enough to bring a commercially suitable vehicle to the market. Of these fewer than a handful operate today, but they account for a substantial share of a much larger economy. The lesson is that technological revolutions take time, and the digital technology revolution has just begun.*⁶

The capacity to manipulate, store and transmit large quantities of information cheaply has increased at a staggering rate over recent years. The digitisation of information and associated pervasiveness of the Internet is facilitating a new application of knowledge to economic activity, and thus a new knowledge intensity in the economy generally.

⁵ *Public Policy for a Knowledge Economy*, Joseph E. Stiglitz 1999

⁶ *Digital Economy 2002*, US Department of Commerce 2002

The rapid globalisation of economic activity further reinforces the impact of this dynamic.

Information and communication technologies have made possible the globalisation of financial markets that underlie the expansion of international trade of goods and services.

The increase in global trade and foreign direct investment in recent years, itself facilitated by ease of information flows, accelerates the impact of these changes. In an increasingly global economy, where knowledge about how to excel competitively and information about who excels are both more readily available, the effective creation, use and dissemination of knowledge is increasingly the key to success, and thus to sustainable economic and social development that benefits us all. Innovation, which fuels new job creation and economic growth, is quickly becoming the key factor in global competitiveness.⁷

The Knowledge-Based Economy

In order to facilitate economic analysis, distinctions can be made between different kinds of knowledge which are important in the knowledge-based economy: know-what, know-why, know-how and know-who. Knowledge is a much broader concept than information, which is generally the “*know-what*” and “*know-why*” components of knowledge. These are also the types of knowledge which come closest to being market commodities or economic resources to be fitted into economic production functions. Other types of knowledge – particularly know-how and know-who – are more “*tacit knowledge*” and are more difficult to codify and measure (Lundvall and Johnson, 1994).

- **Know-what** refers to knowledge about “*facts*”. How many people live in New York? What are the ingredients in pancakes? And when was the battle of Waterloo? are examples of this kind of knowledge. Here, knowledge is close to what is normally called information – it can be broken down into bits. In some complex areas, experts must have a lot of this kind of knowledge in order to fulfil their jobs. Practitioners of law and medicine belong to this category.
- **Know-why** refers to scientific knowledge of the principles and laws of nature. This kind of knowledge underlies technological development and product and process advances in most industries. The production and reproduction of know-why is often organised in specialized organisations, such as research laboratories and universities. To get access to this kind of knowledge, firms have to interact with these organisations either through recruiting scientifically-trained labour or directly through contacts and joint activities.
- **Know-how** refers to skills or the capability to do something. Businessmen judging market prospects for a new product or a personnel manager selecting and training staff have to use their know-how. The same is true for the skilled worker operating complicated machine tools. Know-how is typically a kind of knowledge developed and kept within the border of an individual firm. One of the most important reasons for the formation of industrial networks is the need for firms to be able to share and combine elements of know-how.

7 Building Knowledge Economies, World Bank 2002

- This is why **know-who** becomes increasingly important. Know-who involves information about who knows what and who knows how to do what. It involves the formation of special social relationships which make it possible to get access to experts and use their knowledge efficiently. It is significant in economies where skills are widely dispersed because of a highly developed division of labour among organisations and experts. For the modern manager and organisation, it is important to use this kind of knowledge in response to the acceleration in the rate of change. The know-who kind of knowledge is internal to the organisation to a higher degree than any other kind of knowledge.

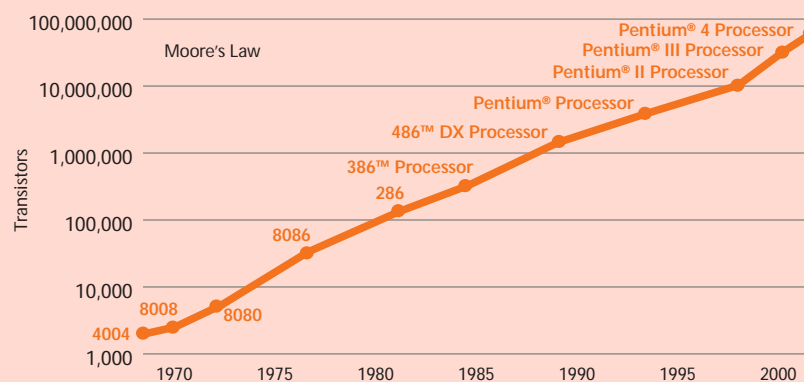
Learning to master the four kinds of knowledge takes place through different channels. While know-what and know-why can be obtained through reading books, attending lectures and accessing databases, the other two kinds of knowledge are rooted primarily in practical experience. Know-how will typically be learned in situations where an apprentice follows a master and relies upon him as the authority. Know-who is learned in social practice and sometimes in specialised educational environments. It also develops in day-to-day dealings with customers, sub-contractors and independent institutes. One reason why firms engage in basic research is to acquire access to networks of academic experts crucial for their innovative capability. Know-who is socially embedded knowledge which cannot easily be transferred through formal channels of information.

OECD, 1996

1.3\ The Evolving Technology Environment

It is appropriate to recognise the phenomenal pace at which the digital technologies underpinning the emergence of the knowledge economy have been evolving. Both processing power and data storage are now dramatically more powerful than they were even a decade ago. And these trends look set to continue. As illustrated in Figure 1.1, processing power has doubled roughly every 18 months – leading to thousand-fold advances every 10-15 years or so.

Figure 1.1 Growth in Processing Power, 1971-2000

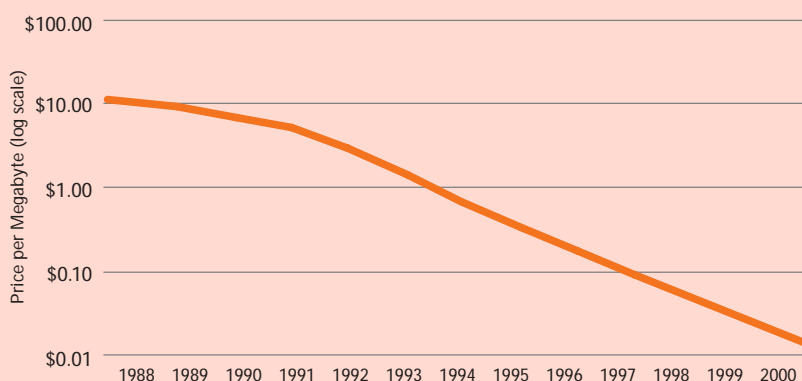


Source: <http://www.intel.com/research/silicon/mooreslaw.htm>

Data storage technologies have evolved at an even faster pace, with disk capacities doubling every 9 months. Figure 1.2 captures the price per megabyte for hard-disk drives falling from \$11.54 in 1988 to \$0.04 in 1998, and an estimated \$0.01 in 2000.⁸

We are also experiencing significant increases in transmission speeds – with the capacity to send data over fibre optic cable estimated to be doubling every 12 months. However it is in this area that difficulties have become evident, with blockages inhibiting the permeation of high-speed technologies throughout the networking infrastructure – essentially what has become the broadband bottleneck.

Figure 1.2 Dramatic Declines in the Cost of Digital Data Storage Illustrated by Falling Average Cost per Megabyte in Hard Disk Drives



Source: Disk/Trend, Inc.

1.4\ Broadband: The Information Infrastructure

Bandwidth is the enabling information infrastructure necessary to underpin the development of the emerging knowledge economy. Economic progress in the 19th and 20th centuries was driven primarily by the discovery and use of electric power to drive agricultural and industrial production. Correspondingly, it has become evident that economic development in the 21st century will be driven primarily by productivity increases due to enhanced application of information and knowledge to economic activity. Bandwidth is the medium through which information and knowledge will be accessed, used and shared.

It is a feature of the emerging knowledge economy that it increasingly relies on the diffusion and use of information and knowledge, as well as its creation. The success of enterprises, and of national economies, becomes increasingly dependent on the information infrastructure that is necessary for the gathering and utilisation of knowledge. *The economy becomes a hierarchy of networks, driven by the acceleration in the rate of change and the rate of learning. What is created is a network society, where the opportunity and capability to get access to and join knowledge- and learning-intensive relations determines the socio-economic position of individuals and firms.*⁹ In this context, the importance of broadband infrastructure – including the appropriate policy and regulatory frameworks – to the development of the knowledge economy must be recognised as no less significant than the importance of electricity to 20th century industrial development.

⁸ *Digital Economy 2002, US Department of Commerce 2002*

⁹ *The Knowledge-based Economy, OECD 1996*

The economic case for broadband and its significance can be put into context by looking back on similar capacity and capability changes in our national infrastructure – rail, road, electricity and telecommunications. Each of these transformed economic activity for firms and citizens, enabled new activities to develop, and provided the nation with competitive and comparative advantages. Crucially, however, many of these benefits were unforeseen when the original infrastructure investments were made, yet today it is difficult to conceive how our economy or society would function in their absence.¹⁰

1.5\ Innovation

In the knowledge society, sources of competitive advantage will increasingly depend on knowledge-based innovation. The clear implication is that there is no alternative to prosperity than to making learning and knowledge-creation of prime importance, with a new focus on scientific and technological innovation through research and development. *Now, thanks to satellites and fibre-optic cables, ideas leap among people almost like lightning. In this age, through a terminal, a satellite, and a decent battery or a plug in the wall, ideas can jump from an island to anywhere – and likewise attract. The only limit now is the worth of the idea, the intelligence that uses it, and the innovation it creates.*¹¹

This requires not only a strong science and technology base and R&D capacity. Equally important are the capacities to link fundamental and applied research, to convert the results of that research to new products, services or processes, and to bring these innovations quickly to the market.

Innovation fundamentally means coming up with new ideas about how to do things better or faster. It is about making a product or offering a service that no one had thought of before. And it is about putting new ideas to work in enterprise and having a skilled work force that can use those new ideas. *Policies relating to science and technology, industry and education will need a new emphasis on the role and importance of innovation systems, the requirement for infrastructures, and incentives which encourage investments in research and training to support those systems.*¹²

Innovation isn't the responsibility of any one sector of the economy or society. Success in the knowledge society means that innovation must become everyone's business – government, enterprise, and the individual. The key role of information and communication technologies is as an enabler of innovation – allowing new ways of doing things, and doing of new things.

¹⁰ The Broadband Stakeholder Group (UK), November 2001

¹¹ William Harris, 26 April 2002 (http://www.sfi.ie/content/content.asp?section_id=211&language_id=1)

¹² A Primer on the Knowledge Economy, John Houghton and Peter Sheehan, February 2000 (<http://www.cfes.com/primer.htm>)

IDA Strategy Statement, October 2002

Our vision of the future is not simply about remaining competitive in the FDI (foreign direct investment) market. It is not even exclusively focused on FDI. In a globalised world is there any real difference between foreign and indigenous industry anymore? Whether or not a country has a proactive FDI policy like Ireland, implemented by agencies like IDA Ireland, surely all countries in the future have to make themselves attractive locations for an appropriate range of economic activities, much of which are becoming increasingly mobile?

