NORWEGIAN MINISTRY
OF GOVERNMENT ADMINISTRATION AND REFORM

Summary in English: Report No. 17 (2006–2007) to the Storting

An Information Society for All

Translation from the Norwegian. For information only.

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1 Objectives and summary

1.1 Introduction

Information and communications technology (ICT) has changed the world, not once, but several times over. In July 1945 Vannevar Bush published his famous article[1] "*As we may think*". He was concerned with how the science of warfare, when the war ended, might be used in peacetime applications, his main vision being to ensure access to all the sources of knowledge that had been accumulated over the ages. The rationale was that we build mountains of knowledge and research findings but fail to keep them at our fingertips and coordinate the findings obtained by thousands of scientists all over the world. As an example, he refers to Mendel's concept of the laws of heredity: it was lost to the world for a generation because his publication did not reach the few who would have been capable of putting it to use. In 1945 Vannevar Bush's dream was to develop new technologies for storing and retrieving information, for the Encyclopaedia Britannica to be stored in a unit the size of a matchbox, of a library of millions of books that could be kept in a desk drawer and that the entire body of human knowledge, right back to the earliest days of printing, could be packed in a pickup truck. He continues to dream, still in 1945, that storage of the Encyclopaedia will cost 10 cents and that transmitting the contents to anywhere in the world will cost one cent.

Today, these dreams have become reality. Through new technology we have capabilities beyond Vannevar Bush's wildest dreams. We carry miniature libraries in our pockets, we have dispensed with distance and altered much of the way we work, while our recreation and interaction with friends and acquaintances has changed beyond all recognition.

Our shared body of knowledge, combined with rapid technological progress, offers vast potentials for further development of the information society. Digital literacy in the population, efficient public services and predictable framework conditions are key elements that must be in place in order for Norway to remain one of the world's most desirable countries to live in. The fact that our common progress should be inclusive and embrace everyone is more than a heartfelt cause for the present Norwegian government. It is an imperative.

ICT by its very nature transcends boundaries and penetrates all sectors and areas of society. With a commitment to coordinate the ICT processes involved, this then offers great opportunities for bringing together and making the most of society's common resources. Such developments should be founded on effective cooperation between the private and public sectors, between citizens and authorities and between individuals with differing abilities and resources. This will fos-

[1] http://www.theatlantic.com/doc/194507/bush

ter more efficient use of public resources, reform and efficiency improvements in the public sector and improved services for citizens and business and industry. This in turn will allow us to sustain and renew the competitiveness of business and industry and raise the nation's general and digital skills. Good cooperation is how we boost each other, generate economic growth, create new jobs and ensure the security that most of us take for granted.

The present whitepaper is broad in scope. It deals with several major topics and invites debate on key choices of direction and challenges for Norwegian society. It comments on the present era, but does not attempt to look deep into the crystal ball. It addresses topics concerning skills and digital inclusion and homes in on a trend in which the preference should be for universally designed solutions. This dictates the need for reform and efficiency improvements in public administration based on effective and standardised technical solutions that are accessible to the users as and when they themselves require them. The whitepaper also focuses on business development and increased ICT research. It deals with personal data protection issues associated with ICT usage and with national security concerns associated with a common electronic infrastructure to which public authorities, business and industry and the majority of individuals are connected. The government has many objectives and ambitions for societal development such as those laid down in the Government's political platform (Soria Moria Declaration). We have to achieve these, with technology as an aid rather than a barrier to progress. And some of these objectives will be far more readily achievable by the government via the directions for ICT policy set out in the present whitepaper.

In many ways the creation of the information society in Norway is a success story. But the development process is far from over. The cards have not been dealt once and for all: there are new rounds coming all the time. New possibilities are just around the corner, while old solutions are relegated to the scrap heap. Competition is rife internationally to create values through ICT. It is therefore important how we make provisions for the individual, for companies and for institutions so that Norway can retain its leading-edge position in the future too.

1.2 Projected trends: Why we need a cohesive ICT policy (Ch. 2)

Technological progress is set to proceed at a fast rate *for at least another decade*. Accordingly, rapid change will prevail among companies, institutions and individual users. This fast rate of change is a challenge in itself because the decision-making processes that necessarily precede new policies and new regulations can take years. In the field of ICT, changes often happen so fast that there is a risk that parliamentary decision-making and bills exceed their "expiry date".

Rapid technological progress leads to demanding challenges in making and implementing policies. An ICT policy is successful above all if it enables the government to achieve its ambitions in important social areas, e.g. within reforms of the public sector, within business and employment sector policies, education and research policy and health and social policy.

Because ICT policy *transcends barriers* and is implicated in the majority of traditional policy areas, there will be a constant need for *cross-sectoral initiatives*. A modern society such as Norway's, with its fast pace and dynamism, creates a continual need for new policies and new regulation while the technology itself changes the premises for the regulation applicable at any time within a number of policy areas.

The development and implementation of a *cohesive ICT policy* is necessary for further development of the information society. The present government holds that those countries that pursue a policy which taps into the potentials and reaps the rewards of ICT while successfully countering or mitigating unwanted effects also stand to achieve higher growth and better welfare than countries that fail to deal with the need for change.

1.3 ICT generates higher productivity and increased welfare (Ch. 3)

ICT is a *main driving force in the economy*. Recent EU data reveals that the ICT sector represents 5 per cent of the Member States' gross domestic product, but drives 25 per cent of the total growth in the economy and 40 per cent of productivity growth. The all-pervasive nature of ICT means that it boosts productivity in a number of sectors and industries, from feed in agriculture and fisheries, through automation in heavy industry to radical changes in widely differing service sectors such as retailing, banking and insurance. In addition it is a

facilitator for more effective and enhanced production of public services. And the higher the productivity growth, the more we stand to gain in the way of increased prosperity.

1.4 Everyone must be able to participate in the information society (Ch. 4)

Norway ranks among the global leaders in terms of ICT penetration in society. This results in easier access to services and information – both public and private – for all those that are part of the information society. Because ICT is a facilitating technology, it is vital to make provisions for people who for various reasons are outside of the information society, either by choice or otherwise. In a society undergoing rapid change, access to and use of ICT is instrumental in upholding fundamental principles such as participation and inclusion.

Three preconditions in particular form the basis for the government's commitment to digital inclusion: *digital access, universal design and digital skills*.

Digital access is above all a question of ensuring everyone of good provisions for high-speed Internet access. Place of residence should not be what determines whether or not people can take part in the information society. In 2007 the government will therefore be increasing its broadband appropriations.

Universal design of ICT solutions is a precondition for participation by everyone. The government operates with the specific objective of ensuring that all technological solutions involving ICT in the public sector are based on universally designed solutions – in self-service machines as in computer solutions. The private sector will be urged to follow suit.

Digital skills throughout the nation are essential. The government will therefore be increasing the focus on digital skills and making better provisions for disadvantaged groups such as elderly persons and those outside of the labour market – groups who at present fall behind in access to electronic solutions. However, school pupils and people in employment will also need to build their digital skills through school and working life in order to become discerning media users. The commitment to ICT in the Norwegian education system will be stepped up. Key elements include ensuring access to computers and the Internet for all pupils and teachers and extending the use of digital learning resources. The government aims for Norwegian schools to be pioneers at global level in the use of ICT in teaching and learning. At the same time it is important to focus on other arenas for skills acquisition. Voluntary organisations play a key role in this work, as do libraries and public services, such as those offered by local labour and welfare offices. Digital skills are not abilities that are acquired once and for all, like riding a bike or swimming. Good digital content is a key to skills acquisition, and the government will therefore be focusing on this type of approach. It is important to make access to content, such as that from the National Library of Norway, the Norwegian Broadcasting Corporation and other sources of knowledge and information as straightforward as possible.

1.5 ICT research – essential for sustained progress (Ch. 5)

Research has been and will continue to be crucial for advances in information and communications technology, including use of the technology. Such research should be wide-ranging and embrace technology, social sciences, law and the humanities. Participation in international research projects is decisive for Norwegian research efforts also. Another success criterion is to achieve adequate scientific and mathematical skills in society.

Business and industry currently accounts for just under half of the total volume of R&D activities in Norway. Approximately one third of this is research into the ICT sectors, which are thus more research-intensive than other sectors. Public research initiatives present a somewhat different picture. Government appropriations for ICT research in the Research Council of Norway's budget have stagnated in recent years in spite of the fact that ICT was identified as one of four prioritised areas as early as in 1999. This prioritisation was laid down in Report to the Storting No. 20 (2005–2005), in which ICT was designated as one of three prioritised technology areas. The government will seek to assure ICT research of better conditions in the years to come. ICT research must therefore be accorded higher priority within the prevailing frameworks for research.

Norwegian commitments to the High North and scientific programmes such as International Polar Year will serve to boost ICT research. Information and communications technology has favourable preconditions for contributing to value creation, prosperity and security in the High North and Polar Regions. A proportion of the government

appropriations for these special commitments is therefore earmarked for ICT research.

1.6 ICT fosters competitive and knowledge-oriented business and industry (Ch. 6)

In recent years developments in information and communications technology have influenced trends and framework conditions notably in the service sector, which accounts for the greater proportion of value creation in the economy. In 2005, the ICT sectors alone produced turnover of NOK 177 billion, an increase of two per cent over the preceding year.

The interaction between an ICT-provider industry and use of technologies in business and industry is generally of great importance. Business and industry policy within ICT should therefore operate with two types of focus. Firstly it should provide good operating conditions that promote innovation and value-creation within the *ICT sectors*, among other things through the innovation policy instrument systems of Innovation Norway[2] and SIVA (Industrial Development Corporation of Norway). Secondly, the authorities will need to make provisions for the sustained development and use of ICT throughout business and society generally.

One of the challenges is to build the capacity of business and industry for making efficiency improvements with the aid of ICT. Here the challenges include lack of expertise in small and medium-sized businesses, both in terms of basic user skills, but also high-end technological expertise. Raising the level of *ICT skills in business and industry* is a prime objective for the government. However, the extensive take-up of technology in the population generally is an important competitive advantage. In the future, large generations will be taking retirement at a time when demand for high-end expertise will be increasing. Some of this expertise is available from countries outside of Europe. The lengthy applications processing time for job appointments in Norway has in many cases meant that the needed expertise has instead been sourced from enterprises and institutions of education abroad. The Norwegian government is therefore committed to ensuring that the processing time for applications connected with recruitment from countries outside of Europe will also be speeded up.

Another challenge is to encourage more enterprises to make effective use of e-commerce solutions. The government will seek to promote greater take-up of e-commerce.

1.7 Round-the-clock electronic public administration improves services (Ch. 7)

Norway is at the forefront internationally in implementing ICT in the public sector. But the sector is large, the actors are many, and interaction between them could be improved. Each individual government organisation is responsible for its own procurements or development of in-house ICT solutions, while we also have an autonomous municipal sector. The result is that many electronic services are scarcely coordinated since the solutions have been developed "locally" without reference to broader, common requirements.

The government's aims here are two-fold. We want the users to be met by an *open, accessible and coherent public sector* offering integrated and fully digital services via sound electronic self-service solutions. We also want to *effectivise and free up resources through the use of ICT* in order to strengthen public welfare provisions, while reducing administrative burdens. In the future, developments in society will put public finances under pressure, and increase the need for adjustment processes.

The government will make provisions for *round-the-clock electronic public administration* entailing far more extensive interorganisational cooperation. This will pose challenges for organisational, legal and administrative processes in the public sector. The realisation of round-the-clock public administration will be based on the main principle of developing electronic self-service solutions, establishing common, cross-sectoral solutions and formulating universal architectural principles for ICT solutions in the public sector.

Electronic services, both for citizens and businesses, must be accessible via the *"Miside" ("Mypage") citizens website portal and the business portal "Altinn" ("AllIn")*. Every business in Norway will be responsible for implementing this in practice. The establishment of cross-sectoral common components will underpin the development of decentralised solutions and function across divides and public administration tiers. One example of this type of common components are the solutions

[2] Innovation Norway offers products and services intended to help boost innovation in business and industry nationwide, foster regional development and promote Norwegian industry and Norway as a tourist destination.

for secure authentication (logging in) of persons and businesses. In addition, new, large-scale national ICT projects will assess the extent to which they possess components that could be used in a common public ICT infrastructure. The establishment of common architectural principles for the public sector is the very framework for the development of ICT systems and must be based on a tiered framework.

The government will base its software policy on open standards and more extensive use of open source software. The use of *open ICT standards* is important, among other things because it promotes enhanced interaction between enterprises and counteracts the tendency for public enterprises and users to become locked into particular technologies and providers. The government also wants public enterprises to make more extensive use of solutions based on *open source software*. A culture of sharing software developed "in-house" will benefit organisations, businesses, students and ICT specialists.

Observance of these principles will to a greater extent than previously call for *cross-sectoral coordination functions* within areas such as standardisation, use of concepts and financing. This will also dictate the need to devise new ways of organising and managing work processes.

1.8 Effective personal data protection is a precondition for the information society (Ch. 8)

We leave an increasing number of electronic trails behind us as our right to privacy is challenged by more extensive registration and intensive use of personal data. The purpose of such registration and usage will often be entirely proper, and it is therefore important to acknowledge the vulnerability of personal data protection. While the importance of fighting terrorism and organised crime is generally indisputable, this also makes it easier for "new" surveillance and monitoring activities to gain acceptance. However, this puts personal data protection at risk of being "exchanged" for financial or other gains.

Surveys reveal that people generally and in the business community are not well-informed about personal data protection issues. The same applies to compliance with the Norwegian Act on processing of personal data.

Personal data protection interests are challenged by other interests – both commercial and those for the common good. The individual's wish for discretion may come into conflict with other interests. Isolated actions may appear harmless, but the sum of such actions over time may be to the detriment of personal data protection. One important challenge in the future will be to bear in mind the integrity of the system of personal data protection and the diverse challenges it presents. To that end, the government is proposing to establish a personal data commission which will perform a comprehensive status review, while at the same time examining how personal data protection can avoid being weakened by the introduction of new technology.

In parallel with this project, the government will be implementing other measures, including a focus on *the right to anonymity*, and the development of solutions to ensure provisions where anonymity is appropriate and identification is not necessary. The government is also proposing measures to encourage the use and application of technology in ways that will reinforce personal data protection, including the use of so-called privacy enhancing technologies. In addition, measures will be proposed to examine the need for improved coordination of various supervisory bodies and the need for improved harmonisation of the rules governing personal data protection.

The whitepaper also proposes measures to extend awareness of privacy issues and associated legislation, particularly with a view to awareness-raising and targeting information for minors concerning safe and secure use of the Internet. Legal protection in the use of automated decision support systems and the introduction of any requirements regarding privacy protection in purchasing and development areas are other issues that will be addressed.

1.9 Everyone has a part to play in assuring ICT security in the society (Ch. 9)

ICT security is a natural sub-theme in general ICT policy. This chapter, and in particular section 9.4, also sets out the government's response to the fact-finding report commissioned by the Storting on 2 March 2006 during its deliberations on the Office of the Auditor General of Norway's investigation into how to secure IT infrastructures, cf. Doc. no. 3:4 (2005–2006) and Recommendation to the Storting no. 85 (2005–2006).

The government's main objective is for society's general ICT security to be effective. ICT infrastructure of critical importance for society must be

robust and secure in the face of the potential threats to which it is exposed. Critical information systems must be secure so that the harmful effects of any breaches of security are no greater than what may be defined as 'acceptable risk'. General awareness must be raised of the risks associated with information systems and networks, of policies, routines, measures and procedures that are available to counter these risks and of the need for these to be adopted and implemented. In the past, ICT security was a task for specialists. This has changed fundamentally. Now everyone has a role in achieving ICT security in practice: the public sector, private enterprises and individual users at work and in their own leisure time.

The government has reviewed responsibilities surrounding ICT security. Primary responsibility for securing information systems and networks rests with owners/operators, after which each responsible ministry has a general *sectoral responsibility*. The Ministry of Government Administration and Reform's *coordinatory responsibility* for ICT security will apply exclusively to *preventive, cross-sectoral efforts*. To that end, in its budget proposal for 2007, the government proposes transferring budgetary responsibility for NorCERT (Norwegian Computer Emergency Response Team) from the Ministry of Government and Administration and Reform to the Ministry of Defence The former will retain responsibility for the Norwegian Centre for Information Security (NORSIS) which pursues a preventive approach.

2 Status and trends

2.1 Information and communications technology: life nerve and facilitator for the whole of society

Information and communications technology (ICT[1]), and the Internet especially, have brought enormous economic and social changes worldwide. Individuals, business and industry, public administration and other organisations place their trust in and are dependent on large and small computers, mobile communications and Internet in everyday life. Society has become so dependent on ICT/the Internet that it is necessary to direct focus at emergent trends, to assess strengths and weaknesses and formulate the necessary policies and technological requirements to ensure that ICT continues to be a significant driver of Norwegian economic growth and prosperity in the future.

The liberalisation of telecommunications markets and rapid technological advances have changed the significance of ICT fundamentally. The figure for broadband subscribers in the OECD area has grown from around one hundred thousand in 1998 to 158 million in 2005. In 1998 the average speed of data communications (dial-up connections) was a maximum of 56 Kbps (thousand bits per second), while broadband today offers speeds from 2 to 50 Mbps (million bits per second), and for fibre connections, 100 Mbps. Increased capacity and take-up makes it possible to provide new services over the Internet and use that channel for capturing new user groups. Developments are proceeding at such a rate that it is difficult for policy-makers and regulators to keep pace.

Technological *convergence* between fixed and mobile networks is likely to take on great importance in the coming years. Cheap computer chips with RFID (Radio Frequency Identification) and sensor networks are set to have great impact and consequences. The chips, which are linked to the Internet, will be attached to everyday objects such as suitcases, postal packages or garments in shops, making it possible to identify and track each object. These technologies will build bridges between the physical world and the information systems in areas such as transportation, logistics and the retail trade and promote greater productivity and social benefits.

Meanwhile, networks are evolving. Next generation networks will not consist of single networks, but systems of multiple, interconnected networks interoperating over the Internet.

Two main messages in this chapter are:

- The rapid progress of ICT will continue, for at least another decade. The underlying technological developments will continue at the same rate and hence also the rapid changes in the market and among users.
- A considered and cohesive policy is needed on ICT. Those countries that have a well-founded policy for exploiting the potentials and reaping the rewards of ICT, while at the same time countering or mitigating unwanted consequences, stand to achieve higher growth and better welfare.

2.2 We have been using ICT for a long time, but are only at the start of the Information Society

In international comparisons of ICT, the general picture puts Norway well in the lead in terms of take-up of new technology. We are often among the 10 leaders globally, but rarely number 1. We have been using ICT for many decades, but are still in the start lane in terms of development of the real information society. The commercial Internet has been around for just over a decade, and we are still working to formulate standards and create services that "talk" to each other. Many people are still outside the digital society. The majority of young people have an intuitive feel for ICT, but for those who have lived 40 years or more with a completely different frame of reference, logging on does not always come naturally.

Registries based on the Norwegian national identification number, simplifications in administrative procedures and considered use of the infor-

[1] In this report we have chosen to use the term ICT instead of IT since ICT now appears to be a commonly adopted term, while there are only minor – if any – distinctions between the two terms.

mation available have meant that Norway now has a number of fully and part-automated solutions whereas other nations have *many different* electronic services. This gives Norway an advantage. Internationally, Norway is also among the leaders in factors such as access to the Internet, online public services, the diffusion of mobile technology, the use of ICT in industry and business and effective payment solutions. Equally, Norway has a well-developed system of public ICT regulation, with supervisory bodies such as the Norwegian Post and Telecommunications Authority, the Data Inspectorate, the Norwegian Competition Authority and the Norwegian Media Authority as key actors. In spite of the positive picture, major challenges associated with ICT persist in Norway in almost all areas of society, and its inherent dynamics means that we never quite keep up. The need for changes is continual.

2.2.1 Usage patterns in the population are changing rapidly and continually

The last decade has seen two types of ICT in particular spread to virtually the whole nation. These are the Internet and mobile telephony.

The Internet in Norway today

Although not everyone has broadband at home, the vast majority have access to the Internet, from home, work, school, a public library or the like. The majority use the Internet for e-mail and for looking up information on the World Wide Web and the use of e-mail is now so widespread that it is now possible, for instance, to reach all the parents of children in one schoolclass by this channel. E-mail is now a natural and integral element of everyday life at the majority of workplaces. This trend provides new conditions for disseminating information, for coordination and for collaboration at work and at home.

The World Wide Web is keenly used for looking up information, for entertainment, for internal corporate purposes and commercial activities generally. It has developed into a key for obtaining information about alternative products, options and suppliers for a range of product and service purchases, even where the final transaction is made by traditional means. As more and more products become purely digital (such as music), it is becoming more and more natural for the entire transaction to be effected electronically. In a number of sectors, the large, traditional actors are focusing intensively on electronic customer service, challenged by newcomers who operate exclusively online. The banking sector is a typical example to the point where many of us scarcely set foot in a bank anymore.

2nd generation Internet – the interactive Web

The Internet is evolving all the time. Two main traits appear to have characterised trends in recent years: a constant increase in those who participate by providing content on the Web such as through blogging and establishing new groupings in the shape of social networking, online communities.

In a sense, this is nothing new. Large-scale discussion and conferencing forums were established long before the Internet became commonplace. Newsgroups are still a very vibrant phenomenon on the Web, in spite of the fact that they are not the object of newsmedia attention in the same way as chat rooms or blogs.

In Web-savvy circles, the new trends are referred to as "Web 2.0". This term, conceived by Tim O'Reilly in 2004, is somewhat misleading, as it does not refer to a new technical version of the World Wide Web. In fact, it designates a number of new *ways of using* the Web in which *active use,* as opposed to passive reception, is the common denominator. Web 2.0 also includes activities such as blogging, or Weblogs, which is another name for this phenomenon of people's journals or viewpoints published on the Internet, and which have penetrated deep into the editorial offices of the newsmedia[2]. Blogging is a youth phenonmenon, with more than half of bloggers under 30 years of age. More than half of the bloggers have not previously expressed their thoughts through any public media, and half of them prefer to remain anonymous. A new American survey reveals that 12 per cent of Web users are writing blogs[3]. Blogging is one of the phenonmena on the Internet that has seen explosive growth over a five-year period.

Social networking means that people make contacts over the Internet and exchange information and experience. The IT press claims that MySpace, the best-known example to date, has more than 100 million members and gains 500,000 new ones every week.

Wikipedia, also known as the "people's encyclopaedia", is currently the world's largest encyclopaedia on the Web. Wikipedia is created by the

[2] http://www.pewinternet.org/pdfs/PIPprosent20Bloggersprosent20Reportprosent20Julyprosent2019prosent202006.pdf)

[3] See also: http://www.internetworldstats.com/blog.htm

users. Anyone can submit articles to it. All contributions and changes are logged. Essentially, Wikipedia is a logical impossibility: many shrewd analysts comment that the risk of misinformation and errors is so great that it will never be a reliable encyclopaedia. And yet: it works. Errors are discovered, weeded out, corrected. The services are constantly being expanded, with new language versions being added.

"Folksonomy" is another phenomenon. How to find information on the Web? This is the popular analogue of the term "taxonomy", which refers, among things, to the scientific practice of classifying organisms into groups based on their similarities. Articles and books are associated with a search word or metadata – often referred to as tagging. By the users tagging their information themselves, new recognition systems are created. A dubious Internet phenomenon from the perspective of experts, but nonetheless booming on the Web.

It is far too early to tell if the phenomena mentioned above will survive or be sustainable in the long term, and whether the Web communities currently being established will evolve further. As they appear now, they embody an element of chaos. At the same time, we are seeing the emergence of more formal structures involving purchasing, sales and international collaboration. These new structures may spell new developments in education, learning, popular movements and democracy. Perhaps collaboration and communities on the Internet may vitalise political activities such as the television did in its time.

Internet trends display certain fundamentally common traits: we are *moving away from* a situation in which knowledge is created, stored and developed in more or less closed environments, according to strict rules and procedures. We are *entering* a new situation in which knowledge is being spread far and wide, is accessible through a couple of keystrokes, just as new knowledge can also be published and publicised at a single keystroke. It is becoming easier to get in touch with others who share the same interests as oneself. This challenges traditional quality assurance and all existing monopolies on knowledge and opinion.

Mobile telephony

In the space of just over a decade, the mobile phone has gone from being a portable telephone for privileged business people to become commonplace. In just a short space of time, the mobile phone has become part of everyday life and we have become accustomed to being able to reach each other anywhere, anytime.

The mobile phone has been influential in the business sector and for many sectors and professions the change has been very significant. Norway is perhaps the country in the world that has come furthest in use of mobile services. One reason for this is that the Norwegian mobile operators cooperate on number ranges and rate classes which means that everyone can get hold of e.g. ring tones, bus timetables and telephone information services over their mobile. This has also created a whole industry of mobile service and content providers. More and more companies are now recognising the value of using mobile telephony in their customer services; for example, it is now possible to check in for a flight using a mobile phone. There are also a number of public services available over the mobile phone such as the facility for filing tax returns, and these will eventually be joined by others.

More extensive ICT usage

ICT usage is not just a question of connecting new equipment, but a question of what type of software and what types of services we are ready to use. In 2006, 1.4 million Norwegians filed their annual income tax returns over the Internet and a further 320,000 did so by SMS. These services save a great deal of time for the users, while they provide huge efficiency gains for the Norwegian tax authorities. The use of e-services (electronic services) such as home banking, travel booking over the Internet, digital photo services and other use of private and public digital services is contributing to societal improvements, reform and raised efficiency.

The government views this type of development as important both for economic development and for the capacity of Norwegian society to respond to the challenges it faces in terms of extended life expectancy and a higher percentage of pensioners. Such benefits for society are only possible to achieve if the majority of people are able to use the new solutions. Digital inclusion, dealt with in Chapter Four of the report, is a keyword for success for society. The importance of everyone having access to the same networks is seen for instance in the emergence of social, network-building applications for ICT. Such phenomena are on the rise and are possible by virtue of the great prevalence of mobile telephony and the Internet. Modern youth sees ICT as part and parcel of everyday life and as a natural means of creating their social networks. This creates new arenas for participation

and involvement in society, new ways of relating to other people and new norms for what is good etiquette.