Will the most advanced countries not be driven by **innovation** rather than by efficient conversion? Innovation is now trans-national. It occurs where talent is nurtured, where expertise and research skills are greatest and where creativity flourishes. Clustering effects, such as underpin Porter's diamond, play a considerable part.

The objective must be to place Ireland at the leading edge of the global economy in some specific competencies or industry niches. It will mean not relying solely on an individual project focus but adding the development of **clusters of excellence** in which technology companies, education and research activities, venture capital providers, business service providers, etc. network to create a climate of innovation and entrepreneurship. If they are to be successful, these activities need to tie both Irish and overseas firms and resources, thereby mitigating previous divides.

Sean Dorgan, IDA¹³

1.6\ Investment in People and Skills

The countries that succeed in the 21st century will be those with citizens who are creative, adaptable and skilled. Our people – their skills, talents, knowledge and creativity – are the key to future success. We must prioritise provision of opportunities for everyone to learn and to develop their skills and abilities, underpinning our commitment to economic growth and prosperity while supporting also wider social objectives of inclusion and equality.

Knowledge has become the key resource. Knowledge has value, but so too does knowledge about knowledge. Creating value is about creating new knowledge and capturing its value. The most important property is now intellectual property, not physical property. And it is the hearts and minds of people, rather than traditional labour, that are essential to growth and prosperity.

The emergence of the knowledge society means an ever-increasing demand for a well-educated and skilled workforce across the whole economy. *The next society will be a knowledge society. Knowledge will be its key resource, and knowledge workers will be the dominant group in its workforce.*¹⁴

¹³ Is FDI necessary in post Celtic Tiger Ireland? IDA Strategy Statement, October 2002 (<http://www.ida.ie/>)

¹⁴ *The Next Society*, Peter Drucker, *Economist*, 1 November 2001 (http://economist.com/surveys/displayStory.cfm?Story_id=770819)

As access to information becomes easier and less expensive, it becomes more crucial that we have the skills and competencies relating to the selection and use of that information. Tacit knowledge (essentially know-how and know-who) in the form of the skills needed to handle codified knowledge (essentially know-what and know-why) becomes more important than ever. *The skills required of humans will increasingly be those that are complementary with information and communication technology; not those that are substitutes. Whereas machines replaced labour in the industrial era, information technology will be the locus of codified knowledge in the knowledge economy, and work in the knowledge economy will increasingly demand uniquely human (tacit) skills – such as conceptual and inter-personal management and communication skills.*¹⁵

Investment in people and skills is vital not only for children and young people. The skills required for many conventional occupations are changing rapidly, and many skills are becoming quickly dated as new jobs, new technologies and new industries emerge.

It is estimated that 80 percent of people who will be in our workforce in 10 years time are in the workforce already. There is a clear imperative for continuous education and training, and the establishment of incentives for firms and individuals to make the critical adjustment to a culture of lifelong learning. Workers at all levels in the 21st century knowledge society will need to be lifelong learners, adapting continuously to changed opportunities, work practices, business models and forms of economic and social organization.

1.7\ Knowledge Society Foresight

While there is firm consensus about the increasing importance of knowledge as a driver of economic prosperity, there remains a high level of uncertainty as to the shape the knowledge society will take. As Peter Drucker has put it: *The terms “knowledge industries”, “knowledge work” and “knowledge worker” are only 40 years old. They were coined around 1960, simultaneously but independently; the first by a Princeton economist, Fritz Machlup, the second and third by this writer. Now everyone uses them, but as yet hardly anyone understands their implications for human values and human behaviour, for managing people and making them productive, for economics and for politics.*¹⁶

What are the implications of the knowledge society for living conditions, and for working conditions? Does it necessarily lead to new prosperity for everyone? How will organisational structures evolve? Will society become more democratic and transparent? What contribution can new and evolving technologies make? One thing that is clear is that we face significant adjustments from the socio-economic conditions of the late 20th century. And the scale of this challenge demands a strong focus on longer-term, strategic policy issues.

Within this context the Commission has established a Futures working group to support the development of insights and perspectives on key issues associated with the emerging knowledge society in Ireland – nationally and internationally – in the early 21st century.

¹⁵ *A Primer on the Knowledge Economy*, John Houghton and Peter Sheehan February 2000 (<http://www.cfes.com/primer.htm>)

¹⁶ *The New Workforce*, Peter Drucker, *Economist*, 1 November 2001 (http://economist.com/surveys/displayStory.cfm?Story_id=770847)

The broad aim of the Futures work of the Commission will be to strengthen awareness about the future implications of the knowledge society among both ordinary people and within institutions and organisations, and to build a shared vision moving forward. This is generally achieved by offering alternative images of the future, and choices of action based on these images as a foundation for planning and for shaping present action. It typically embraces:

- Possible future(s) – What may happen?
- Probable future(s) – What is most likely to happen?
- Preferable future(s) – What would we prefer to happen?¹⁷

Foresight activity has become an important policy focus internationally, and builds on different methodologies including scenario planning, group discussions, Delphi-method surveys, and future-search workshops. It has become particularly established in the science and technology area – including the Technology Foresight Ireland exercise completed in 1999¹⁸ – but is less well developed in relation to wider societal issues.

A key development in this context is the European Knowledge Society Foresight project that is being progressed through the European Foundation for the Improvement of Living and Working Conditions.¹⁹ This future oriented project is informed by the Lisbon strategy objective of making Europe the most competitive and dynamic knowledge-based economy in the world with improved employment and social cohesion by 2010. It will study the **drivers and impacts** of the knowledge society on living conditions, working conditions and industrial relations, and aims to produce national and European level foresights to support knowledge society development.

The Commission will be liaising closely with the European Foundation to develop appropriate linkages and synergies with the European Knowledge Society Foresight project and to enhance its application in the Irish context.

1.8\ Conclusion

The emergence of the knowledge society, building on the pervasive influence of modern information and communication technologies, is bringing about a fundamental reshaping of the global economy. Its significance goes well beyond the hyping of the Internet or the dramatic declines in the dot.com sector. What is underway is a transformation of our economy and society.

The strategies we adopt now will determine our success in the next phase of national socio-economic development. In this changing environment, holding the status quo is not an option. We move forwards and embrace the conditions necessary to underpin higher value economic activity, better jobs, and new social prosperity. Or we prepare to fall into relative decline.

¹⁷ *A Futurist's Toolbox*, UK Cabinet Office, September 2001

¹⁸ <http://www.forfas.ie/icsti/index.htm>

¹⁹ http://www.eurofound.eu.int/industrial/foresight_prog.htm

2

Assessing Ireland's Performance



2\ Assessing Ireland's Performance

As the doctors say of a wasting disease, to start with, it is easy to cure but difficult to diagnose. After a time, unless it has been diagnosed and treated at the outset, it becomes easy to diagnose but difficult to cure. So it is in government.

Machiavelli

2.1\ International Indices

Information Society developments permeate across economic and social activity, so there are understandable difficulties in arriving at objective measurements of performance. However, a review of available indicators provides an important basis for comparisons with competitor countries, and for developing a sense of relative progress.

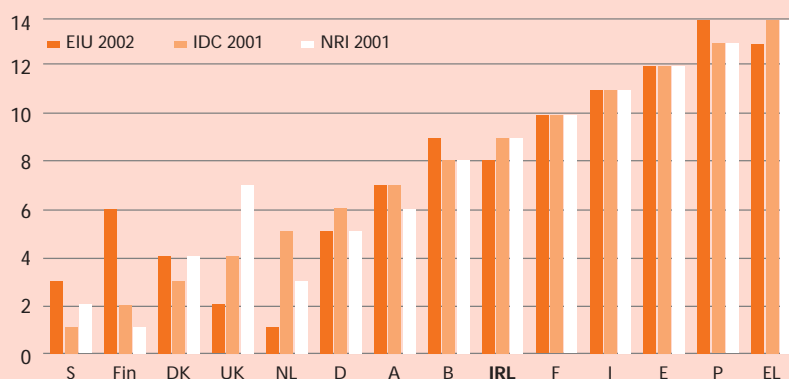
Perhaps the most recognised international measurement is that provided by the IDC/World Times Information Society Index – as referenced by the original Information Society Steering Committee in its 1996 report. This measures variables in 55 countries under four different headings: computer, information, Internet, and social infrastructures.

Ireland is ranked 20th on the 2001 index. When the original Information Society Steering Committee reported in 1996, Ireland was ranked 23rd. The underlying score supporting our ranking on this index has improved appreciably since 1996. But our relative position has improved only marginally.

The two other most commonly used composite indices in this area are the Harvard Networked Readiness Index (NRI), which ranked Ireland 19th in 2001, and Economist Intelligence Unit's eReadiness Index, which ranked Ireland 15th in 2002. In the 2002 Forfás eBusiness Monitor, Ireland's performance on all 3 indices is the poorest of the countries reviewed.²⁰

In an EU context, Ireland ranks 9th of the fourteen countries that are rated, behind Sweden, Finland, Denmark, UK, Netherlands, Germany, Austria and Belgium – Figure 2.1.

Figure 2.1 Ireland's Information Society Performance in EU14 Perspective



Source: Various

The common feature to our performance on all 3 indices is the relative maturity of the underlying information infrastructure and the low penetration of broadband networking connectivity relative to leading countries.

2.2\ Broadband

Given its significance as the underlying information infrastructure, progress with provision of broadband services in Ireland is cause for concern.

An OECD study produced in October 2001 ranked Ireland 27th of 30 countries in terms of penetration of broadband technologies – Figure 2.2.²¹

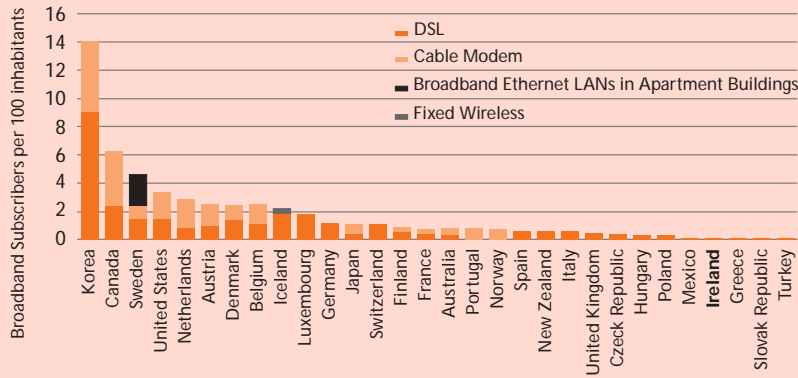
Forfás is now benchmarking our broadband performance on a quarterly basis against 19 countries (EU15, Canada, Japan, Korea, USA). The November 2002 update shows no appreciable improvement, with Ireland being the worst performing country of the benchmarking group for broadband take-up. Indeed, with initial DSL offerings made available by Eircom and Esat from only May 2002, we must recognise that we are 2-3 years behind leading competitor countries. The price of DSL services in Ireland is also among the highest of the benchmarking group.