2.3 Goals for ICT policy and public sector roles

ICT developments bring a number of promising but demanding challenges in their wake. A successful ICT policy should promote achievement of government objectives in a number of domains, including:

- public sector reforms
- business and labour policy
- educational policy
- health and social policy
- regional policy
- environmental policy.

It is thus difficult to demarcate ICT policy, and there will be a need to pursue a cross-sectoral ICT policy in effectively all the traditional policy areas. The technological dynamic is such that there is a constant need for new policies and new regulation, while ICT has the effect of changing the premises for current regulation in a number of policy areas, such as in cultural policy, for example.

The rapid *pace* of developments in the field of ICT is a challenge in itself. In the Norwegian system of government for example, it takes a good number of years to draft and introduce new legislation: first a fact-finding phase, consultations, then the final drafting and quality assurance by the responsible ministry and finally Parliament's consideration of the bill. In the field of ICT, significant changes tend to occur within the space of a year and this may result in assessments and proposals approaching or exceeding their "expiry date".

The different roles of the public sector

The public sector has at least four roles in the field of IT:

- *Rule maker*: Defines national "ground rules" (legal statutes, regulations, standards) to foster effective interaction between the public administration and the business sector and with society generally. This role is best exercised in close, consultative interaction with central actors in the public sector and business sector, especially in the ICT sector.
- *Pilot*: To guide developments towards a knowledge economy in an era of great global upheaval and competition, in which national borders have less import. This role primarily involves competency building and labour policy in which ICT is altogether essential.
- *Service provider*: Further develop public services for companies and citizens with the aid of ICT. The public sector has traditionally been verticalised, i.e. information flows up and down within separate, co-parallel "silos", but rarely horizontally. The task is to ensure a better integrated public sector, with intensified coordination and information exchange *between* public authorities in order to cater to the needs of companies and citizens.
- *Developer*: Exceptionally to build (i.e. finance) ICT infrastructure in a broad sense in:
  a) areas that patently belong to the public domain, or
  b) in which the market/other actors are unable to assume the financial risk (market failure). In the majority of areas, providers in the market are currently well positioned to build infrastructure on market terms.

3 Economy impacts of ICT

3.1 Introduction

The rapid and comprehensive advances in ICT are a source of more efficient transactions both in society generally and internally within individual enterprises. For that reason, many experts have argued that we are at a turning point in our economic development and have drawn parallels with past technological revolutions brought about by the advent of electricity, the combustion engine and telecommunications. Claims of a widescale digital revolution are supported by the argument that ICT is a pervasive technology[1] that raises productivity in a number of sectors in the economy, from feed in agriculture and fisheries through automation in industry to radical changes in widely differing sectors such as retailing, banking and insurance. ICT also facilitates more effective and improved public service production. In addition, the constituent sectors of the very sector that is the focus of the changes are naturally affected, the ICT industries and services.[2].

Spurred by the extensive take-up of ICT, a number of studies have been conducted which seek to quantify how important this technology is for economic growth. Productivity growth is often used as an indicator of national economic growth and productivity growth is basically measured according to how much of the growth in production is not due to increased use of resources. Productivity growth may thus be seen as an expression of the capacity to produce goods and services more efficiently or more "smartly" than previously. The higher the productivity growth, the more we stand to gain in terms of higher rates of pay or more leisure time for example. The growth of a nation's productivity depends on a number of factors such as the efficiency of the workforce, access to capital and enterprise innovativity.

In general, trends in and use of ICT may be seen to impact economic growth through three channels:

1. Innovations in the ICT sector, including computers, software and communications equipment, boost productivity growth in this industry.
2. Productivity growth in the ICT sector results in lower prices and enhanced quality of ICT equipment. This makes it profitable for the business sector generally to increase its investments in ICT equipment. With more and better equipment, productivity per employee is able to increase among the users of ICT.
3. Productivity growth as a result of more efficient use of ICT in the business sector. This may involve efficient use of ICT through new services, changed business models and organisational restructuring.

In the *short* term, reduction in the price of telecommunications equipment, software and hardware through innovations in the ICT sector will serve to increase ICT investments in those businesses that use ICT. This will boost productivity (1) in the ICT-producing sector and (2) in business and industry generally in that it will increase the capital/labour ratio. For instance, new and more powerful PCs will help to raise productivity among employees.

In the *long term,* investments made by businesses in ICT will boost efficiency in business and industry through improvements in the production of existing services and products or the development of new ones. This will typically call for complementary investments in new business models and organisational restructuring. A study from the OECD[3] indicates that each USD 1 that firms invest in ICT solutions may be associated with USD 9 of complementary investments in organisational development and changes to work routines.

[1] ICT is often referred to as a "General Purpose Technology" (Helpman & Trajtenberg, 1994): The technology is widespread in different sectors and benefits from continual improvements – as illustrated by e.g. Moore's Law which states that the number of transistors on a chip doubles every 18 months – see also table 2.1.

[2] The ICT sector is an agglomeration of the ICT industry, ICT commodity trade, telecommunications and ICT consulting services. This is an internationally accepted definition.

[3] OECD 2003, ICT and Economic Growth

3.2 Historically it has been difficult to quantify ICT's contribution to productivity growth

The majority of Western European nations experienced a slow-down in productivity growth post-1973. In the USA productivity growth averaged 1.5 per cent in the period 1973–1995, well under its average for the previous decade. But what caught the interest of economists were the large capital investments made in ICT at the end of the 1980s, and the increase in ICT skills achieved as a result of these investments. There was a long-held belief that these investments would have a positive impact on the American economy, but it was difficult to find any empirical evidence for this correlation. Robert Solow[4] , the Nobel Prize winner in economics, stated in 1987:

> *"You see computers everywhere but in the productivity statistics".*

The figure below shows investments in ICT equipment for different OECD countries and indicates that ICT investments in the USA, as part of gross fixed capital formation, increased from approximately 18 per cent in 1985 to 25 per cent in 1995.

ICT investments increased throughout the whole of the 1990s in the USA and from around 1995, the USA saw extraordinarily high growth, both in labour productivity (averaging 5 per cent in the period 1996–2000) and total factor productivity. This trend would normally have resulted in a shortage of labour and subsequent wage and price inflation, but the period did not see any significant inflation pressure in the American economy. This gave new impetus to the notion of a positive correlation between ICT and productivity growth. Due to insufficient access to data, not until the well-known article by Jorgenson & Stiroh[5] in 2000 was it possible to demonstrate the contribution of ICT investments to economic growth. Here the authors point to the fact that

> *"The vaulting contribution of capital input since 1995 has boosted growth by close to a percentage point [in the U.S.]. The contribution of investment in IT accounts for more than half of this increase. Computers have been the predominant impetus to faster growth, but communications equipment and software have made important contributions as well".*

The impact of ICT on the American economy during this period is also remarked on by the Federal Reserve Board Chairman Alan Greenspan:[6].

> *"Until the mid-1990's, the billions of dollars that businesses had poured into information technology seemed to leave little imprint on the overall economy. The investment in new technology arguably had not yet cumulated to a sizable part of the U.S capital stock, and computers were still being used largely on a stand-alone basis. The full value of computing power could be realised only*

[4] Solow, R (1987). 'We'd Better Watch Out', New York Review of Books, July 12

[5] Jorgenson, D.W. and K. Stiroh (2000), "Raising the Speed Limit: U.S. Economic Growth in the Information Age", Brookings Papers on Economic Activity, 1, pp. 125-211

[6] Remarks of Alan Greenspan, 'Technology Innovation and its Economic Impact' before the National Technology Forum, St. Louis MO April 7, 2000

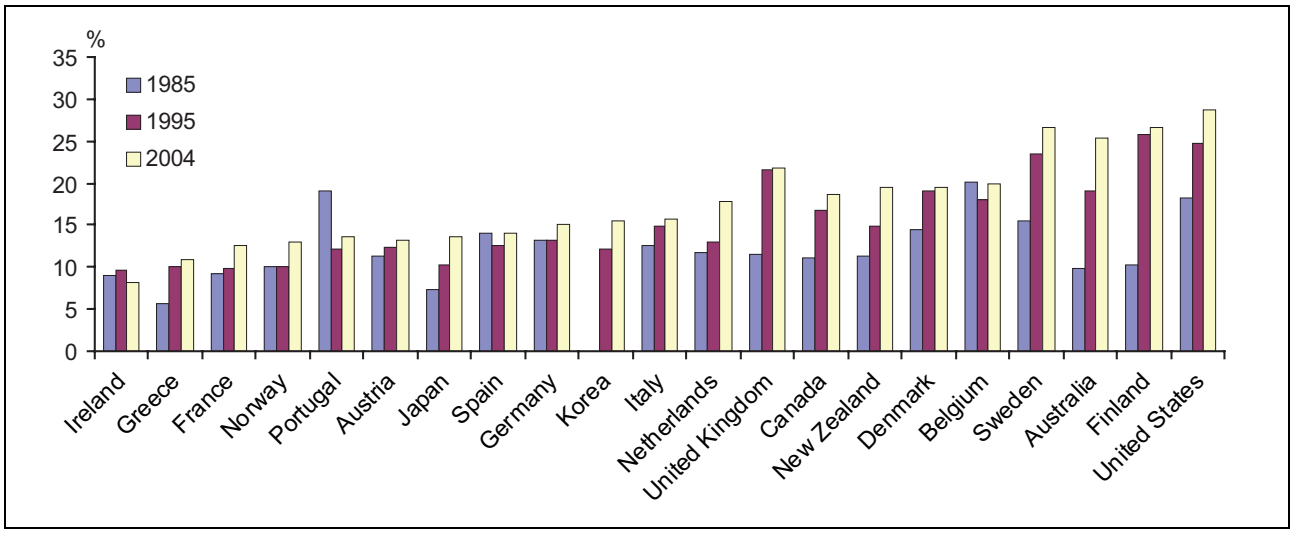

Figure 3.1 ICT investments as a percentage of gross fixed capital formation

Source: OECD Stan database

after ways had been devised to link computers into large-scale networks…"

From 1995 the disparity in productivity between the USA and Europe begin to grow. Different trends in the use and take-up of ICT in the USA and the EU were often drawn on to explain this phenomenon. This in turn led to the Lisbon Declaration on transforming Europe into the most competitive and dynamic knowledge-based economy in the world by 2010. Parts of the Lisbon Declaration were made concrete through the formulation of the eEurope Action Plans. ICT was placed on the political agenda. In Norway we have established corresponding strategies through the eNorway Action Plans. The Lisbon Declaration and the eNorway Action Plans are discussed in Chapter 2.

3.3 Productivity growth in the USA and Europe[7]

As discussed by way of introduction in this chapter, the contribution of ICT to national productivity growth is a far-reaching process based on investments in equipment, the introduction of new services, changed business paradigms and organisational changes and the liberation of labour from less to more productive applications. The *direct impacts* of ICT on productivity are linked to innovation and efficiency in the ICT sectors. These generate ICT investments in business and industry generally and productivity growth in that they provide more capital per employee. The *indirect impacts* of ICT typically arise over the long term and are linked to how business and industry generally adopt ICT in order to raise the efficiency of existing production of products and services or the development of new products and services. This will typically call for complementary investments in new business models and organisational restructuring.

There is broad agreement that productivity growth in the 1990s increased strongly in those sectors that produce ICT equipment. The figure below shows the increase in labour productivity for the USA and EU-15 (before the most recent EU enlargement) for the years 1995–2005 broken down by contributions from:

- Investments in ICT equipment in user sectors (more capital per employee)
- Efficiency gains in the ICT sectors (innovations)
- Other investments
- Efficiency gains in other sectors

The *direct* contribution from ICT is identified in the first two bulleted items. In the period 1995–2000, aggregate productivity growth in the USA was 2.4 per cent. Of this, ICT's *direct* contribution was a full 74 per cent, with the ICT sectors contributing 30 per cent through innovations and lower prices on ICT equipment, while the increase in ICT investments in user sectors accounted for around 44 per cent. Corresponding figures for EU Member States (EU-15) in this period indicate that ICT accounted for around half of EU productivity growth which in this period was approximately 1.8 per cent. The contribution to productivity growth from ICT sectors was significantly smaller in EU-15 than in the USA.

In the period 2000–2004 the gap in productivity growth between the EU and the USA increased. In the USA productivity growth rose from 2.3 per cent to approximately 2.8 per cent, while productivity growth in EU-15 Member States fell from 1.8 per cent to approximately 1.1 per cent. In this period, ICT's direct contribution to productivity growth fell in the USA from 74 to 33 per cent. In EU-15, ICT's contribution remained at 50 per cent.

But what aroused the interest of economists were the very disparate trends in EU-15 and the USA in the development of efficiency gains in sectors other than ICT. In the USA, the efficiency gains from other sectors during this period account for around half of the productivity growth, while the corresponding figure for the EU was only 2 per cent. Among those sectors that contributed the most to productivity growth in the USA in this period were the business and financial sectors. These sectors made appreciable investments in ICT equipment notably in the latter half of the 1990s and in all likelihood these investments served extensively to facilitate efficiency gains in these sectors (spillover effects). The financial sector, for example, underwent rapid product development and a large-scale transition to new technology and new forms of distribution. Credit transfers were rationalised, the online banks experienced massive customer influx and new technology paved the way for new and efficiency-raising solutions for business and industry.

EU Commissioner Viviane Reding acknowledges[8] that the lower level of and later investments in ICT in the EU as compared with the USA are a

[7] Due to the lack of availability of data on Norway, discussion of productivity growth in this chapter will be based on comparisons between the USA and EU-15.

[8] Viviane Reding, speech, London, September 2005, http://www.i2010.org.uk/keynote_speeches_Viviane_Reding.html

contributory factor in the USA now having laid the foundation for reaping the rewards for business and industry of efficient use of ICT:

> *"Now you know that ICT is economically crucial. The latest EU25 data show that the sector represents just over 5 percent of the EU GDP. But this 5 percent drives 25 percent of overall growth and about 40 percent of our increase in productivity, which is the fundamental source of new wealth in the economy. This sounds good, but we could do better. Most economists now agree that weaker and later investment in ICT in the European economy has widened the productivity gap with the US. Their much larger ICT sector delivers benefits to their economy, yielding as much as 60 percent of the productivity growth compared to 40 percent in Europe. I have said it before and I am going to repeat it here, this is not a failure, this gap for me is an opportunity gap, which we should manage to bridge. A wider and efficient use of ICT throughout the economy will help the EU to preserve and to extend its global competitive position"*

The prediction is that in the future Europe will achieve the greatest gains from more efficient use of ICT[9]. This is due to the fact that the development of ICT equipment is characterised by substantial innovation and that the price of the equipment goes down as the volume of units produced goes up. The ICT sector is characterised by its globality and there are relatively few trade barriers between different countries in terms of the purchase and sale of ICT equipment. This means that innovation in this sector will contribute to cheaper ICT equipment in the majority of countries. It is therefore be logical for the majority of countries not to have a large ICT sector.

The OECD indicates (2004) that a large ICT sector is neither necessary nor sufficient in itself for achieving high productivity growth:

> *"Several countries … that are characterised by high ICT investment and use, as well as high … productivity growth, do not have a large ICT sector. In addition, one or two countries that do have a large ICT sector have not been among the high growth countries of the 1990s."*

[9] DTI – i2010 – Responding to the challenge, September 2005

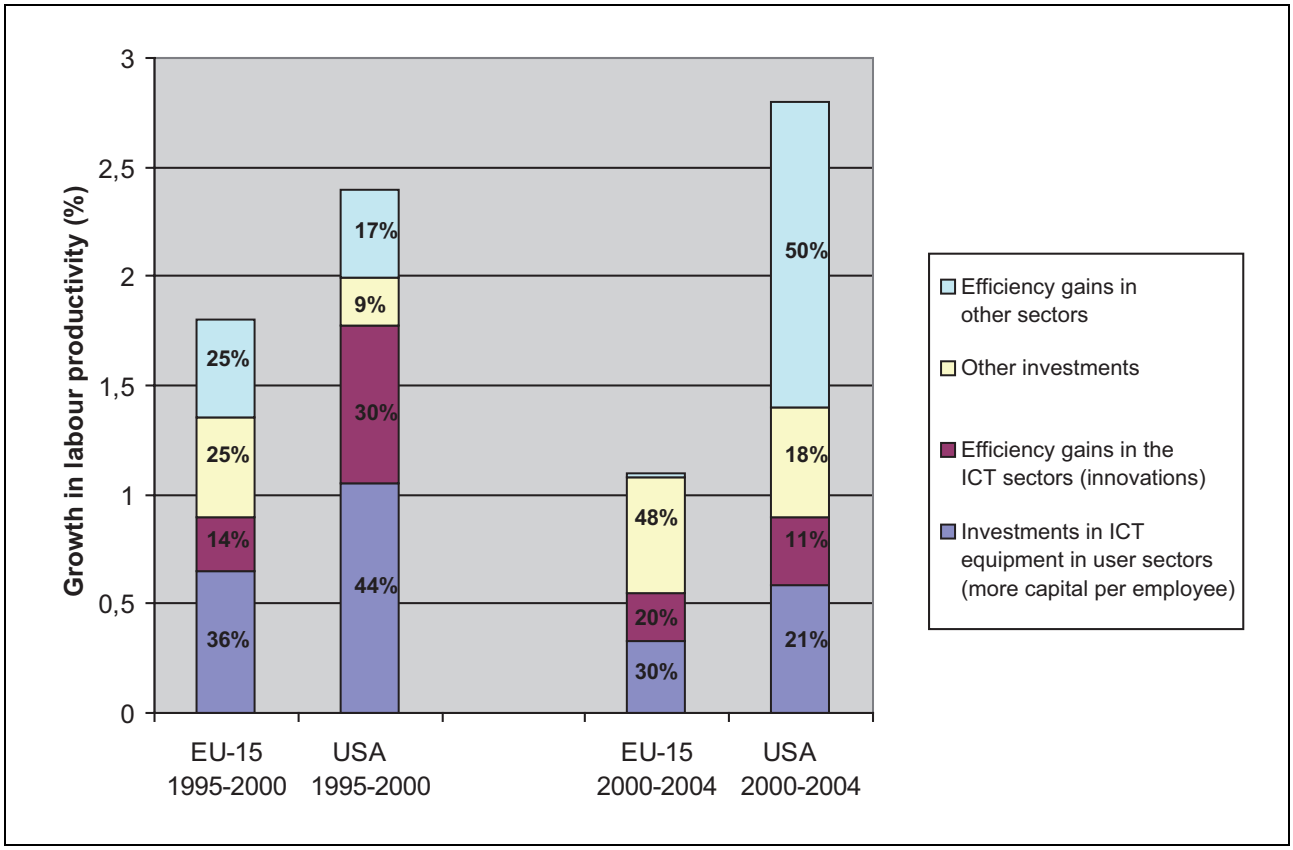

Figure 3.2 Breakdown of different contributions to growth in labour productivity for the periods 1995–2000 and 2000–2004.

Source: B. van Ark and R. Inklaar, 2005

4 Digital inclusion – access, universal design and skills for all

The penetration of ICT in all areas of society enables many groups to gain easier access to public and private services, which paves the way for solutions which empower many people to lead more independent lives and raise quality of life. ICT has provided us with an ideal resource for including functionally impaired persons in working life and for improving the prospects for senior employees to stay in employment for longer. We can build bridges over the inconvenience of geographical distances, for example, as regards workplaces in remote areas and access to the health services, and a more flexible working situation for the parents of young children, elderly persons and other groups with special needs. The use of ICT is so extensive and widespread that it has been incorporated as a core skill in the new lower secondary syllabus, on a par with reading, writing and arithmetic. ICT has become a facilitator in inclusion policy.

But in the absence of conducive conditions, ICT can also cause divides in many areas. Those who do not have access to, or proficiency in use of, the new technology risk being excluded from new arenas for information and services. Digital exclusion and digital divides are attributable to many different factors: inadequately developed infrastructure in certain areas, economic barriers to purchasing, technology designed in such way that it is inaccessible, or lack of skills. Surveys indicate that digital divides often follow the same social and economic patterns as other distribution-related divides in society: personal finances, education, age, gender, place of residence etc.

4.1 The Norwegian government's goals and ambitions

The Norwegian Government's political platform (Soria Moria declaration) conveys the declared aim of turning Norway into a leading knowledge and ICT nation. The platform stresses that "everyone shall have access to knowledge and insight to enable their participation in democratic processes," and that a commitment must be made to "new, universally designed technology and a proactive ICT policy in the public sector". This must occur within the frameworks of an inclusive society and working life in which account is taken of the skills and potentials of each individual. The government aims to ensure that everyone has the means and motivation to acquire the necessary skills for making optimal use of technologies and new services. This government wishes to use ICT actively to reduce differences in society.

Norway is not alone in placing ICT and inclusion high on the IT policy agenda. Much of the policy that has been formulated and the measures that are being implemented have been developed through international cooperation. The Riga Ministerial Declaration of June 2006 on eInclusion, signed by 30 nations, including Norway, expresses a common European vision of digital inclusion and work plans going forward to 2008. The essence of this vision is to include all citizens irrespective of age, accessibility needs, skills, geography and cultural background.

A successful digital inclusion policy must be based on three main pillars:
1. Access to the Internet, equipment and content
2. Universally designed solutions
3. Digital skills.

Based on these, the government has identified the need to:
- ensure the whole of Norway of provisions for connecting to broadband Internet
- target universally designed technology
- strengthen the commitment to digital skills in the population.
- intensify ICT commitments in education

4.2 Access to the Internet, equipment and content – the digital common access right

Access to infrastructure is an important precondition for digital participation – whether the site for ICT usage is school, work or home. Without access there will be no usage. Surveys and statistics reveal that everyday digital usage is not part of everyday life for everyone in Norway[1]. Access to ICT varies according to factors such as income and education.

In schools there are great differences in access, both between municipalities and between lower-secondary and upper-secondary schools.

Broadband policy in Norway has previously been addressed by Report to the Storting no. 49 (2002–2003) – *Breiband for kunnskap og vekst* (*Broadband for Knowledge and Growth*) Accordingly there is no intention to discuss this area in any depth in the present report.

4.2.1 Broadband access for everyone

4.2.1.1 Objectives and ambitions

The government has set ambitious objectives for the development of broadband. In the government platform document (Soria Moria Declaration), the government sets out its objective for all citizens of Norway to be offered a connection to broadband Internet by the end of 2007, to which end public funds will be used to assist in achieving broadband extension in areas where this is not commerically viable.

Access by schools to adequate broadband is a key factor in successful use of digital media in education. The government has the objective of providing schools throughout Norway with reliable and satisfactory access to high speed broadband.

4.2.1.2 Current status

As at October 2006, broadband coverage[2] in Norway was 95 %[3], an increase of approx. 14 percentage points since August 2004. Extension of the broadband network is relatively even nationwide in Norway.In the second quarter of 2006, seven out of ten Norwegian households had Internet access. Of these, 80 per cent were connected by broadband. This corresponds to 57 per cent of Norwegian households, an increase of 16 percentage points since the second quarter of 2005[4]. Families with children and high-income families have greater access than other population groups to information and communications technology. Out of households with a total gross income of NOK 600,000+, 84 per cent have broadband, while the percentage for households with an income of less than NOK 200,000 is just 39 %.

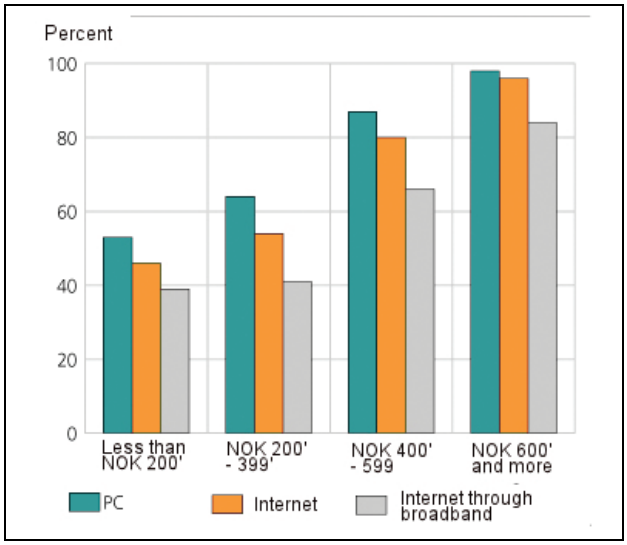

Figure 4.1 Households with access to a computer, the Internet and broadband at home, by total gross household income. NOK 1,000. 2nd quarter of 2006. Per cent.

Source: Statistics Norway: ICT in the households, 2006

The current definition of broadband is set out in Report to the Storting no. 49 (2002–2003) – *Broadband for Knowledge and Growth*, which was presented to the Storting in September 2003 and considered by the Trade and Industry Committee in March 2004. This stated that, due to uncertainty concerning the development of capacity and the need for broadband, it would not be meaningful to operate with any specific limit on transfer capacity. Instead, the government took as its premise a usage-oriented approach by which broadband is defined as:

> *"two-way communication networks capable of transmitting different types of data such as text, sound and live images and which must be capable of supporting new services and enabling use of the network by many users simultaneously"*

The government holds that this is still a meaningful definition.

Norwegian broadband policy is based on the concept of having market actors responsible for developing infrastructure, while it is the task of the authorities to provide conditions conducive to effective competition and to stimulate demand by making its own exacting demands on broadband. In addition, the authorities assess and implement special measures in geographical areas in which it is evident that no market-based broadband provisions will be made. The public policy is technologically neutral, i.e. it is left to the market to deter-

[1] Statistics Norway (2006). Use of ICT in the households
[2] 'Broadband coverage' is taken to mean the proportion of the population that has the opportunity of obtaining broadband. This is not to say that 95% of the population actually has broadband.
[3] Teleplan (June 2006). Nexia (September 06)
[4] Statistics Norway (2006). Use of ICT in the households

mine which technologies are the most appropriate in each individual instance.