The rate of broadband take-up in Ireland is currently around 0.1 percent. Internationally, take-up rates among the benchmarking group range from 1 to 6 percent, with Korea having a significantly higher take-up at over 16 percent.

²⁰ The following leading e-business economies were selected for comparison purposes in that exercise: Australia, Denmark, Germany, Netherlands, Singapore, Sweden, United Kingdom, and United States.

²¹ The Development of Broadband Access in OECD Countries, OECD 2001

Figure 2.2 Broadband Penetration in OECD Countries, June 2001

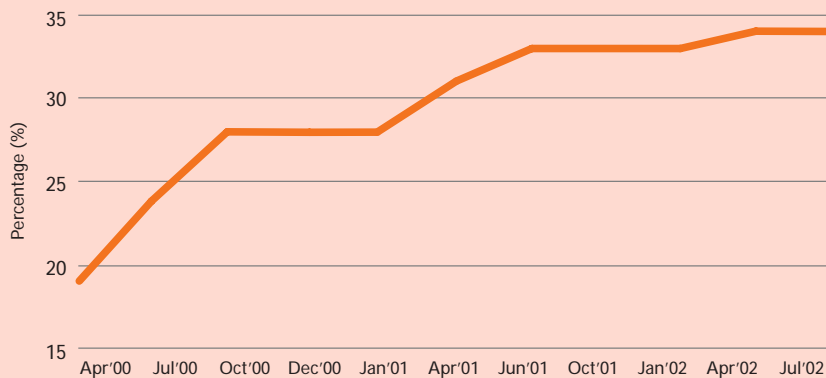


Source: OECD

2.3\ Internet Penetration

The best available indication seems to be that around 34 percent of the population currently accesses the Internet from home in Ireland.²² This level reflects significant growth from below 20 percent at the beginning of 2000. However, it also reflects a more recent stagnation of this growth, with an increase of only 1 percent over the previous 12 months – as captured in Figure 2.3.

Figure 2.3 Ireland's Internet Penetration Rate: April 2000 - July 2002



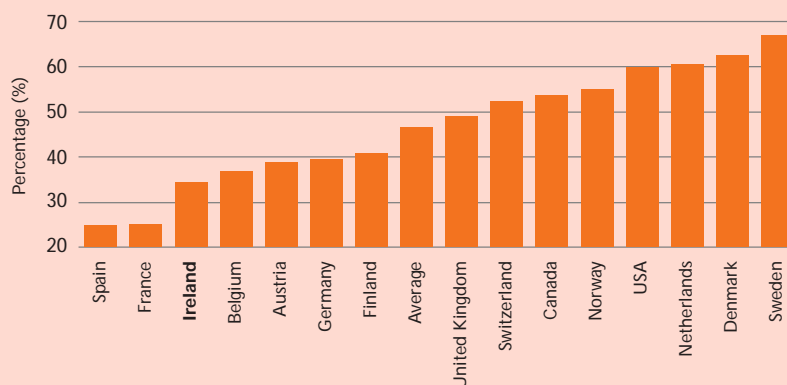
Source: Nielsen NetRatings

Further development of the residential Internet penetration market has been inhibited by the lack of flat-rate Internet access and by the cost of available higher-speed offerings.

As of April 2002, this placed us 14th internationally amongst those countries for which comparable data was available, with leading countries showing residential Internet penetration rates of around 60 percent – Figure 2.4.

22 ODTR Quarterly Commentary, September 2002 (derived from Nielsen Netratings)

Figure 2.4 Comparative Home Internet Penetration Rates, April 2002



Source: Nielsen NetRatings and CIA World Factbook

In July 2002, the average home Internet user here spent approximately 3.5 hours online. This compares with significantly higher average online times of 11 hours monthly in the US, and 7 hours monthly in the UK – Table 2.1.

Table 2.1 Average Internet Usage for Ireland, the UK, and the USA, July 2002

	United States	Ireland	United Kingdom
Number of Sessions per Month	21	8	14
Number of Unique Sites Visited	46	25	42
Time Spent per Month	11:06	3:39	6:57
Time Spent During Surfing Session	31:39	25:46	28:58
Duration of a Page viewed	00:54	00:43	00:47

Source: Nielsen NetRatings

2.4\ eBusiness Adoption

The 2002 Forfás eBusiness Monitor overviews available data relating to e-business adoption and sophistication among the indigenous enterprise sector relative to the 8 case study countries – Australia, Denmark, Germany, Netherlands, Singapore, Sweden, United Kingdom, and United States.

It concludes that Ireland lags behind most of the case study countries (which were chosen as leading e-business economies) in terms of e-business adoption. However, it performs reasonably well in terms of sophistication levels amongst those businesses that are engaging with e-business processes.²³

²³ The eBusiness Monitor report enters a reservation that Ireland's performance in this area may be overstated because of the relatively high number of very small businesses here, and the use of international survey samples that may not therefore be representative of the Irish enterprise sector as a whole

2.5\ Innovation and Enterprise Creation

Table 2.2 is extracted from the 2002 Forfás eBusiness Monitor and overviews available data in terms of innovation and enterprise creation relative to the case study countries.

Table 2.2 Ireland's Relative Performance in Innovation and Enterprise Creation

	A	D	DK	IRL	NL	S	Sing.	UK	US
WCY Total No. of Patents granted to Residents per 1 m Population, 1999	64	229	67	65	186	284	34	75	295
WCY Total No. of Patents in Force per 100,000 Population, 1999	466	453	555	619	764	1106	458	n.a.	456
European Commission, EPO patent applications in high-tech classes per 1,000 population, 1999	n.a.	29.3	21.5	13.3	38.5	22.9	n.a.	18.9	29.5
Eurostat/USPTO, USPTO Patent Applications in High-tech Classes per 1 mn Population, 1998	n.a.	15	18	4	20	29	n.a.	14	85
D&T Technology Fast 500 in Europe/No. of Indigenous Enterprises, 2001	n.a.	50	6	38	33	20	n.a.	149	n.a.
D&T Technology Fast 500/ No. of Indigenous Enterprises per 1m population, 2001	n.a.	0.6	1.1	10	2.1	2.2	n.a.	2.5	n.a.
Tornado 100/No. of Indigenous Enterprises, 2001	n.a.	11	1	5	4	9	n.a.	31	n.a.
No. of Companies Listed on the NASDAQ per 1m population	0.57	0.11	0.19	3.42	1.51	1.46	1.46	0.42	n.a.

Source: Forfás eBusiness Monitor 2002

While measuring **innovation** is inherently problematic, patenting activity is one of the more commonly used indicators. We have a relatively high number of patents in force per capita, and ranked 3rd among the case study countries in this regard.

However, this standing is not matched by contemporary performance. Only Australia and Singapore performed more poorly among the case study countries in terms of new patents awarded per capita in 1999. Ireland had 65 patents granted for every 1m population, compared with 295 in the US, 284 in Sweden, 229 in Germany, 186 in the Netherlands, and 75 in the UK. This performance is also reflected in our relatively low level of patent applications per capita to both the European Patent Office (EPO) and the United States Patent and Trademarks Office (USPTO).

In terms of available data on high-tech **enterprise creation**, Ireland's performance allows it to be regarded as the strongest of the case study countries. We have the highest per capita number of listings in the Deloitte and Touche Fast 500 in Europe. Ireland also performs strongest of the European case study countries in the Tornado 100 listing of Europe and Israel's top high-tech companies. And we have more NASDAQ listings per head of population than any of the case study countries (excluding the US).

2.6\ Foreign Direct Investment

Ireland's performance in the attraction of ICT-related FDI is captured in Table 2.3 – again this data is taken from the 2002 Forfás eBusiness Monitor.²⁴

Ireland is, in relative terms, the strongest FDI performer of the group on 2001 data. We attracted the highest per capita number of FDI projects – 38.9, compared to 37.3 in Singapore, and 14.6 in third-placed UK. We attracted the second highest per capita number of overall ICT FDI projects – 17.1, compared to 19.5 in Singapore and 7.7 in third-placed UK. And, by a significant margin, we attracted the highest per capita number of ICT R&D projects – 5.3, compared to 2.1 in Denmark, 2 in Sweden, and 1.5 in fourth-placed Singapore.

Table 2.3 Ireland's Performance Attracting ICT-related FDI, 2001

		A	DK	D	IRL	NL	Sing.	S	UK
All FDI	% of new projects	11%	3%	16%	7%	6%	8%	6%	43%
	total projects/population	11.1	10.2	3.8	38.9	7.9	37.3	14.5	14.6
	<i>rank</i> % of new projects	3	8	2	5	6	4	6	1
	<i>rank</i> total projects/population	5	6	8	1	7	2	4	3
All ICT	% of new projects	7%	3%	16%	6%	9%	8%	6%	44%
	total projects/population	4	5.7	2	17.1	5.6	19.5	7.4	7.7
	<i>rank</i> % of new projects	7	8	2	5	3	4	5	1
	<i>rank</i> total projects/population	7	5	8	2	6	1	4	3
All ICT R&D	% of new projects	10%	8%	6%	15%	3%	4%	13%	40%
	total projects/population	0.7	2.1	0.1	5.3	0.3	1.5	2	0.9
	<i>rank</i> % of new projects	4	5	6	2	8	7	3	1
	<i>rank</i> total projects/population	6	2	8	1	7	4	3	5

Source: Forfás eBusiness Monitor 2002

²⁴ Note: United States is excluded from the FDI rankings

2.7\ R&D

Levels of R&D investment – underpinned by appropriate technology-transfer structures to support commercialisation – are generally regarded as the primary driver of a country's innovation performance. Table 2.4 captures gross expenditure on R&D in Ireland as a percentage of GNP for the years 1991-1999.

Table 2.4 Gross Expenditure on R&D (GERD) as a Percentage of GDP 1991-1999

	1991	1993	1995	1997	1999
GERD €m	345.4	501.8	667.4	856.2	1,075.6
GERD as a % GDP	1.07	1.30	1.43	1.45	1.42
EU Average GERD as % GDP	1.98	1.92	1.81	1.8	1.86
OECD Average (26 Countries)	2.32	2.25	2.11	2.16	2.21
Ireland's Rank	19	17	17	17	17

Source: Forfás (GNP used in place of GDP in Ireland)

Gross spending on R&D grew from 1.07 percent of GNP in 1991 to 1.42 percent of GNP in 1999. This remained appreciably below the OECD average (26 countries) of 2.21 percent of GDP – giving Ireland a ranking of 17th in 1999.

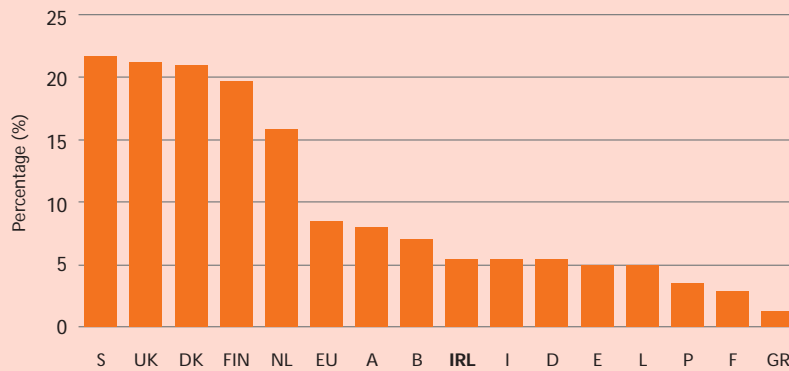
Business sector spending on R&D grew at an annual average rate of 14.6 percent for the overall period 1991-1999, and represented 1.03 percent of GNP in 1999. This compares with an EU figure of 1.2 percent, and an OECD figure of 1.5 percent.

However, it should be acknowledged that relative performance is improving. Government has also committed unprecedented investment of €2.5b to R&D under the National Development Plan 2000-2006, the impact of which is not yet reflected in available data.

2.8\ Education and Training

Engagement with lifelong learning in Ireland is poor in an EU context. Based on data from the Eurostat Labour Force Survey in Spring 2000, the rate of participation here among 25-64 year olds in formal education or training is 5.2 percent, compared to an EU average of 8.4 percent, and a rate of around 20 percent in leading countries.

Figure 2.5 Participation in Lifelong Learning (% 25-64 year olds)



Source: European Innovation Scoreboard 2001

The OECD's 2002 *Education at a Glance* Indicators rank Ireland 15th of 19 countries for participation in education and training by 25-64 year olds.

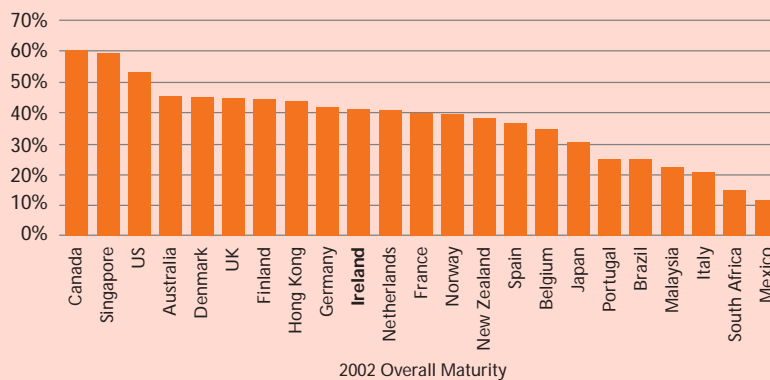
Available data also suggests that we under-perform leading countries in relation to the application of ICTs in mainstream education. Figures from the eEurope benchmarking process in 2002 indicate that we have 5 computers connected to the Internet per 100 pupils, compared with 25 in Denmark, 12 in Finland, 11 in Sweden, 10.6 in the UK, and below the EU average of 5.9.

However, our standing in terms of availability of ICT specialists appears relatively strong. Figures from the Forfás eBusiness Monitor 2002 indicate that we have the highest per capita availability of ICT-related training places at third level among the case study countries.

2.9\ eGovernment

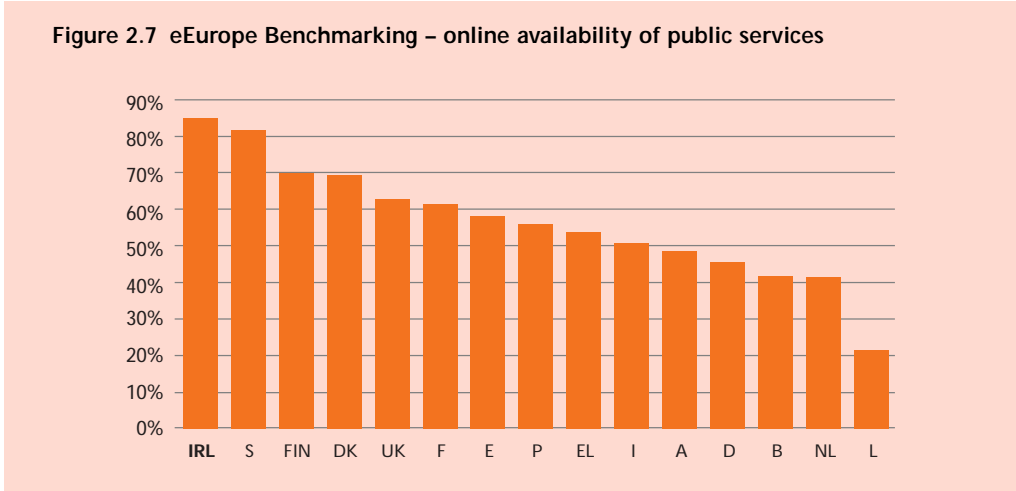
The findings of Accenture's 2002 eGovernment Leadership study are overviewed at Figure 2.6. Ireland is ranked 10th on this index, up from 13th in 2001.

Figure 2.6 Accenture eGovernment Leadership Rankings 2002



2002 Overall Maturity

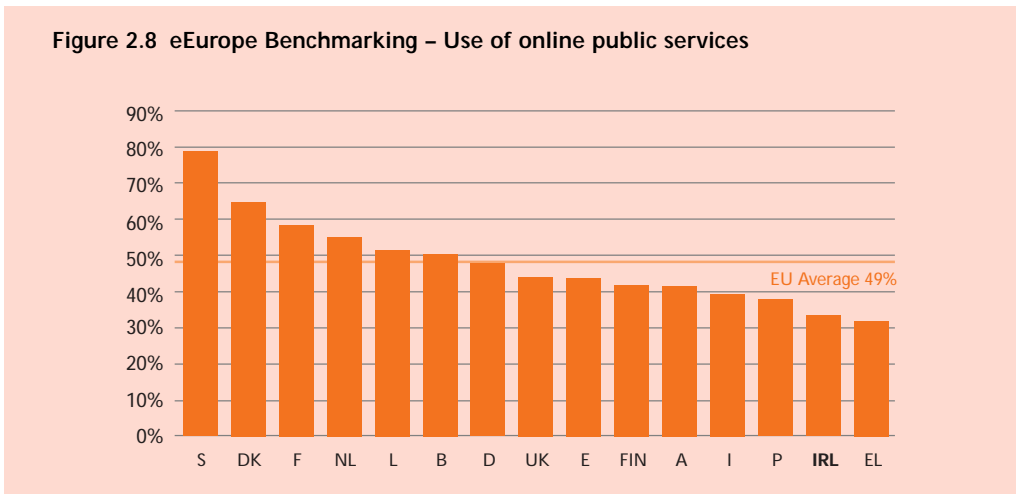
Ireland's approach is seen as somewhat distinctive in placing a high emphasis on integration of service delivery through a single point of contact²⁵, and it is recognised that this may have an impact in terms of capacity to deliver early wins on individual services. Under the *New Connections* Action Plan, Government is committed to the objective of having all public services that are capable of electronic delivery available online, through the Public Services Broker, by 2005.



Source: European Commission (Cap Gemini Ernst & Young)

In the eEurope benchmarking process, Ireland performed strongest of all member states in November 2001 in terms of online availability of 20 basic public services (12 for citizens, 8 for businesses). This performance was repeated in April 2002 – Figure 2.7.

However, the Eurobarometer survey carried out in June 2002 as part of the eEurope benchmarking process suggests that the percentage of Internet users visiting Government websites in Ireland is relatively low at 35 percent, compared to an EU average of 49 percent – Figure 2.8.



Source: European Commission (Eurobarometer, June 2001)

25 The Public Services Broker Model (<http://www.reachservices.ie>)

2.10\ Social Inclusion

As noted by the National Economic and Social Council, an important feature of the social partnership process in Ireland since 1987 has been recognition of the mutually reinforcing nature of economic and social policies – as reflected, for example, in the complementarity between the National Employment Action Plan and the National Anti Poverty Strategy.²⁶

There is also increasing recognition at EU level of the importance of social policies to facilitating the development of a dynamic and competitive knowledge-based economy. An associated shift in emphasis is that from employment per se to quality of jobs.

Along with a general move towards evidence-based policy-making, these developments have substantially increased demand for statistics and indicators at all levels of social policy. However, collection and use of data is less well developed than in other areas. The Commission notes and welcomes in this context the work that is underway within Government through the Steering Group on Social and Equality Statistics towards establishing appropriate indicators to support policy development in the social inclusion area.

2.11\ Relative Strengths

Ireland's relative strengths in addressing the challenges of the emerging knowledge society can be represented as follows:

- Our relatively small size as a country enables us to respond quickly to new developments, and this has been a key factor in underpinning our competitiveness and economic success to date.
- The establishment of the Cabinet Committee on the Information Society in 2001, and the appointment this year of Ms Mary Hanafin TD as Minister of State at the Department of the Taoiseach with special responsibility for the Information Society, equips us with the policy framework needed to coordinate and drive forward this agenda with the necessary urgency at the highest level of Government.
- Government's *New Connections Action Plan* produced in April 2002 captures the key policy commitments that need to be progressed. The challenge is largely one of moving quickly from policy to implementation.
- The Broadband Strategy approved by Government earlier this year, and overviewed in the *New Connections Action Plan*, reflects a new level of public policy engagement with the underlying importance of broadband as a key 21st century infrastructure. This commitment is being underpinned by the appointment in December 2002 of the new Commission on Communications Regulation (ComReg), putting in place a new regulatory regime to support public policy objectives.

- The €2.5b investment in R&D that is being supported through the National Development Plan (2000-2006) reflects a new commitment to the importance of an advanced science and technology base, and recognition by Government that sources of competitive advantage will increasingly depend on knowledge-based innovation.
- The establishment of Science Foundation Ireland to administer the Technology Foresight Fund²⁷ will underpin the creation of a critical mass of world-class research in niche areas of ICTs and Biotechnology. *This initiative is seen by the IDA as the single most progressive and important development in Irish industrial policy in recent years.*²⁸
- We have established a global leadership position in fostering the creation of an innovative and high-tech indigenous enterprise sector.
- Our performance in attracting Foreign Direct Investment is excellent and one of the strongest in the world relative to the size of the economy. In 2000 we received 10 percent of FDI into the EU relative to a population that is roughly 1 percent of the EU total. The ICT sector currently provides approximately 100,000 jobs, over half of which are provided by foreign owned companies, and the sector is currently responsible for around one third of our total exports of goods and services.
- We have a strong reputation for having a well-educated, highly-skilled workforce and have an established responsiveness to the skills needs of the high-tech sector.