In 1999, the Høykom Programme was established as a three-year financing programme to promote demand and take-up of advanced high-capacity networks by public enterprises. In 2001, the decision was adopted to continue Høykom for a further three years (2002–2004) and in 2004 for a further three years (2005–2007).

The Høykom Programme is a key instrument in underpinning the goals laid down in the Norwegian Government's political platform (Soria Moria Declaration). Høykom grants subsidies according to precise criteria, and the emphasis is on reaching out to municipalities, local business and firms in Norway's regions. One challenge is to generate investment in broadband in sparsely populated areas of the country. As of 2004, a new sub-programme was established, "Høykom distrikt", specially geared to fostering demand for broadband in outlying districts. For 2007, the government has proposed granting NOK 122 million to this sub-programme, of which NOK 100 million is to be spent on infrastructure.

Provisional figures from the last funding granted by Høykom distrikt (totalling NOK 80 million in September 2006) indicate that these funds combined with local subsidies have generated a total of approx. NOK 200 million for broadband development. The greater proportion of the funds are distributed between the counties which have assumed an active role in coordinating broadband development in their respective area. If the estimates hold, the State financing combined with local funding will provide almost 30,000 new broadband lines. 30,000 new lines represent almost a third of the some 5 per cent of households which as at October 2005 did not have broadband coverage. This is seen as excellent progress, and indicates how central government, counties and municipalities can join forces to bring broadband coverage to the entire nation.

Basic education

In the summer of 2005, the Ministry of Education published a report on infrastructure and operations in basic education[5]. The report indicates that 80 per cent of computers for use by pupils in primary and lower secondary schools are connected to the Internet. Figures from Teleplan, a private telecom, media and Internet consultancy, indicate that it will be possible for around 98 per cent of primary and lower secondary schools to obtain a broadband connection and that just under 94 per cent are now connected to a broadband network[6].

Although increasing numbers of primary and lower-secondary schools now have broadband, there is a great difference in capacity from one school to the next. Lower secondary pupils (13–15 year olds) have better line capacity on average than primary school pupils (6–12 year olds). However, more recent figures indicate that the situation in the primary and lower secondary schools is improving.

In upper secondary schools, coverage is better. 44 per cent of pupils in upper secondary education have access to broadband with a capacity ranging from 10 to in excess of 100 Mb/s.

Access to the Internet and infrastructure for the higher institutions of education is managed by UNINETT A/S – a company owned by the Ministry of Education and Research. As demand for capacity has increased, UNINETT has gradually extended the infrastructure. UNINETT is currently working to improve the internal infrastructure at the institutions so that each individual researcher and student can make full use of the network capacity.

New infrastructures – digital TV and mobile broadband solutions

Technological progress means that the platform on which digital services are offered will eventually be of less significance. For instance, we are seeing a trend in offering TV or TV-style services of a high standard on several different platforms or networks, and perhaps especially, broadband solutions. Expectations regarding future solutions for mobile broadband are running high, but there is still a way to go before these are generally available with adequate capacity.

4.2.1.3 Challenges

The government's focus on the digital common right access dictates a high level of ambition for broadband development. Geography will not be the determinant of whether or not individuals can take up new technology.

Experience indicates that broadband is a necessary precondition for making ICT part of everyday

[5] Norwegian Directorate for Education and Training (2005), Kartlegging og rapportering av utstyrs- og driftssituasjonen i grunnopplæringa, (Survey and report on equipment and operating situation in basic education)

[6] Teleplan (May 2006). The analysis is based on figures from GSI, the lower-secondary schools' information registry

life in schools and other education. The 2003 report "Skole for digital kompetanse[7]" (*School for digital competence*) assesses the need for broadband in basic education using educational criteria. The report recommends that Norwegian schools should have a broadband connection of 2 – 100 Mb/s depending on school size. While acknowledging that this is a positive development, the Norwegian government wishes to point out that the aim of improved PC coverage and broadband in elementary schools still stands. The differences between schools and municipalities are still too great.

We are seeing a trend in which access to content services is not just a question of having a broadband and computer connection. Other channels for mediating information and services are multiplying, as are the receivers such as mobile phones and digital TVs. Each of these channels and devices are characterised by unique features and functionality. It is important in future that perspectives surrounding broadband policy also comprise these.

4.2.1.4 Government measures

Measure 4.1: Broadband nationwide

The government will guarantee the last 4–5 per cent of the population the option of obtaining broadband. The increased financing for broadband extension will be earmarked for outlying districts and will be distributed through the Høykom Programme. For 2007, the government is proposing a total appropriation of approximately NOK 122 million, the highest appropriation made to Høykom to date. Of these funds, NOK 100 million will be earmarked for outlying districts without existing broadband provisions. The public sector will promote development and extension through sustained, high demand for broadband services.

The broadband policy will continue to be based on establishment of networks and services by commercial operators, while the public authorities will support development only where the market (commercial operators) fails.

[7] The Høykom Programme, commissioned by the Research Council of Norway (2003) Skule for digital kompetanse (in Norwegian only)

4.2.2 Access to equipment and services

4.2.2.1 Objectives and ambitions

The government aims for the entire nation to be able to adopt new information technology if they so wish. This demands that computer equipment and Internet services are available. Norway is a leader when it comes to diffusion of information technology, but at present an estimated 15 – 20 per cent are still without access to such equipment and services. While 82–94 per cent of the under-60s had used the Internet within the last 30 days, the same was true of only 40 per cent of the over-60s[8]. The practical and financial thresholds involved in adopting new technology should be lowered even further.

In schools, access to equipment should reflect the goal set by the government for Norwegian schools to be global leaders in the use of ICT in teaching and learning.

4.2.2.2 Current status

Three out of four households have access to a computer, and it is used daily by 66 per cent of the population. Internationally, Norway ranks high in terms of access to equipment. However, 10 per cent of the population have never used a computer and 26 per cent seldom use the Internet. Approximately 95 per cent of all households with children have access to a computer and just over 80 per cent of them have access to the Internet[9].

Total household income has a great influence on access to a computer and the Internet from home. While 97 per cent of households with a total income in excess of NOK 600,000 have a computer and 91 per cent have Internet access, the corresponding figures are 53 per cent and 46 per cent for households with a total income of less than NOK 200,000.

Basic education

Figures from the Norwegian Directorate for Education and Training (2005)[10] indicate that, with very few exceptions (approx. 0.4 per cent or fewer

[8] TNS Gallup (3rd quarter 2006), Interbuss

[9] Statistics Norway (2006). Use of ICT in the households

[10] Norwegian Directorate for Education and Training (2005), Kartlegging og rapportering av utstyrs- og driftssituasjonen i grunnopplæringa ((Survey and report on equipment and operating situation in basic education))

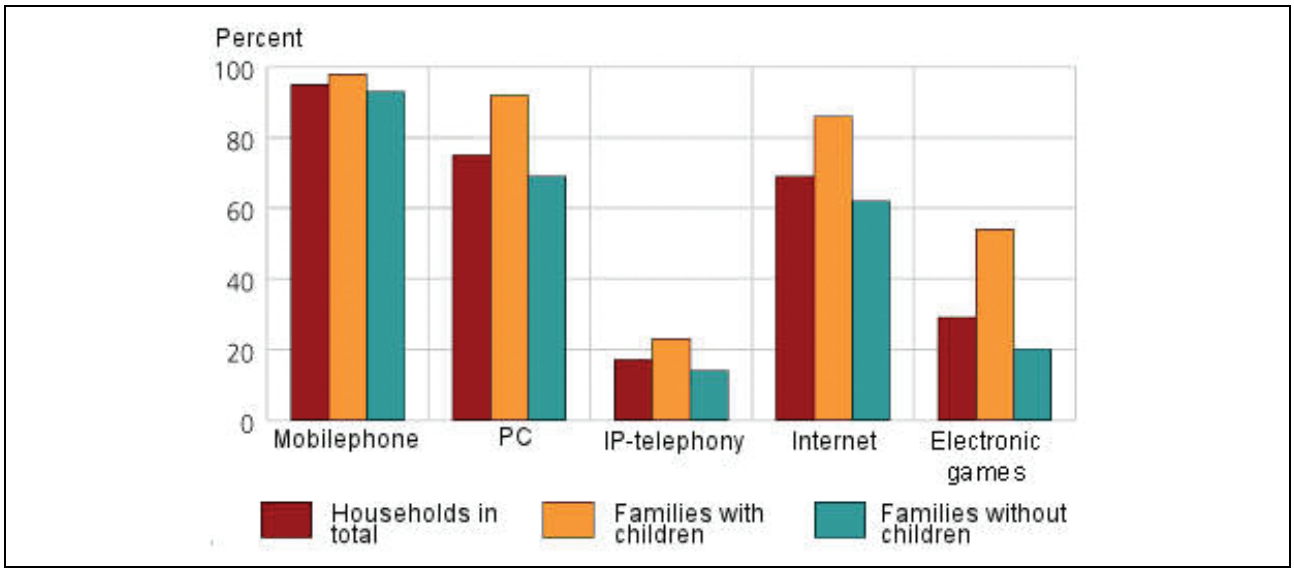

Figure 4.2 Households with access to ICT, by family type, 2nd quarter, 2006

Source: Statistics Norway: ICT in the households, 2006

than 20 schools nationwide), all primary and lower secondary schools have computers available to their pupils[11]. The average coverage nationwide is 6.5 pupils per computer. There are more pupils per computer at primary school level than at lower secondary level.

Coverage in further and higher education is better than in primary and secondary schools.

The education sector is showing high growth in digital education resources and services where access control is based on user-side electronic identification. Reliable identification of pupils and teachers is therefore a condition for users obtaining access to digital resources and services. The *Feide – Federated Electronic Identity* project was established for the purpose of achieving consistent national identity management in the education sector.

Access at public libraries and public offices

In 2002, 98 per cent of public libraries had computers with Internet access available to the public. Statistics from 2004 indicate that approx. two-thirds of public libraries in Norway provide Internet access via broadband[12]. One in five library users state that they use the library Internet services[13].

Almost all local authority administrations[14] and public offices currently provide good access to computers and to the Internet, although capacity varies.

4.2.2.3 Challenges

Access to computer equipment and Internet access is a precondition for making the most of the opportunities for participating in the knowledge society. For some people, however, the cost of acquiring such equipment is prohibitive. Access to this kind of infrastructure is not always just a question of geographical disadvantages associated with broadband access, but also of social disparities. Those groups in society who are less well off financially must also be given the chance to make use of the infrastructure.

Although some 95 per cent of all households with children have access to a computer and just over 80 per cent of them have Internet access[15], in purely statistical terms this means that around 40,000 children of school age do not have access to a computer at home and that almost 150,000 children have no Internet access. This is a challenge in the light of the fact that a great deal of ICT usage among children and young people goes on at home. Given that we also know that those households that have least access to a computer and the Internet are also those with the lowest incomes, we

[11] Not all of these are connected to the Internet
[12] Unpublished statistics from Norwegian Archive, Museum and Library Authority
[13] Statistics Norway (2006), Reports 2006/14: Survey of library use
[14] Statistics Norway (2005), Use of IT in municipalities and county municipalities
[15] Statistics Norway (2006). Use of ICT in the households

are thus seeing a trend whereby social divides may result in a group of young people being relegated from an important area.

Libraries reach many groups and serve an important function in the effort to bridge digital divides[16]. The challenge still remains to equip the libraries with the necessary computer equipment and line capacity. Public-sector bodies also reach many users. Instructing users in use of the public body's own Internet services ensues from the obligation to provide instruction as laid down in the Act relating to public access to documents in the public administration (Freedom of Information Act). However, the Government wishes to challenge public bodies to go one step further and contribute to erasing differences in access by offering different user groups access to and instruction in the use of electronic services. However, it is not only the public sector that should assume responsibility for ensuring that everyone has facilities for using computers and the Internet. The business sector increasingly provides services over the Internet and should have a vested interest in ensuring that as many people as possible gain proficiency in and access to the technology.

Basic education

The emphasis in the Knowledge Promotion[17] educational reform programme on core skills in the use of digital tools and skills targets entailed by ICT in syllabuses presupposes access to infrastructure. Good infrastructure in schools will also be an important instrument for avoiding digital exclusion as a result of lacking ICT access at home.

4.2.2.4 Government measures

Measure 4.3: *Public sector organisations shall contribute to access to equipment*
Continued focus must be placed on the role of libraries as providers of instruction in and access to electronic services.

All relevant public offices should have public terminals available and provide instruction in use of their electronic services.

Businesses should also be encouraged to promote greater access to Internet services, for example by establishing public terminals and provisions for instruction.

Measure 4.4: *Targeting ICT in schools*
Provisions must be made for increased use of digital learning resources and over time drives to reduce the pupils' expenditure on learning resources.

The schools' role in efforts to level digital disparity for example will be addressed in a separate Report to the Storting on education as an instrument in social levelling.

Provisions must be made for identity management for basic education based on the Feide project.

4.2.3 Access to content

4.2.3.1 Objectives and ambitions

Satisfactory and proper access to public information and services is one of the preconditions for the welfare state to function. Making a wide range of public material available will promote this objective. Large and small institutions in the archives, libraries and museums domain manage an outstanding repository of documentation which, via digitalisation, can be made more readily accessible to a much larger readership. Making Norway's common national heritage accessible at home and abroad over the Internet will represent a democratisation and decentralisation of sources of knowledge.