2.12\ Relative Weaknesses

Ireland's relative weaknesses in addressing the challenges of the emerging knowledge society can be represented as follows:

- Levels of broadband connectivity are very low both in absolute and comparative international terms.
- We have traditionally low levels of investment in research and development and a relatively low level of patenting activity.
- General societal engagement with Internet technologies is weak relative to leading countries, reflected in a both a low residential Internet penetration rate and significantly shorter amounts of time spent online by the average user.
- We have poor rates of participation in adult education and training by international standards, pointing to a bigger challenge in embracing a culture of lifelong learning.
- We are behind leading countries in the application of ICTs to the education sector.
- Our relatively high VAT rate in an EU context tends to undermine our attractiveness as a location for distribution of digital content – a market that is developing an increasing strategic importance. The global digital content market is estimated to be growing at an annual rate of around 30 percent and is projected to be worth in the region of \$434b by 2006.²⁹

²⁷ €635m over the period of the NDP 2000-2006

²⁸ Is FDI necessary in post Celtic Tiger Ireland? IDA Strategy Statement, October 2002 (<http://www.ida.ie/>)

²⁹ PwC 2002

3

Key Messages for Government



3\ Key Messages for Government

It is not the strongest of the species that survive, nor the most intelligent, but the ones most responsive to change.

Charles Darwin

3.1\ Significance of the Knowledge Society

The emergence of the knowledge society represents a new phase of national socio-economic development. While building on the pervasive influence of modern information and communication technologies, its significance goes well beyond the hyping of the Internet or the dramatic declines in the dot.com sector. The generation and exploitation of knowledge has become the predominant factor in the creation of wealth, giving rise to a transformation of our economy and associated implications for the shape of society.

We must recognise that the strategies we adopt now – most significantly in supporting broadband connectivity, innovation capacity and skills development – are critical to shaping the conditions necessary to underpin higher value economic activity, better jobs, and new social prosperity.

3.2\ Making it Happen

An underlying theme of the knowledge society is the rapid pace of change brought about by developments with information and communications technologies. This clearly presents new challenges for Government and for public policy development.

A review of developments in the Information Society policy area since the original *Strategy for Action* was produced in 1996 points to a level of progress that is disappointing in some respects. While the policy issues that need to be addressed are reasonably well established, it would seem to the Commission that there is room for a stronger engagement by Government in driving forward the process of change.

The Commission notes the following extract from the recent review of the Strategic Management Initiative as pertinent in this context: *SMI/DBG³⁰ introduced a managerialist tone into the civil service which properly focused on the managerial actions and organisational processes required to deliver results within a given policy framework. This assumes however that the policy framework can indeed be taken as a "given". It is not clear that a similar focus has yet emerged around the dynamics governing the evolution of policy, and the arrangements through which ministers and civil servants most effectively interact in shaping such policy and in considering the strategic options for its implementation. Some potential exists to forge a greater connection between ministers and their senior management team in relation to their respective contributions to these matters.³¹*

The Commission welcomes the acknowledgement by Government *that Information Society developments are bringing about the single most dynamic shift in the public policy environment in the history of the State.³²* However, it is not evident that we yet have the corollary shift in public policy priorities to deliver the necessary response to the demands of this new environment, supported by a clear sense of its underlying importance.

It may be that there is a need for more explicit recognition of the extent of the adjustments that are required, and that incremental progress will not allow us to keep pace with radical change.

In support of such recognition, Government's approach must also be characterised by a clear determination to revisit arrangements that are designed to cater for the needs of the past – including, for example, the significant structural shift that is needed in the education and training sector to support a culture of lifelong learning.

3.3\ Policy Cohesion

The emerging knowledge society clearly requires a coherent and co-ordinated response by Government that cuts across both traditional Departmental boundaries, and areas of responsibility within Departments. The Commission is struck by the perception among many commentators that this public policy cohesion is not sufficiently evident to them, and the concern that fragmentation of effort may be impeding overall progress.

³⁰ *Strategic Management Initiative/Delivering Better Government*

³¹ *Evaluation of Progress of the Strategic Management Initiative 2002* (<http://www.bettergov.ie>)

³² *New Connections Action Plan, April 2002*

Government is clearly progressing a range of key initiatives in this area – including, for example, the broadband strategy; new levels of investment in R&D; the Technology Foresight Fund; the Digital Hub; the eGovernment process; ongoing work of the Expert Group on Future Skills Needs; the report of the Task Force on Lifelong Learning; and the ICT in schools programme.

However, there is perhaps room for improved cohesion across Government in capturing the sense of conviction that these objectives are being driven forward in concert towards a shared over-arching goal – the imperative of adjusting to the demands of a new phase of national socio-economic development.

In this context the Commission welcomes the re-establishment by Government of the Cabinet Committee on the Information Society, as well as the appointment of Ms Mary Hanafin TD as Minister of State at the Department of the Taoiseach with special responsibility for the Information Society.

The Commission is confident that a firm focus on policy implementation through the work of the Cabinet Committee, complemented by strong political leadership through the role of the new Minister, can allay any concerns that are held about fragmentation of effort, and can drive forward progress with the necessary level of urgency.

3.4\ The Broadband Challenge

Whereas economic progress in the 19th and 20th centuries was driven primarily by the discovery and use of electric power to drive agricultural and industrial production, it is evident that economic productivity in the 21st century will depend on enhanced application of information and knowledge to economic activity. Broadband is the enabling infrastructure through which information and knowledge will be accessed, used and shared. Future economic development, including our sustained attractiveness to increasingly mobile foreign direct investment, is therefore critically dependent on it.

The importance of broadband investment to the knowledge society will be no less significant than that of electricity to 20th century industrial development. Broadband investment must therefore be guided by a clear sense of its importance as a key 21st century infrastructure, and a key determinant of future socio-economic development, both nationally and regionally.

3.5\ The Innovation Challenge

In the globalised knowledge society, sources of sustainable competitive advantage increasingly depend on knowledge-based innovation. R&D investment – and attractiveness as a location for R&D investment – has become crucial.

Continuous market-driven innovation is the key to competitiveness, and thus to economic growth – accentuated by the erosion of our traditional cost advantages. This requires not only a strong science and technology base, but equally important are the capacities to link fundamental and applied research, to convert the results of that research to new products, services or processes, and to bring these innovations quickly to the market.

Innovation fundamentally means coming up with new ideas about how to do things better or faster. It is about making a product or offering a service that no one had thought of before. And it is about putting new ideas to work and having a skilled work force that can use those new ideas.

The key role of information and communication technologies in this context will be as facilitators of innovation – including innovation in public sector organisational and service delivery arrangements. Success in the knowledge society means that innovation must become everyone's business.

3.6\ The Skills Challenge

The emergence of the knowledge society means an ever-increasing demand for a well-educated and skilled workforce across the whole economy. The countries that succeed in the 21st century will be those with citizens who are creative, adaptive and skilled. Therefore our people – their skills, talents, knowledge and creativity – are the key to future success.

However, investment in people and skills is vital not only for children and young people. The skills required for many conventional occupations are changing rapidly, and it is estimated that 80 percent of people who will be in our workforce in 10 years time are in the workforce already. Lifelong learning must become a key public policy focus in this context, and highlights the mutually reinforcing importance of the economic and social strands to knowledge society development.

General familiarity with digital technologies throughout society, and ready availability of the new skills needed by high-tech and knowledge-based enterprises, is becoming critical to supporting innovation and underpinning sustainable economic development. And the knowledge society in turn can deliver better jobs and higher standards of living to support enhanced social prosperity. In this context it is imperative that we foster a learning environment that facilitates the process of adapting to ongoing change.

4

Initial Recommendations to Government



4\ Initial Recommendations to Government

Joint Research Centre of the European Commission – Futures Project

Information and communication technologies will be one of the key drivers of changes in the economic and industrial geography of Europe. Especially important will be their role as a force for globalisation: through the establishment of globalised firm level networks and trends towards the virtualisation of enterprises.

However, there are equally important countervailing tendencies, especially the tendency towards the 'localisation' of economic activities. It seems that, with the increasing mobility of investment capital, places will have to strive to be 'attractive' in order to maintain stable growth within the global economic system. This means that place specific factors such as skill and education levels, effective institutions and administrations, a modern infrastructure and an innovative industrial base will be the key attractors in the global economy.

Going 'glocal' (i.e. local strategies for the global market), therefore, will be the touchstone of economic development in the years to 2010.

*Institute for Prospective Technological Studies*³³

³³ ICT Panel Report, April 1999 (<http://www.jrc.es>)

4.1\ Broadband

Accelerating Progress

The Commission welcomes the Government's Broadband Strategy produced in March 2002 on foot of the report of the Inter-Departmental Telecommunications Working Group. The strategy involves provision of open-access Metropolitan Area Network (MAN) infrastructure within five years in all 123 towns with a population of over 1,500. Phase 1 involves two parallel actions: funding of a set of pathfinder Metropolitan Area Network (MAN) projects in 20 towns; and establishment of a PPP-type arrangement to integrate management of these local networks and to participate on an increasing basis in the capital investment needed to support further roll-out.

Recent confirmation of funding to support the development of the phase 1 projects in 2003 is welcome. The Commission is also broadly satisfied as to the streamlining of the projects in terms of common architecture standards and specification. However, the pace of progress in rolling out the programme is significant cause for concern to the Commission and needs to be expedited significantly, including arrangements for extending the initiative to the next cohort of towns.

Recommendation 1:

Government needs to accelerate significantly the pace of progress in implementing its broadband strategy, including putting in place as quickly as possible the PPP-type arrangement to integrate management of the Metropolitan Area Network (MAN) projects.

Coherence

The Commission notes that there is a range of Government agencies involved in the area of telecommunications infrastructure. These include the Department of Communications, Marine and Natural Resources, Department of Finance, Department of Enterprise, Trade and Employment, Department of Environment and Local Government, as well as the Department of the Taoiseach which co-ordinates the work of the Inter-Departmental Telecommunications Working Group, and Forfás, which is benchmarking progress. It is imperative that the responsibilities and activities of all these agencies are managed in such a way as to ensure they are mutually reinforcing in contributing to overall progress.

Recommendation 2:

There should be a clear sense of overall strategic direction by Government to ensure that the various agencies that have an involvement in the area of telecommunications infrastructure development act coherently to achieve its objectives.

Backbone Infrastructure

A number of semi-state bodies have made significant investments in fibre optic cable infrastructure, including with NDP support. There may be a public policy interest in leveraging access to this infrastructure on an interoperable and open-access basis to enhance competition in backbone network availability.

Recommendation 3:

The potential role that the fibre assets of semi-state bodies might have to play in meeting broadband policy objectives and stimulating competition needs to be given careful consideration.

Regulation

The Commission welcomes the Communications Regulation Act 2002, which provides for significant strengthening of the regulatory regime governing telecommunications services, and the establishment of the new regulatory body, Commission for Communications Regulation (ComReg). It also welcomes the Minister for Communication's draft policy directive to ComReg, particularly his intention to direct that ComReg use its powers to expedite the introduction of flat-rate Internet access.

Recommendation 4:

The Minister for Communications should provide a clear policy framework and strategic direction to underpin the work of ComReg, including its role in realising policy objectives. The legislation underpinning the new regulatory regime must also be kept under review to ensure that it is adequate to support public policy needs and is sufficiently responsive to any changes in the external environment.

The Director of Consumer Affairs represents the interests of domestic consumers in relation to telecommunications services and products. There is no equivalent representation for business consumers who experience difficulties with telecommunications providers, although reports of lack of product delivery, lack of service delivery and breakdowns in service are legion. Problems and delays can be further complicated by the fact that a business contract may be with an Other Licensed Operator who is, in turn, dependent on provision of service from the incumbent.

Recommendation 5:

The Minister for Communications should ensure that ComReg includes as part of its remit a focus on an independent complaints procedure for dispute resolution between operators and customers.

Planning Process

Telecommunications operators currently experience problems with the range of inconsistent administrative procedures that currently apply when dealing with local authorities. There is also a need to consider mandatory provisions for telecommunications infrastructure in the context of planning permissions for new road, housing and industrial estate developments.

Recommendation 6:

As highlighted by Forfás, Government needs to quickly complete work on the development of a consistent set of regulations for use by local planning authorities in order to provide certainty as to costs and administrative requirements, underpinned by appropriate legislation. Common guidelines for managing telecommunications infrastructure needs in the context of new planning permissions should also be finalised and put in place as soon as possible.

Information on Infrastructure

The Commission is concerned that there are no particular arrangements in place at present to maintain contemporary mapping of telecommunications infrastructure development or broadband coverage, and see this as a strategic deficit that needs to be addressed. The mapping currently available is dated and contributes to uncertainty as to infrastructure availability.

Recommendation 7:

Government should put appropriate arrangements in place to ensure that good quality independent information on telecommunications infrastructure is available, including quality mapping, to support ongoing planning and policy development.

Aggregating Public Sector Demand

Aggregating public sector demand has become a key focus internationally in stimulating the development of broadband markets. Given its role as the single largest player in the economic activity of the country, Government can clearly play a key strategic role in terms of its own adoption of broadband services. The Commission notes that Government in the UK has recently committed to funding broadband connections for every primary and secondary school, GP surgery and hospital, as well as across the criminal justice system.

Recommendation 8:

Government should adopt a clear strategy regarding its role in stimulating demand for broadband services and should commit the public sector to broadband adoption. This commitment should embrace innovative ways of aggregating public sector demand to support the development of critical mass and the commercial case for network investment, as well as innovative applications in areas such as e-health and e-learning.

Radio Frequency Spectrum

Ongoing developments with wireless technologies and applications present ever-increasing demand for limited radio frequency spectrum. Government needs to ensure that the arrangements for managing this spectrum are sufficiently responsive to these developments and avoid in particular the risk of inadvertently inhibiting the development of innovative wireless broadband solutions. The Commission notes in this context that the Federal Communications Commission in the US recently established a Spectrum Policy Task Force.³⁴

³⁴ <http://www.fcc.gov/sptf>

Recommendation 9:

The Minister for Communications should conduct an early review of the regulatory framework for managing radio frequency spectrum and should bring forward proposals as soon as possible aimed at increasing the public benefits from use of this resource.

Universal Service Obligation (USO)

Information Society developments require a review of Government's Universal Service Obligation (USO) for telecommunications services in terms of how this can best be applied to data traffic and the progressive roll-out of higher speed services. The Commission notes in this context the recent publication of the UK Government White Paper which contained a commitment to *review the need for an expanded universal service obligation to include access to high speed Internet connections in light of the coverage delivered by the market.*³⁵

Recommendation 10:

Government should consider extending the Universal Service Obligation for telecommunications services to embrace digital data traffic and should bring forward early proposals for public consultation.

4.2\ Enterprise Development**Investment in R&D**

National competitiveness will increasingly depend on technology-based innovation. Investment in R&D activity is not an area in which Ireland is traditionally strong. However, Government has set about addressing this deficit with R&D investment of €2.5b being supported under the National Development Plan. The Commission would highlight in particular the funding of over €635m through Science Foundation Ireland to support world-class research in niche areas of ICT and biotechnology. We must recognise moving forward that our performance in this area must rise to rival that of competitor countries that have established strong leadership positions, including having regard to best practice in use of fiscal incentives.

Recommendation 11:

The scale of investment in Science Foundation Ireland must be sustained and increased over the longer term.

Recommendation 12:

Government should consider the introduction of specific fiscal incentives to support business R&D investment.

³⁵ A Fair Deal for Rural England, UK Government White Paper, 2002

Commercialisation of Publicly Funded Research

The increased levels of investment in R&D require a new focus on deriving economic benefits from enhanced commercialisation of research. Government agencies have tended to under-invest in commercialisation of non-commissioned research, even relative to historically low levels of public funding. Targeted action must be taken to improve performance in this area, with a new focus on turning ideas into commercial products that can create and maintain new jobs in the longer term. These actions need to be supported by appropriate and clearly stated arrangements for managing the ownership of associated intellectual property (IP).

Recommendation 13:

Government needs to prioritise introduction of clear arrangements to accelerate the level and pace of commercialisation of publicly funded research.

Recommendation 14:

Government needs to introduce clearer policies in relation to the ownership of intellectual property arising from publicly funded research, informed by the objective of improved commercialisation outcomes.

eBusiness Adoption

The high profile collapse of a number of dot.com companies appears to have given rise to a misplaced cynicism about the importance of e-business as a driver of enterprise competitiveness. However, the fundamental significance of the efficiency gains facilitated by Internet technologies remains, and there is no shortage of empirical evidence from enterprise to support this. Government has to date funded a number of support initiatives embracing awareness raising, training and strategy development, and deployment of good practice.

Recommendation 15:

There should be a strong focus on evaluating the outcomes of e-business support programmes completed to date and applying this learning to inform ongoing policy development and to enhance the effectiveness of new initiatives.

Recommendation 16:

The Commission supports a continuation of programmes to support SME e-business engagement, with a particular focus on sectors where traditional business processes are likely to be significantly enhanced by the application of Internet technologies. A high priority should be accorded to the widespread dissemination of sector-oriented case studies that demonstrate clear returns on e-business investment.

Recommendation 17:

It should be a requirement amongst all Government agencies involved in the support of enterprise start-ups and enterprise development that ICT training be included as an integral part of such support.

Recommendation 18:

Government needs to consider the introduction of specific measures to promote greater societal engagement with Internet technologies as a key element of overall strategies designed to bring about greater engagement with these technologies in the enterprise sector.

Recommendation 19:

Where it is appropriate to the workplace, support and assistance should be provided through the National Training Fund for the development of an ICT training plan to include basic computer skills and for the encouragement of companies to undertake training by alternate means such as distance and online learning.

eProcurement

Government's *Strategy for the Implementation of eProcurement in the Irish Public Sector* was published during 2001, along with establishment of the public sector procurement portal.³⁶

The strategy itself captures a compelling business case: Based on a Government procurement spend of €8.8b in 2001, the potential savings to be generated through adopting the strategy amount to a cumulative total of €414m for the years 2002-2007, with additional savings of €177m per annum thereafter – representing a saving of approximately 2 percent on the total spend of €8.8b. It is also clear that the e-enablement of public procurement procedures has very significant potential as a driver of wider engagement with e-business processes in the economy generally.

However, the Commission is concerned that there is little evidence of progress in implementing the strategy since initial establishment of the procurement portal. In a climate of tightening budgetary resources, Government needs to give careful consideration to the potential that Public Private Partnerships (PPPs) and other innovative arrangements might offer in realising the significant benefits that the e-procurement strategy can clearly deliver. For example in North Carolina in the US the State Government has engaged with a private sector partner to build a fully functional e-procurement service that will be funded through a marketing fee of 1.75 percent charged to a suppliers.³⁷ In the UK, the IT procurement of central government is outsourced through the GCat initiative, supporting online catalogues and tendering procedures.³⁸

Recommendation 20:

The potential of the existing portal providing online information about public sector procurement opportunities should be developed quickly to support online catalogues, online tender management, and electronic ordering and payment. The process should begin with the establishment of a national level pilot project, which should be progressed as a matter of priority.

Recommendation 21:

Government must explore the potential of Public Private Partnerships (PPPs) and similar arrangements in driving forward its e-procurement strategy, building on innovative examples of good practice available from experiences in other countries.

³⁶ <http://www.etenders.gov.ie/>

³⁷ <http://eprocurement.ncgov.com>

³⁸ <http://www.gcat.gov.uk>

4.3\ eGovernment

The Commission welcomes the commitment to the e-government process that is evident from the *New Connections Action Plan* – embracing both improved service delivery and the wider challenges associated with the modernisation of business processes. It is clear that the application of information and communication technologies has significant potential to bring about substantial improvements in governance in the context of modernising government. However, it is equally important to recognise that the application of new technology is rarely a solution in itself, and must be closely aligned with the management of cultural and organisational change, appropriately supported by the development of new skills and capacities.

Service Delivery

The Public Services Broker adopted by Government for electronic service delivery is widely recognised as representing international best practice – providing access through a single point of contact, delivered through multiple access channels, and providing necessary protection for personal and business data. Government's commitment that all key public services that are capable of electronic delivery will be available through the Broker by 2005 must also be welcomed in the context.

However, the Commission is concerned that there is little evidence of substantial progress in establishing the Broker since the initiative was announced during 2000. A particular concern is that the pace of progress in establishing common standards and specifications clearly has the potential to undermine the progress that individual Departments and agencies can make in supporting the integrated, user-centred approach that underpins the overall e-government strategy.

Recommendation 22:

The pace of progress in establishing the Public Service Broker is cause for concern and needs to be accelerated significantly.

Recommendation 23:

Government must ensure that common standards and specifications are put in place as quickly as possible that will enable the service delivery strategies of individual Departments and agencies to be aligned with the overarching objective of integrating service delivery through the Public Services Broker.

eGovernance

International attention to the e-government area has tended to focus initially on the transformation of the service delivery model. However there is increasing recognition of the far-reaching implications for background processes, and the potential of information and communications technologies to facilitate a transformation of the structures and operation of the public service. This includes the development of collaborative knowledge-based structures, as well as shared services – such as financial management or human resource management systems – that would operate across traditional boundaries.

The volume of e-government initiatives is also growing significantly and will be characterised by increasing cross-departmental complexity and enhanced impact in terms of service provision. The e-government process is evolving to a mature stage where there is a need for a governance structure that ensures:

- The delivery of value for the investment made
- A development of and adherence to approved standards, both technically and process wide (project management, etc.)
- The integration and alignment of e-government programmes with the wider public sector modernisation process
- A single point of focus that aligns all relevant stakeholders with input and opportunities concerning e-government in Ireland (unions, technology companies, social interest groups, etc.).

Recommendation 24:

The potential of e-government developments to support a transformation in traditional business processes has important implications that must be addressed as a key element of the overall process of public sector modernisation and reform.

Recommendation 25:

There is a need for the establishment of a clear governance structure to support the development of e-government in the context of the wider modernisation process.

Development of Value Cases

eGovernment programmes will absorb significant investment over the years in terms of capital and current expenditure. This investment should enable significant increases in service levels, both reactive and proactive, to citizens over the more traditional channels and as electronic uptake of services increases, so will the breadth and range of services continue to evolve. However the return on investment for e-government programmes should have many facets, including internal efficiencies and savings, external improvements in customer service, and supporting national competitiveness. The Commission feels that there should be an overall template for e-government programmes to ensure the return on investment is measured in both tangible and intangible elements.