In order for society to be guaranteed uniform access to digital content of a high standard, the government will pursue a policy that balances the needs of content producers to earn a living from copyright with the potentials for sharing and access which Internet technology offers the general public.

4.2.3.2 Current status

A communication from the European Commission on digital libraries (COM(2005) 465 final) states as follows:

> *"European libraries and archives contain a wealth of material – including books, newspa-*

[16] This is discussed in more detail in Section 4.4 on digital skills.

[17] The Knowledge Promotion is the latest reform in the 10-year compulsory school and in upper secondary education and training. It introduces certain changes in substance, structure and organization from the first grade in the 10-year compulsory school to the last grade in upper secondary education and training http://www.regjeringen.no/nb/dep/kd/Sok.html?id=87060&quicksearch=knowledge+promotion, Ministry of Education and Research

pers, films, photographs and maps – representing the richness of Europe's history and its cultural and linguistic diversity. The degree of access to this information determines how people may experience our cultural heritage and how studies and work may benefit from that heritage. …. The digitised material is a key asset for education and will serve to enrich the cultural life of Europe".

Digitisation and access to cultural heritage has a high priority in all European countries. Norway, for its part, is certainly making progress, but the goal is still far off. A survey of Norwegian archives, libraries and museums in autumn 2005[18] indicates that more than 80 per cent of the catalogues[19] in archives and libraries have been digitised. For the museums sector, the figure is 70 per cent. The archive and library catalogues are extensively available to the public (60–70 per cent), while the museum catalogues are scarcely available.

But the content itself has barely been digitised. Half of the Norwegian archives and museums have plans to digitise their collections; as do a third of the libraries. The Norwegian Broadcasting Corporation and the Norwegian Film Institute are currently in the process of digitising their archival materials.

A new world order for the diffusion of digital content

Digitisation and access to information over the Internet has created new potentials for worldwide diffusion of music, film and other copyrighted material. At the same time, the copyright holders and practising artists, the music industry, film industry, publishing houses and newspapers are up in arms over the lost revenue resulting from illegal copying.

While it is important to safeguard and amplify on circumstances regulated under copyright law, it is also important to be aware of the special circumstances that have risen in relation to the Internet. Large volumes of material are published on the Internet without the traditional criteria familiar from copyright law, see, for example, material published on the Wikipedia online encyclopaedia.

The Storting discussed copyright issues in relation to digital usage in the spring of 2005 in extension of its review of the Copyright Act. The Copyright Act will be re-reviewed by 2009 and digital use of copyrighted material will be given broad treatment.

4.2.3.3 Challenges

In Norway and in Norwegian culture there is a time-honoured tradition for exercising rights to '*allmenning*' (literally, "owned by all", as in commons), a concept denoting an area or resources which may be used freely by all. This includes the common use and harvesting of natural resources in forests and on mountains, such as shooting, fishing and berry gathering. In relation to a number of other countries, this quasi-ownership concept is a uniquely Norwegian/Nordic phenomenon. The Internet, at its best, is based on a culture of sharing and the re-use of resources. The Government regards the establishment and furtherance of digital 'commons' as a challenge; as a means of promoting a unique trait in Norwegian culture and a project to bring a Norwegian social perspective and sense of the collective into the digital age. The 'digital commons' should be as extensive as possible and contain information and material of a high standard. There should be the opportunity for digital re-use for non-commercial ends, while use of the 'digital commons' should be free of charge for individual users. Naturally it is a precondition that the content of the 'digital commons' is not made available without the consent of the rights holder.

Public information is an obvious source in the 'digital commons'. It should also be considered whether government-funded research results should be published as part of the 'digital commons'. Here reference may be made to the work on the new Freedom of Information Act and the subsequent work on regulations, cf. the EU directive from 2003 on the re-use of public sector information.[20].

In special circumstances, consideration may be given to purchasing copyright-protected material outright so that it may be incorporated in the 'digital commons'. This would ensure all users in Norway of access to information which would otherwise be reserved for a narrow group with strong purchasing power.

There are also issues concerning what type of "traffic regulations" should apply on the Internet. One of the challenges that has emerged in recent years has been termed "network neutrality". Should the Internet be constructed like a motor-

[18] Norwegian Archive, Library, and Museum Authority (Development) (2005), Rapport fra kartlegging av digitalisert digitalisering i abm-sektoren (Report on a survey of digitisation in the archives, libraries and museums sector) Norwegian only

[19] The catalogues are listings of the contents of collections, not the collections themselves.

[20] This work is discussed in more detail in Section 6.2.7 "Re-use of public data"

way with several lanes, with those who transmit information obliged to buy the right to higher speed? Is this a model by which Internet providers could actually charge for both content and network leasing? This issue is currently under strong debate worldwide.

4.2.3.4 Government measures

Measure 4.5: The 'digital commons'

The Ministry of Government Administration and Reform, in association with relevant ministries such as the Ministry of Culture and Church Affairs and the Ministry of Education and Research will be investigating the possibility of buying up diverse copyright-protected material in order in the long term to make 'digital commons' available to the nation.

In association with the Ministry of Culture and Church Affairs, the Ministry of Education and Research will be facilitating educational coordination of Norwegian cultural heritage.

4.3 Universally designed solutions

4.3.1 Objectives and ambitions

The Government's political platform (Soria Moria Declaration) sets out a policy whereby the design of public sector welfare provisions is to be dictated by the needs of the users:

> *"The needs of the individual shall be focal as concerns both the substance and organisation of welfare provisions. The services shall as far as possible be adapted to the needs of the individual. Through frequent and active dialogue with individual citizens, public authorities shall ascertain that the provisions made match the needs of the recipient."*

Many people feel that there is a gap between the design of ICT solutions and their chances of utilising the technology satisfactorily. The government's objective is for all technological developments within ICT and the media to be based on the principle of universal design. The public sector has a distinct responsibility for ensuring that the different ICT and web-based services do not result in new and extensive barriers to those with special needs.

Universal design shall contribute to inclusion, in that the same principles applied to design are to be applied vis-à-vis all people, irrespective of functional ability. It is important to avoid special or alternative adaptations for people with reduced functional ability and instead, as far as possible, to seek solutions that work well both for people who have a functional problem and those who do not.

4.3.2 Current status

The accessibility issue is one that affects a large segment of the population. ICT can provide enhanced quality of life and greater independence for the people involved. At the same time, society and the labour market will gain greater access to valuable human resources.

One way of dealing with the issues surrounding access is to design the technical solutions according to universal design principles. This means designing products and surroundings in such a way that they can be used by everyone to the greatest possible extent without the need for adaptations or custom design. The term is often used synonymously with accessibility for all, planning for all and design for all. Universal design is aimed at all people, of all ages, sizes and abilities[21].

The concept of universal design has been implemented in many areas. It has been incorporated in legislation, regulations, action plans and is highlighted as a strategy for promoting good accessibility in many political documents. Among other things, the Public Procurement Act was amended in 2006 and comes into force on 1 January 2007. Both statutes and regulations presuppose that the requisitioning party will have taken the need for universal design into account as early as in the planning of procurements. This applies equally to ICT procurements. However, the Public Procurement Act makes no stipulations regarding what minimum requirements are to be met for ICT procurements.

Norwegian Official Report, NOU 2005:8, *Likeverd og tilgjengelighet* (Equality and accessibility) proposes making guidelines concerning right of accessibility for people with disabilities in different areas statutory. A minority on the committee proposed making universal design mandatory for ICT and transport, within explicit time limits. The Ministry is working with a view to presentation of an legislative bill to the Storting in autumn 2007.

[21] Council for people with disabilities (1997), Universell utforming. Planlegging og design for alle (Universal design, planning and design for everyone) (in Norwegian)

The drive for universal design in ICT solutions must also be considered in the context of the drive now launched to implement open ICT standards in the public sector. For people with disabilities who require custom equipment/custom software, failure to adopt open standards may create barriers since it will not be possible to use custom solutions in conjunction with existing solutions. This standardisation drive is discussed in more detail in Chapter 7.

Guidelines exist on universal design of web-based services and information. Nationally and internationally the guidelines provided by the Web Accessibility Initiative (WAI) are the most widely recognised and often form the basis for accessibility initiatives in the ICT area. In recent years, it has become easier for people with disabilities to gain access to information, but there is still far from equal access for everyone. The annual quality assessments of the official websites conducted by Norway.no[22].indicate that the websites are observing WAI criteria more extensively than in the past. In 2006 Norway.no tested 448 local government websites and 243 central government websites. These quality criteria are based, among other things, on the WAI criteria. The greatest improvement has been in the local government sector, while the central government sector is still rated below average. The percentage of websites that meet 80 per cent of the quality criteria in respect of accessibility is 39 per cent of central government websites and 27 per cent of the local government websites.

4.3.3 Challenges

Physical accessibility is fundamental for social involvement and participation in society. From the perspective of inclusion, it is not satisfactory that citizens are excluded from important social arenas because the design of ICT solutions is not adapted to their needs.

The government wishes statutory time limits to be set for universal design of ICT, cf. the minority proposal of NOU 2005:8. A requirement regarding the universal design of ICT has not yet been examined. In conjunction with other relevant ministries, the Ministry of Government Administration and Reform will be examining in detail how time limits on implementation of universal design of new and existing ICT might be incorporated in an act on non-discrimination and accessibility. It is essential to delimit what the concept of ICT denotes, and to estimate the financial and administrative costs of introducing a statutory requirement.

There is a need to establish definitions, operationalisation and development of necessary indicators in the area of universal design in terms of conformance with the proposed requirements but also in order to ensure updated development in the area. This is important because the concept of universal design will be incorporated in legislation, action plans and other public strategies and goal documents.

Consumers and citizens need information about what is available, what they can expect and what rights they have. The greatest barrier at present is not the lack of technological capabilities. It is more a lack of knowledge as to how these technological capabilities can be used and adapted to differing requirements, as well as delimiting the financial, political and social framework conditions.

Universally accessible technology

Through Norway.no's quality assessments, it has to some extent been possible to focus attention on the accessibility of public sector websites. But these criteria do not apply to internal networks, such as intranets at work and learning platforms in primary, secondary and higher/further education. Nor are private actors subject to any quality requirements regarding the design of their websites.

The government sees it as a challenge to make software for voice synthesis, also known as text-to-speech (TTS) available, and ideally with free access for those who wish to use it. The software should be distributed via multiple channels, and when using the Internet for distribution, it should be possible to store TTS software on a local computer. This will now be achieved. At the Norwegian government's request, Microsoft Norway has assumed responsibility for further developing and making available software for Norwegian (*Bokmål*) and New Norwegian (*Nynorsk*) speech synthesis. This will make Norway the first country in the world with freely available TTS software. The software will be capable of reading both of Norway's official languages, *Bokmål* and *Nynorsk,* so that users of either language will have the option of using it. Clearly, however, this is not a solution that covers all technical platforms fully. The government will be urging suppliers and development environments to work on designing freely available and quality solutions for platforms other than Windows.

[22] http://www.Noreg.no/kvalitet/

4.3.4 Government measures

Measure 4.6: *Universally designed public sector electronic services*

The government will follow up on the proposals made by the legislative Syse Committee in NOU 2005:8 Equality and accessibility, and put forward a proposal for a new act on non-discrimination and accessibility. The government wishes to see public sector electronic services universally designed, except where special circumstances render this impossible. The Ministry of Government Administration and Reform will be examining the consequences of incorporating ICT into this act.

Under the supervision of the Ministry of Government Administration and Reform, the relevant competency environments shall produce guidelines and detailed specifications on standards and requirements for the universal design of ICT. In this work it will also be necessary to develop indicators for how universal design is to be implemented.

Once serviceable indicators for universal design of ICT are available, consideration will be given to incorporating public sector reporting systems such as KOSTRA (local-central government reporting) and the new StatRes (central government performance indicators).

Measure 4.7: *WAI criteria in development of public sector websites*

In all new development or comprehensive further development of public sector websites, public enterprises will be requested to observe WAI criteria as laid down in Norway.no's quality requirements for online services. In connection with the granting of State funds to other websites, the government will also recommend that requirements be made regarding observance of WAI criteria.

Departments under the Ministry of Government Administration and Reform will be required to apply WAI criteria as laid down in Noreg.no quality requirements for online services when developing new or undertaking comprehensive further development of their external and internal websites.

Efforts on quality assessment of websites must be stepped up. As of 2007, a number of central, private online services with high utility value will be assessed by Noreg.no. Noreg.no will provide a labelling scheme to signal the extent to which public and private online services are designed according to accessibility criteria.

Measure 4.8: *More clear-cut responsibilities in initiatives on universal design of ICT*

The organisation of public sector initiatives on universal design of ICT and electronic services will be reviewed with a view to achieving more straightforward and clear-cut provisions and responsibilities.

A new action plan on improved accessibility for people with disabilities will be prepared, in which ICT will be focal.

Measure 4.9: *Promote the development of solutions which provide improved accessibility of ICT-based products and services*

The commitment to the IT Funk R&D programme on information technology for people with disabilities will be extended for a further six years from 2007.