Recommendation 26:

Government needs to develop appropriate arrangements to ensure that the assessment of the return on e-government investments captures both tangible and intangible benefits.

4.4\ Legal and Regulatory Issues

A robust regulatory framework is particularly crucial in inspiring confidence and trust and in encouraging people at all levels to engage with the Information Society. Users of ICTs need to be assured that the necessary laws are in place, that these laws can and will be enforced and that appropriate redress is available and accessible.

In tandem with this report, the Commission is publishing a separate report on legal and regulatory issues prepared by its Legal Affairs Working Group. The key recommendations are summarised here.

Awareness

The steady progress of the Information Society has many implications for all groups in society. However, while larger commercial organisations have the resources to become familiar with and benefit from these advances, ordinary citizens and SMEs are often at a serious disadvantage. The Commission recognises that in the past there have been excellent awareness campaigns conducted by Government, business and non-Governmental organizations to promote awareness of the opportunities in the use of ICT. Since building trust and confidence is essential to the achievement of the vision of the Information Society, there is a need to maintain suitable and targeted awareness programmes.

Recommendation 27:

Government should maximise the benefit of awareness programmes by addressing areas of trust and confidence as experienced by the citizen and the SME sector.

Data Protection and Privacy

One of the greatest challenges facing regulators dealing with the Information Society is that of balancing the concerns of law enforcement with personal privacy rights and the freedoms necessary to enable electronic commerce to flourish. Security concerns have been heightened considerably as a result of the events of 11 September 2001 in the US.

The Commission welcomes the *Data Protection (Amendment) Bill*, which is intended to give effect to the outstanding provisions of the Data Protection Directive (95/46/EC). However, the Commission believes that consideration should be given to additional measures necessary to strengthen the legal framework for data protection. These are described in detail in the report of the Legal Affairs Working Group.

Recommendation 28:

Legislative proposals regarding Data Protection should be subject to public debate and clarification.

Unsolicited Commercial Email (UCE)

One of the most frustrating aspects of using the Internet is the rapid spread of unsolicited commercial e-mail or spam, as it is commonly known. At little or no cost to themselves, unscrupulous commercial operators can send out e-mails advertising goods and services to thousands of unsuspecting people who have no interest or desire to purchase them. Recipients are forced to spend time dealing with large volumes of unwanted messages clogging up their systems. In addition, the downloading of UCEs can impose a cost on the recipients.

Although legislation to regulate the use of personal data has been on the statute book since 1988, it has not been effective in preventing the spread of UCEs. In addition, confusion is caused by the existence of different UCE provisions in different EU Directives. EU Directive 2002/58/EC concerning the processing of personal data and the protection of privacy in the electronic communications sector will serve to harmonise this situation at European level.

Recommendation 29:

EU Directive 2002/58/EC should be transposed as soon as possible. The legal position relating to UCE, as a result of the conflict between Directive 2002/58/EC and other Directives, needs to be clarified.

Network Security

The security of computer networks is crucial to the development of the Information Society in Ireland. Both individuals and organisations need to be confident that all electronic transactions are as secure as paper-based ones.

Like any network and information system, there are security and legal risks associated with use of the Internet. The EU has adopted a package of legislative proposals to deal with these risks and the transposition of these measures into Irish law is underway.

Ireland is one of the few states without Computer Emergency Response Teams (CERTs). An Inter-Departmental Committee is reviewing national arrangements regarding computer emergency response.

Recommendation 30:

Government should establish a framework for the operation of Computer Emergency Response Teams.

Cyber-Crime and Law Enforcement

Cyber-crime involves crimes against ICTs and the use of ICTs for the purposes of committing crimes. There are no detailed studies of the extent or impact of cyber-crime in Ireland. There is considerable anecdotal evidence that cyber-crime is widespread. Unfortunately, due to fears of brand damage and a fear of confidentiality leaks, much of the crime perpetrated against business is not reported to enforcement agencies but is dealt with quietly by management.

Recommendation 31:

An in-depth qualitative and quantitative analysis should be conducted into the extent and impact of cyber-crime in Ireland.

Recommendation 32:

Cyber-crime should be given a high priority by the Garda Síochána and adequate resources and specialist staff should be assigned to tackle the growing problem of cyber-crime.

Dispute Resolution

Individuals and organisations must be made to feel confident that their rights will be protected when transacting business online. Redress is currently restricted to the traditional courts process, which can be time consuming and expensive.

An exception is the Small Claims Court, which provides a quick, cheap, fair and easy resolution procedure. The possibility of establishing a similar dispute mechanism online should be investigated. The online nature of the process would save both time and money.

Another approach would be to develop Alternative Dispute Resolution (ADR), a process by which disputes can be resolved without going to court. The eCommerce Directive recognises the usefulness of such systems in resolving consumer disputes in the context of e-commerce. An effective and affordable Dispute Resolution Mechanism would do much to foster confidence in e-commerce transactions among consumers and businesses alike.

Recommendation 33:

A study should be conducted into the feasibility of establishing an online court.

Recommendation 34:

Government should continue to encourage the development of online dispute resolution models.

The European Union

The European Commission plays a key role in determining the internal market legislative framework of the European Union. It is important, therefore, that the EU acts coherently and consistently in the regulatory area of the Information Society. This has not always been the case in the past, where there have been examples of impractical and conflicting measures adopted.

Recommendation 35:

A special group should be established to co-ordinate legislation at Commission level and so prevent contradictory provisions being included in EU legislation.

The International Environment

There is a general recognition that the regulatory framework for the Information Society is at an embryonic stage and requires international co-operation. It is important to identify the most appropriate form of international co-operation as well as its scale. There is, however, a danger of overlapping initiatives and duplication of activities.

International regulatory co-operation in the Information Society area is more likely to succeed where there is a clearly defined and realistic goal capable of delivering a specific outcome within a reasonable timescale.

Recommendation 36:

Ireland's approach to international regulatory co-operation in the Information Society field should be based on needs and priorities.

Recommendation 37:

International co-operation mechanisms should include provision for technical back-up to policy makers and enforcement agencies, for stakeholder involvement and for transparency.

4.5\ Skills and Learning

Taskforce on Lifelong Learning

The structural adjustment to embrace a culture of lifelong learning in the education and training sectors represents one of the key challenges of the emerging knowledge society. The Commission welcomes in this context the recent publication by Government of the Report of the Taskforce on Lifelong Learning. It is also appropriate to acknowledge the progress that is already underway in a number of key areas identified by the Taskforce, building also on the White Paper on Adult Education produced in 2000. These include the development of a National Framework of Qualifications; work by FÁS towards the accreditation of prior and experiential learning; the establishment earlier this year of an IT Fund of €12m being administered by the Higher Education Authority; an initial extension by FÁS of the range of courses available outside standard working hours; extension of the Training Networks Programme with funding of €15m approved over 3 years; establishment of the National Adult Learning Council; the Back to Education Initiative; and the workplace literacy initiative in the local authority sector.

However, we must acknowledge that our rate of adult participation in education and training is low by international standards, and that significant challenges remain that must be recognised and addressed.

Recommendation 38:

The agenda set out by the Taskforce on Lifelong Learning must be embraced by Government as a strategic priority in addressing the challenges of the emerging knowledge society. The shift that is required in the education and training sector – where many current arrangements continue to predominantly reflect the needs of a different era – should be considered in terms corresponding to the significance of the introduction of free second level education in 1967.

Recommendation 39:

Basic ICT skills training for adults should be established as a key component of the Back to Education Initiative and should also, as far as possible, be integrated as a core component of mainstream education and training provision.

Recommendation 40:

Government needs to acknowledge the fee barriers that deter participation of adults in part-time courses. The Commission supports the recommendation of the Taskforce on Lifelong Learning that a grant-in-lieu-of-fees scheme should be introduced for part-time participants in courses in publicly funded further and higher education and training institutions.

Recommendation 41:

The Commission wishes to highlight and endorse the 11 recommendations made by the Taskforce on Lifelong Learning in relation to workplace learning (Chapter 7), and emphasises a particular importance in Government addressing this area in the context of the new need for ongoing training and skills enhancement in the emerging knowledge society.

Recommendation 42:

The National Adult Learning Council needs to be established on a statutory basis as soon as possible in the light of the role it is being given in coordinating, reviewing and reporting on the implementation of the framework set out in the Taskforce report.

eLearning

Government's commitment to exploring the potential for e-learning to contribute to the education and training sectors is welcome. Progress in this area should be accorded a priority consistent with the opportunity that exists to introduce new flexibility to learning provision and to support overall lifelong learning objectives. The Commission would urge the development of an integrated, user-oriented solution across the education and training sectors that avoids reinforcing traditional delivery structures.

Recommendation 43:

The Department of Education and Science needs to develop an overarching e-learning strategy that builds on and is responsive to the needs of all sectors.

Recommendation 44:

Proposals for the development of a national e-learning platform should be expedited and should, as far as practicable, deliver an integrated solution across the education and training sectors.

Recommendation 45:

Specific provision needs to be made for the building of ICT capacity in the further education sector, including capital investment in the purchase of hardware and development of an appropriate technical support solution.

ICT in Schools

Given the increasing importance of digital literacy, the application of ICT at primary and secondary level education is clearly of fundamental importance. Attention must increasingly focus on the integration of ICT into the learning environment, supported by broadband connectivity. Government's New Connections Action Plan contains welcome commitments in relation to curriculum integration, teacher professional development, lowering computer/pupil ratios and networking connectivity. However, the Commission is concerned at the pace of developments in these areas and is of the view that progress needs to be accelerated significantly.

Recommendation 46:

The Commission wishes to express concern at the significant cut in capital investment in ICT in schools proposed for 2003 and urges that this area must continue to be accorded a high priority. Capital investment must also be supported by a clearer policy framework capturing high-level objectives, and by the establishment of recognised indicators to measure progress.

Recommendation 47:

Government needs to make a high-level political commitment to establishing a broadband connectivity solution for schools. Priority should also be given in this context to integrating the connectivity needs of education centres, libraries, and other places of community-based learning.

Recommendation 48:

Government must also make clear provision for an integrated technical support solution for the education sector.

Recommendation 49:

While considerable progress has been made in the integration of ICT into the primary curriculum, the pace of progress at second level needs to be accelerated, including a review of the approach to ICT in existing teacher training provision. The professional development needs of teachers must also be clearly established and addressed in this context.

Taskforce on the Physical Sciences

The Taskforce on the Physical Sciences reported during 2002. A key finding was that at a time when we need to guarantee a continued supply of science, engineering and technology graduates, we are experiencing a decline in interest and participation rates in these areas.

The report set out a 6-part strategy designed to address this emerging deficit, covering: planning and resources for school science; equity of access; teaching and learning of science; school curriculum and assessment; promotion of science and careers; and science education at third level.

The Commission endorses these conclusions. Action in this area is critical to the policy objective of establishing Ireland as a centre of excellence in niche areas of world-class research in the emerging knowledge society.

Recommendation 50:

The Commission supports the recommendations of the Taskforce on the Physical Sciences and urges early action by Government to address emerging deficits in the numbers of science, engineering and technology graduates.

4.6\ eInclusion

Policy Coherence

The Commission welcomes Government's commitment to inclusive Information Society development as reflected in its New Connections Action Plan. It is also appropriate to acknowledge that a number of significant initiatives have been taken to date. These include the 1,400 Internet access points available through the public library network, the CAIT programme supporting community-led projects aimed at engaging late-adopters of new technologies, the Equalskills pilot project in the South West and Shannon regions aimed at building basic ICT literacy, and the comprehensive IT Accessibility Guidelines produced by the National Disability Authority during 2002. The commitment to deliver the Public Services Broker through multiple access channels – including telephone contact centres and one-stop-shops – should also be noted in this context.

However, these initiatives have in the main been taken in isolation from each other. The Commission takes the view that there is room for significantly improved coherence between Government initiatives in the e-inclusion area, supported by a stronger sense of underlying strategic policy direction.³⁹ Evaluating and applying the lessons learned from pilot projects must also become a more important focus.

Recommendation 51:

Government needs to adopt a more strategic and coordinated approach to public policy objectives in the area of inclusive Information Society development. The Commission acknowledges that it can play an important role in supporting policy development in this regard and is working to bring forward specific proposals for consideration by Government in early 2003.

Recommendation 52:

There should be a strong focus on evaluating the outcomes of e-inclusion initiatives carried out to date and applying this learning to inform ongoing policy development and to enhance the effectiveness of new initiatives.

³⁹ It is appropriate to acknowledge that this perspective builds on the positive contributions made by the key stakeholders from the various Government Departments and Agencies at the eInclusion Workshop organised by the Commission in June 2002

Social Inclusion Context

Building an inclusive society is set out as the key priority of Government in the National Anti Poverty Strategy (NAPS), which contains a nationally agreed set of policy targets, proposals and programmes towards the elimination of the main factors contributing to the prevalence of relative poverty and social exclusion in Irish society. Careful attention is needed in this context to the risks of new forms of exclusion associated with the emergence of the knowledge society and the increasing prevalence of new technologies. For example, the International Adult Literacy Survey (1997) points to the need for a new emphasis on document literacy skills to support participation in an increasingly knowledge-oriented society. Basic ICT skills are also increasingly seen as a component of functional literacy.

Recommendation 53:

Government should ensure that the National Anti Poverty Strategy (NAPS) and all other social inclusion measures include appropriate indicators to reflect new risks of social exclusion associated with the emergence of the knowledge society.

Community and Voluntary Sector

The *New Connections Action Plan* notes that community and voluntary organisations have the potential to play an important role in engaging late adopters of new technologies. The evaluation of the community-led projects supported through the CAIT initiative should contribute to better understanding of how public policy can support and facilitate this role. However, it is important that further policy development in this area is underpinned by a process of dialogue and consultation with the community and voluntary sector, building on fora such as the Implementation and Advisory Group (IAG) established under the White Paper on Supporting Voluntary Activity, and the support provided by Comhairle to the sector. The potential of awareness building measures in the sector should also be explored in this context.

Recommendation 54:

Government must ensure that policy development in relation to the role of community and voluntary organisations in inclusive Information Society development is underpinned by a process of dialogue and consultation with the community and voluntary sector.

Recommendation 55:

The Minister for Community, Rural and Gaeltacht Affairs should bring forward early proposals in relation to the role of ICT in supporting wider community development objectives, building on the evaluation of the CAIT initiative.

Role of Community Champions

Leadership has a key role to play in highlighting the innovative potential of new technologies, their applications, and fostering greater engagement with them. In this context, the Commission is very supportive of the concept of *Community Champions* as set out in the Government Action Plan to support the Universal Participation initiative – working with the various education, training, business, local development and community and voluntary interests to agree objectives, encourage engagement with ICT, and create a shared sense of purpose in Information Society development. There is no doubt that this should be an important feature of any strategy to engage late adopters of new technologies, particularly in the light of evidence from a number of sources that many remain to be convinced that such technologies have a relevance for them.⁴⁰

It is therefore a cause for concern that the Universal Participation initiative, which was to have been progressed on a proof-of-concept basis in 2002, has not yet materialised. The Commission sees significant potential in this initiative, building on the deployment of *Community Champions* and supported by the bringing together of budget-holders and decision-makers from the key public service and local development agencies through the County and City Development Board (CDB) structure.

Recommendation 56:

Clear priority must be given to progressing the Universal Participation initiative building on the leadership role of Community Champions as set out in the Government Action Plan. The creation of an engaging digital environment at the level of local needs should be key focus in this context.

ICT Literacy

ICT Literacy is increasingly recognised as a basic skill, including for example by the White Paper on Adult Education and the recently published report of the Taskforce on Lifelong Learning. The Commission is concerned that, aside from the Equalskills pilot project, there is little evidence of substantive public policy engagement with addressing its increasing importance.

Recommendation 57:

Government must give a high priority to the establishment of a national ICT Literacy programme, building on the experience of the Equalskills pilot project.

ICT Accessibility

The IT Accessibility Guidelines produced by the NDA during 2002 must be welcomed as a key development and provide clear direction on best practice in designing usable interfaces for service and information delivery. The guidelines need to be supported by a monitoring process to establish compliance levels, including amongst public sector agencies.

⁴⁰ For example in a survey carried out for the previous Information Society Commission by MRBI in 2000, over half of respondents who did not have Internet access were either not at all or not very interested in having such access

Recommendation 58:

The NDA should establish a monitoring process to determine levels of compliance with the IT Accessibility Guidelines and whether further actions may be needed to promote their adoption.

DTT (Digital Terrestrial Television)

It is clear that the digital television has important potential to support greater access to new online content and services through a medium that is user-friendly and already a familiar household appliance. Government had intended that the DTT (Digital Terrestrial Television) platform be introduced in Ireland by two separate transactions – the selection of a DTT multiplex licensee, and the sale of the RTÉ transmission network. In the light of the unsuccessful outcome to the competition to select the multiplex licensee, Government needs to develop a new strategy for the DTT platform as quickly as possible.

Recommendation 59:

The Minister for Communications should bring forward new proposals for the DTT (Digital Terrestrial Television) platform as a matter of priority.

4.7 Northern Ireland Cooperation

The Commission welcomes the all-island cooperation underway through InterTradeIreland in the exchange of information on trade, business development and related matters, and specifically in the areas of telecommunications, information technology and electronic business. A key initiative is the *Digital Island* concept, developed in liaison with the Department of Enterprise, Trade and Employment in Dublin and the Department of Enterprise, Trade and Investment in Belfast, and aimed at seeking the fullest exploitation of digital technologies by businesses across the island.

The Commission also sees value in extending cooperation beyond the enterprise sector in identifying shared challenges associated with the emerging knowledge society, including issues such as e-government, e-health, e-learning and addressing the digital divide.

Recommendation 60:

The benefits of all-island cooperation insofar as the enterprise sector is concerned should continue to be pursued through InterTradeIreland. The value of extending all-island cooperation to knowledge society issues that go beyond the scope of the enterprise sector should also be explored, and the Commission will be including a focus on this issue in the context of its ongoing work programme.

Appendices



Appendix 1

Glossary of Abbreviations

ADR – Alternative Dispute Resolution
 CAIT – Community Application of Information Technologies
 CDBs – County and City Development Boards
 CERT – Computer Emergency Response Team
 COMREG – Commission for Communications Regulation
 CIA – Central Intelligence Agency
 DBG – Delivering Better Government
 DCA – Director of Consumer Affairs
 DSL – Digital Subscriber Line
 D&T – Deloitte and Touche
 EIU – Economist Intelligence Unit
 EPO – European Patents Office
 EC – European Commission
 EU – European Union
 FDI – Foreign Direct Investment
 GDP – Gross Domestic Product
 GNP – Gross National Product
 ICT – Information and Communication Technology
 IDA – Industrial Development Authority
 IDC – International Data Corporation
 IP – Intellectual Property
 IS – Information Society
 ISC – Information Society Commission
 MAN – Metropolitan Area Network
 NAPS – National Anti-Poverty Strategy
 NDA – National Disability Authority
 NDP – National Development Plan
 NESCC – National Economic and Social Council
 NRI – Harvard Networked Readiness Index
 OECD – Organisation for Economic Cooperation and Development
 OLO – Other Licensed Operator
 PPP – Public Private Partnership
 PSB – Public Services Broker
 R&D – Research and Development
 SFI – Science Foundation Ireland
 SME – Small and Medium Enterprise
 SMI – Strategic Management Initiative
 UCE – Unsolicited Commercial Email
 USO – Universal Service Obligation
 USPTO – United States Patent and Trademarks Office
 VAT – Value Added Tax
 WCY – World Competitiveness Yearbook

Appendix 2

Membership of the Information Society Commission

Chairman

Dr Danny O'Hare

Members

Ms Inez Bailey, National Adult Literacy Agency

Mr Michael Byrne, Ennis Information Age Services

Ms Dee Carri, Torque Management

Rev Dr Eamon Conway, Mary Immaculate College of Education – University of Limerick

Dr Chris Coughlan, Hewlett Packard

Ms Claire Cunningham, Aura Internet Services Ltd

Mr Joe Horan, South Dublin County Council

Ms Karen Hynes, Chambers of Commerce of Ireland

Mr Robert Johnston, JLS Technology

Mr Brian Lennon, St Oliver's Community College

Ms Clodagh O'Donnell, IBM

Dr Patricia O'Hara, Western Development Commission

Ms Marion O'Neill, Kilkenny Information Age Town

Ms Kathryn Raleigh, IBEC

Mr Colm Reilly, PA Consulting

Mr Peter Ryan, Department of the Taoiseach

Mr Jerry Shanahan, ICTU/Amicus

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Appendix 3

Membership of Working Groups

Broadband Working Group

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Mr Adrian Devitt, Forfás

Mr Tim Duggan, Department of Finance

Ms Karen Hynes, Chambers of Commerce of Ireland

Ms Fiona Murphy, CMS Peripherals

Mr Deaglán Ó Briain, Department of the Taoiseach

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Ms Deirdre Garvey, The Wheel

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Mr Tommy Kavanagh, Meath County Council

Ms Úna Ní Fhaircheallaigh, Department of Community, Rural and Gaeltacht Affairs

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Mr Seamus Mulconry, Accenture

Mr Dermot Nolan, Bank of Ireland

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Mr Declan Ganley, Ganley Group

Mr Peter Mooney, RTÉ

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Ms Annette Dolan, Teachers' Union of Ireland

Mr John Fanning, Department of Education and Science

Ms Margaret Kelly, Department of Education and Science

Mr Brian Lennon, St Oliver's Community College

Ms Anne Looney, NCCA

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Mr Enda Kyne, The National Microelectronics Applications Centre Ltd

Mr Conleth O'Reilly, Xerox (Europe) Ltd

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