4.4 Digital skills

4.4.1 Objectives and ambitions

The changes and developments in society and technology require that we all, irrespective of our role and function, make sure that we are well informed, that we address and build our skills in an increasing number of fields. The promotion of digital skills should be regarded as a social innovation project carried out in the arena of educational policy. No one should be excluded due to factors such as age, geography and finances when it comes to their means of using and making sense of electronic service provisions.

Norway should be a pioneer globally in the use of ICT in teaching and learning. The government

espouses the objective of achieving a modern education system, with an active and discerning approach to new technology and which draws on the potential that exists in the interface between digital youth culture and the schools' more traditional learning culture.

In higher education, the government is committed to ensuring that students are trained in and use ICT as an integral component of their studies, in primary, secondary, continuing, higher and further education alike. The aim is for pupils and students to master ICT such as they will encounter it in working life and society generally.

The government is concerned that children and young people especially should experience the Internet as a safe place to be. It is necessary to intensify efforts on promoting the use of discerning digital usage among children, teenagers and parents. Legislation and policy instruments will need to be updated where necessary to protect vulnerable groups.

4.4.2 Current status

In the report "*Digital skule hver dag*" (*Digital schooling*)[23], digital literacy is defined as

> *"… skills, know-how, creativity and attitudes required by everyone in order to be able to use digital media for learning and attainment in the knowledge society".*

The concept of digital literacy ranges from basic skills to more generalised insights that foster discerning digital usage. Two different directions may be emphasised: One of these might be described as basic ICT skills such as e-mail, text processing, Internet searching. The second is based on the concept of 'digital *bildung'* which German loan-word denotes an amplified definition of digital literacy.[24] The EU employs the term *eSkills* in reference to practical IT skills and *eInclusion* to encompass the challenges associated with digital participation. Key literacy arenas are home, work, school/college and library.

Basic skills in ICT usage

A recent survey by TNS Gallup[25] indicates that out of those with Internet access at home, 89 per cent respond that it is not difficult to use a computer and more than half see themselves as proficient in dealing unaided with the majority of computing problems. The same survey reveals that only a minority see use of software or the Internet as problematical. International surveys[26] indicate that as many as four in ten in Norway can be classed in the category "advanced" when it comes to basic ICT skills.

The same survey shows that in most countries, gender plays a lesser role in terms of differences in basic ICT skills. Age difference however is a far more significant factor. The age group 55+ currently includes a good 1.2 million Norwegians. Of these, some 800,000 are non-users of ICT and the Internet. A "young senior" group, aged 55–74, represents a total of around 830,000. Of these around 500,000 are non-ICT users – and their life expectancy is a further 10–30 years. Three in four in the age group 65–74 are non-users of the Internet[27]. The picture emerging is that different types of digital forms of communication can be associated with "generations" and even web users born in certain years.

Persons of working age who are unemployed use computers and the Internet to a far lesser extent than those in employment. But the question of the right to digital literacy also affects all those who work in sectors where computer resources are not yet used extensively. The statistics indicate that the self-employed use ICT far less than wage earners.

Working life as a skills arena

In an era characterised by rapid technological development and widespread globalisation, knowledge and skills will come to be an increasingly important factor. EU surveys[28] indicate that 60 per cent of working people use ICT as part of their daily routines and procedure. New technology and new services integrate more and more functionality and content. This entails greater demands for frequent adaptation and flexibility among employees.

[23] Network for IT-Research and Competence in Education (ITU) (2005), Digital skule kvar dag (Digital schooling) (Norwegian only)

[24] HØYKOM (2003), Ein utredning for programstyret i HØYKOM (A report for the programme board of HØYKOM) (Norwegian only): Skule for digital kompetanse. Om framtidige behov for breiband i utdanningssektoren.

[25] TNS Gallup (2006), Interbus nr. 3 2006

[26] Eurostat (2006), 2005 Community survey on ICT usage in households and by individuals

[27] Statistics Norway (2006), ICT in the households

[28] Eurostat (2006), 2005 Community survey on ICT usage in households and by individuals

The *eBorgersurvey* (eCitizen survey) 2006[29] tells us that many of the employed regard their digital skills as adequate to meet the demands made of them in working life. The majority of those surveyed appear to have great self-confidence in the use of ICT.

This satisfaction with personal ICT accomplishments is however by and large not shared by the managers of enterprises, nor by researchers. And a number of Vox[30] enquiries also indicate that the labour market is experiencing high demand for digital skills. The Vox barometer for 2005 also found a large gap between the importance of computing skills among employees and their satisfaction with their attainment of such skills.

Although many rate their personal skills as high, many employees feel that they have not kept up-to-date on developments and see themselves as highly vulnerable because they lose control over various daily or job-related tasks. In a survey conducted by the FAFO Institute for Labour and Social Research, one in four who took early retirement under the AFP scheme (minimum age 62) identified the introduction of corporate ICT systems as a reason for taking early retirement[31]. This may be an indication that senior employees are being sidelined through the introduction of new technologies and that a lack of basic ICT skills may result in mature employees being passed over and hence losing their motivation to stay in work.

Digital literacy in the education sector

ICT promotes changes in learning environments, the way in which we learn and the means by which learning generates new knowledge[32]. New forms of communication and sharing cultures within schools, and not least between schools and their environment, encourage schools to open up to extended collaboration between home and school, local actors such as businesses and other public bodies.

As part of the Knowledge Promotion programme, new curricula were introduced in autumn 2006 for primary and secondary education. The basis for all learning and development is made up of five core skills: reading, writing, oral expression, arithmetic and the use of digital resources. In the new curricula, ICT skills are integrated in the skills attainment targets for all subjects. Among other things, pupils are required to learn to search for, locate, process, produce, re-use, present and critically assess information as well as communicating and interacting with others. Norway is well in the lead internationally with a curriculum in which digital skills are to be integrated in all subjects.

Teaching skills in basic education

The introduction of the Knowledge Promotion programme and new curricula challenge teachers in several ways. The new curricula contain skills attainment targets which presuppose that teachers are fully au fait with how ICT can be used in education. This poses challenges in relation to both the training of new teachers and continuing education of working teachers.

Moreover, trends in children's and teenager's social practices involving ICT pose new challenges for the digital literacy of the teachers themselves. In the general training programme for generalist elementary teacher training, "*ICT as an educational resource for communication and learning*" is a multidisciplinary area prescribed as a component of curricula for all subjects in education. In their local curricula, the teacher training colleges must observe this requirement such that trainee teachers are to receive training in the use of ICT as a communication resource and tool for teaching in the various subjects.

ICT and learning among pupils

The OECD report *Are Students Ready for a Technology-Rich World? What PISA Studies Tell Us,* provides a useful summary of the challenges posed by ICT in education. The report points out that in an age in which ICT features strongly in everyday life and in education, the minority of students with inadequate access to ICT, who make little use of ICT and who are not confident in using ICT are underperforming in relation to their peers. The use of ICT in schools serves to bridge this digital divide. The OECD also raises the issue of whether students who use ICT more are necessarily using them to best effect. It is the quality of ICT usage, rather than the quantity that will determine the extent to which ICT will have a positive impact on the students' academic outcomes.

The Norwegian universities and colleges are at different levels in their use of ICT. There are also great disparities between different professional

[29] Vox (2006), Vaksnes læring 2006 - tilstand, utfordringar, anbefalinger
[30] Vox is the national center for learning in working life
[31] FAFO (2002), Report 385: AFP-pensjonisten: sliten eller frisk og arbeidsfør?
[32] Network for IT-Research and Competence in Education (ITU) (2005), Digital skule kvar dag (Digital Schooling) (Norwegian only)

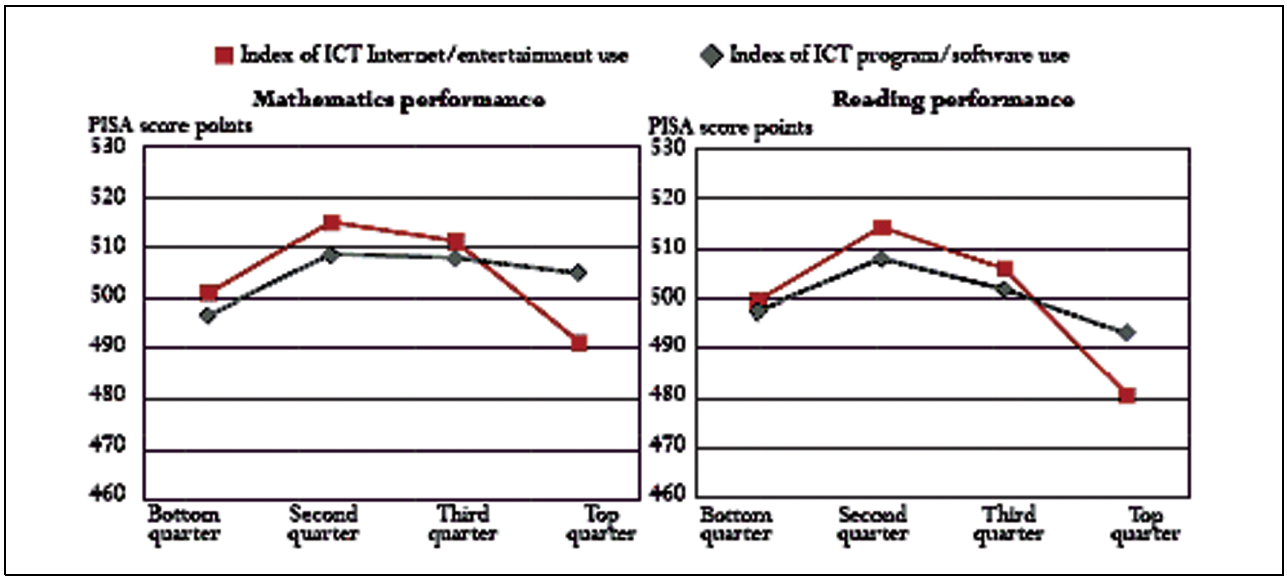

Figure 4.3 The relationship between the students' use of ICT and average performance in mathematics and reading. In the figures, students are broken down into quarters by use of the Internet and software.
Source: OECD/PISA

environments internally in the different institutions of education. In general, Norwegian higher education is well advanced in terms of ICT usage. A solid infrastructure and a good network has been established through UNINETT, the company owned by the Ministry of Education and Research. The institutions of education have also introduced platforms at institutional level for electronic processing of course and learning resources, the so-called LMS (Learning Management Systems).

Discerning digital usage – safe use of the Internet

Discerning digital usage is the ability to acquire important information, interpret media content and to exercise critical judgment. Digital literacy is about possessing the insights required for being fully worthy participants in the current digital society. Here, abilities in communication and content production on the Internet will be important. We are witnessing a trend whereby users are shifting from being passive media consumers to being active participants and content producers. The ability to create and share media content is becoming increasingly important and may be termed "digital cultural literacy". This makes new demands on user competence and critical evaluation, and also on the ability of each individual to distinguish between the valuable and the trivial, and what can and cannot be trusted[33].

The concept of *e*Safety, that is, safe use of the Internet, is particularly topical in relation to children and teenagers. Use of the Internet has to negotiate territory between the right to receive information and the right of children and young people to be protected against illegal, harmful and undesirable aspects of information and communications media. The UN Convention on the Rights of the Child places emphasis on both access to information and protection against harmful information.

SAFT's (Safety, Awareness, Facts and Tools) child studies indicate that technology usage by children and young people is changing and they too are spending more time on technology. It also reveals that children and young people have become more critically aware of the information they find on the Internet. This critical approach is important in the light of the fact that

- 75,000 children state that they have received e-mail that has upset or frightened them. Just 14 of children in the age group 9–16 state that they have posted malicious comments on the Internet (bullying or intimidation).
- 24 per cent of those who use the Internet state that they have received unsolicited sexual posts.

Children and young people are not only potential victims. They can also be responsible for criminal

[33] Petter Bae Brandtzæg, Sintef IKT, Aftenposten 18.1.2005: "Digital dannelse er blitt en nødvendighet, både for voksen og barn"

acts and for causing harm to others. Posting abusive material is one example. Exposing classmates or others to ridicule on the Internet or by mobile phone is a malicious type of bullying, and one which society clearly must take sharp issue with.

The Ministry of Children and Equality and the Ministry of Culture and Church Affairs, in conjunction with other relevant ministries, are responsible for a joint action plan on safer use of the Internet for children and teenagers. This joint action plan is of singular importance because the efforts to promote safer use from many ministries, subordinate departments and enterprises, trade organisations, individual actors on the market and voluntary organisations will be coordinated and presented in a coherent fashion.

*e*Safety is not only associated with children and teenagers. Among all consumers – old and young – the need for information, education and accountability is present – and is predicted to increase still further. Among other concerns, the issue of personal data protection affects all ages and user groups.

4.4.3 Challenges

The government has identified the need to implement measures to maintain and develop digital skills among vulnerable groups in the population in order to prevent digital divides from growing in the years ahead. In order to achieve this it is essential to provide skills arenas for everyone. The skills arenas might be school, work, public arenas such as libraries or local authority service centres, shopping centres and also home.

If we consider skills building from a lifelong-learning perspective, it is important to institute measures for adults – both the employed and the unemployed. Unlike other learners, such as college students and school pupils, many people in this group do not use ICT on a daily basis. With regard to adult learning, digital skills can serve to reduce long-term unemployment and exclusion from the labour market. Continuing and further education is one of the most important resources we have for qualifying people for a working life that is constantly changing, both in terms of structure and procedure. The government sees it as a great challenge to create conditions conducive to a more inclusive labour market that is accommodating of different people with differing abilities. In 2006, the government, through the Ministry of Education created a "Programme for basic skills in working life". The programme funds private and public sector companies who provide training in reading, writing, arithmetic and ICT for their own employees and jobseekers.

The picture of the elderly as the group with the weakest digital skills has scarcely changed in recent years. At the same time, we find that the negative consequences of not participating on the Internet are constantly growing. The public sector invests heavily in the development of web-based services that also have senior citizens as a key target audience. Elderly persons over the age of 60 and pensioners are large consumers of counter services[34], and this entails costs and drawbacks. Those who use online services, both from the public and the private sectors, are extensively rewarded by for example extended due dates, cheaper tickets and lower charges. This situation may change as more technology-savvy generations reach this age, but it is likely that that the challenges mentioned above will be present for many years to come.

Voluntary organisations in Norway will be able to play a key role in mobilising a number of the age-determined groups that are currently being left behind. The government, through the agencies of the Ministry of Government Administration and Reform and the Ministry of Education, wishes in future to continue supporting non-profit organisations that wish to assist in building the public's digital skills. Public service providers should more extensively form partnerships with both the labour market and non-profit organisations to improve digital skills in the adult population.

Public offices such as local labour and welfare office user sites, municipal service centres and others should also be arenas for offering instruction and assistance in using public sector online services. Similarly, private actors in media, finance, retail and travel should be urged to assume responsibility for providing instruction to users so that they become fully proficient at using their solutions.

An education system adapted to the pupils' and students' media habits

Children and young people are exposed to and use digital media and services at an ever-earlier stage and many have acquired a number of digital skills even before they start school. Schools are required to create conditions that are conducive to learning for all pupils and students irrespective of the resources available to them at home. Digital skills

[34] Nye tjenester på postkontorene (New services at the post offices), Fafo report 249 1998

acquisition is an integrated component of all subjects and although many households with children have access to a computer and the Internet, a group of pupils/students will lack access to the equipment required for doing homework. This might exacerbate the differences between pupils/students with different family backgrounds.

At the same time, children's knowledge of new technology should be put to use by schools where possible. Many children and teenagers have extensive computing experience from gaming. It is therefore important that schools do not regard youth digital culture as a threat to school content and ways of working, but manage to balance their role in relation to young people's digital media habits. Schools should be well-informed of and engage in studying external influences in order to identify the considerable potential for learning and cooperation inherent in the technologies that are rapidly adopted by children and young people, such as the so-called Web 2.0 technologies.

eSafety

The government is concerned about the safety of children and young people on the Internet. The Ministry of Justice and the Police has appointed a working group to examine measures for preventing Internet-linked child-abuse. The group will present its recommendations in January 2007 and the government will be considering the measures proposed. Children, teenagers and adults have a need for open discussion about ethical use of the Internet instead of it becoming a covert youth domain. SAFT's youth survey provides clear indications that parents have little awareness of children's' and teenagers' actual Internet usage. The Government sees it as a challenge to encourage schools and parents jointly to assume responsibility for acting both as guides and limit-setters. Everyone who works with minors should be well informed of children and young people's media usage and how this can be used constructively in teaching and interaction with children.

4.4.4 Government measures

Measure 4.10: *Public enterprises shall contribute to digital skills building.*

Public sector enterprises are to contribute to digital skills building in the nation by more extensively forming partnerships with the labour market and non-profit organisations.

Local and central government offices providing services to citizens will be urged to go further in establishing terminals for citizens and in organising instruction of citizens in order to ensure access to electronic services for that segment of the public that does not have access to computer equipment at home or at work.

Measure 4.11: *Information provided to schools, parents, minors and consumers associated with safe use of the Internet to be further coordinated*

This is further to the action plan on "Children, young people and the Internet", a joint action plan on *e*Safety for minors. This joint action plan is of singular importance because the efforts to promote safer use from many ministries, subordinate departments and enterprises, trade organisations, individual actors on the market and voluntary organisations will be coordinated and presented in a coherent fashion.

Measure 4.12: *The Knowledge Promotion programme shall be followed up*

The programme to ensure all pupils/students of digital literacy as a basic skill will be followed up in connection with implementation of the Knowledge Promotion programme. The same applies to the drive to provide all teachers with the necessary proficiencies and skills for using ICT in education

The universities and colleges shall promote digital skills building among students and staff as an integral component of their own activities in education and research. The institutions of education are to engage in national measures such as UNINETT and Norway Opening Universities (national initiative for higher education) on further developing constructive and efficient use of ICT in Norwegian higher education.

5 Research and development

Research has been and will continue to be crucial for advances in information and communications technology, including use of the technology. First because ICT is a special field of research for the development and use of technologies. Second because ICT is a key resource in effectively all fields of research. New technologies and enhanced use of technologies will therefore serve to drive research in future. Third, it is necessary to obtain insights into how ICT is changing society such as through new forms of organisation, communication and information flows. ICT research therefore covers a wide field which will call for extensive commitments in the coming years.

5.1 Research policy ambitions and priorities

Research and development will be crucial in ensuring a knowledge-based and innovative society in future. The government has the objective of extending the aggregate research effort in Norway to 3 per cent of gross domestic product by 2010. This is an ambitious objective that will entail a strong government commitment and a strong increase in R&D efforts in business and industry.

The government's overarching priorities in its research policy follow the main lines of Report to the Storting no. 20 (2004–2005) *Vilje til forskning (Commitment to Research)*. This priority operates with 3 dimensions (see Fig. 5.1). The first of these is the structural dimension: along this dimension, internationalisation will be a sustained perspective. In addition, pure research must be promoted with special emphasis given to quality and research in mathematical, scientific and technological disciplines. The third structural priority is research-based innovation and inventions, including research into increased innovation in the public sector. The second dimension is the strengthening of research in the four *thematic areas* of energy & environment, food, marine and health. The third dimension comprises the three *technology areas* of information and communications technology, biotechnology and materials technology and nanotechnology.

Pursuing these ambitions and priorities will provide broad impetus for Norwegian ICT research. In addition to the fact that ICT is defined as one of three prioritised technology areas, ICT will be strengthened through the other priorities. A broad commitment to internationalisation, pure research and research-based innovation will bene-

Figure 5.1 Priorities in Norwegian research policy.

Source: Report to the Storting no. 20 (2004–2005)

fit ICT research extensively. Furthermore, ICT will be an important element in the thematic commitments and the other technological areas.

5.2 The importance of ICT research for the information society

Information and communications technology is global, but national research and know-how is still crucial for the ability to make use of the technology. *The ICT sectors* are research intensive and research has primarily been devoted to components and how they are assembled in data and communications systems. However, increased penetration of ICT will also entail increased demand for research into *use* of the technologies.

Chapter 3 describes how ICT boosts productivity and value creation in society. This productivity and value creation is based on innovation and research surrounding technology, knowledge of how the technologies can be used and the skills required for making the most of their potentials.

Recent research[1] suggests that technological advances will play a key role in future and that research policy should be geared to stimulate diffusion of new technology within mechanisms of economic growth. There are currently sound prospects for capitalising on Norwegian ICT investments. But to achieve this, Norway must be more ready to tap into the potentials afforded by technology. This requires research into and knowledge about how we use and implement products and services in terms of organisation and administration and how we may reap the benefits of the investments that are made. This entails both research into ICT usage generally and research and development in the ICT sectors.

Recent research in Norway indicates that a significant proportion of research projects in which ICT is involved, result in innovations. Innovation is often the result because information and communications technology transcends traditional divides in terms of new organisational forms, procedures and other new possibilities. New public services and raised efficiency in public administration are also based on new and updated ICT expertise. In addition, society is influenced by breakthroughs connected with ICT, which can have both intended and unintended effects. Research and knowledge building are therefore essential.

5.2.1 Public administration requires ICT research

Over a period of many years, Norwegian public administration has introduced radical changes resulting in appreciable efficiency improvements. The ongoing reform programme also entails adjustments which demand new expertise. Participation in R&D projects and programmes is important in order both to share costs and experience and to avoid fragmented sourcing of expertise. The fact that government departments have often faced short time limits within which to introduce new solutions has meant that there was not always sufficient time to undertake research or development projects and apply for national or international research funds. Instead, the departments have developed solutions with the aid of in-house or contracted external resources.

One instrument in ICT research consists of the research & development contracts administrated by Innovation Norway, cf. Chapter 6. This scheme is designed to promote innovation activity and is based on mutually binding partnerships on product development between a supplier and a government department or a private enterprise.

5.2.2 Norwegian ICT research has yielded results

Norway has no large, international industry drivers in the ICT sectors such as Finland's Nokia or Sweden's Ericsson, which account for a preponderance of research in the ICT sectors in these two countries. Against that, Norway has talented research centres linked to the demand among medium-sized and small businesses for custom ICT products and software. Telenor is the largest individual company in the Norwegian ICT sectors and is one of Norway's largest R&D enterprises. In addition, Norway's applied research and pure research has a solid expert foundation and its results demonstrate innovation and sustainability, among other things through the development of the SIMULA programming language, the GSM industry standard and the FAST search engine. All three testify to advanced capability in software engineering and demonstrate that it is worth targeting Norwegian ICT in this area.

[1] Gordon, R.J. (2000):Does the "New Economy" Measure up to the Great Inventions of the Past? "Journal of Economic Perspectives" vol. 14, 4/2000; Jørgensen, (2003); Hagen, K.P. (2002): Den nye økonomien (The New Economy). Article in"Næringspolitikk for ny økonomi" (Business policy for the new economy), Hope, E. (ed.) Oxford. 1995.

5.3 Current status and financing of Norwegian ICT research

ICT research goes on in business and industry, at research institutes, universities and colleges. The research involves many disciplines, takes place in many sectors and comprises both pure research and development.

In 2003 the total operating costs of ICT research in Norway amounted to NOK 5.3 billion, broken down into NOK 4.5 billion in the commercial sector, just over NOK 700 million in the institutes sector and close to NOK 300 million in the universities and colleges sector.

The decade 1993–2003 saw a heavy real increase in the operating costs of ICT research in business and industry, but a real fall in the universities and colleges sector and the institutes sector, although with a slight rise post-2001 (see Fig 5.2).

Business and industry accounts for just under half of the total R&D programmes in Norway[2]. Business and industry carried out R&D in ICT worth a total of approx. NOK 4.3 billion in 2003, around a third of business and industry's total R&D costs. ICT has special status in that almost all industries carry out research in this area. Service provider sectors in particular concentrate their efforts on ICT.

The universities and colleges sector conducts almost a third of all R&D in Norway and is responsible for a preponderance of the fundamental and long-term ICT research, while it also produces graduates. All of the four main universities in Norway have strong R&D centres in several fields of ICT, while some colleges have made a strong commitment to special areas within ICT.

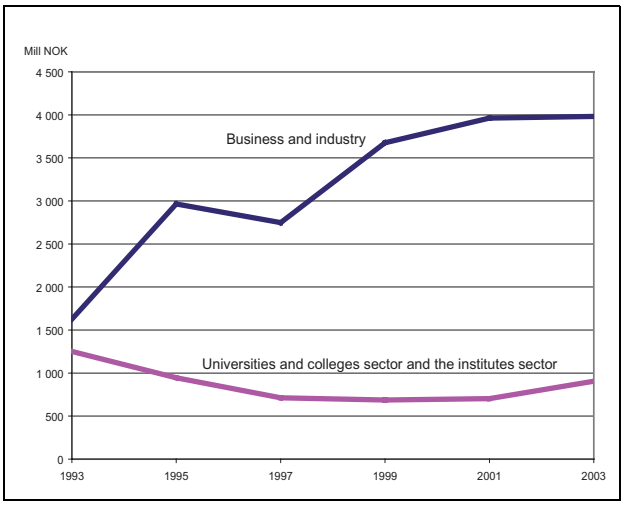

Figure 5.2 R&D operating costs within ICT 1993–2003 by performing sector. Fixed 2000 prices.

Source: R&D statistics, Statistics Norway/NIFU STEP

The institutes sector carries out a fourth of all research in Norway and plays an important role in the Norwegian research and innovation system. The institutes supply applied research to business and industry and public administration and build bridges between companies and government departments and academia.

ICT development calls for close interaction between pure research, innovation and applied research – and the distance between them can be short. Interdisciplinary approaches and project formats are becoming increasingly important as a result of technological convergence and the growing diversity of applications and issues associated with use of the technology. The Research Council of Norway has a wide array of programmes and instruments to enable it to promote all aspects of ICT research. A particularly relevant drive is the VERDIKT research programme, designed to operate across disciplinary and sectoral divides. The programme is one of seven major research programmes under the Research Council of Norway.

Of the three prioritised technology areas, ICT is the one that receives the most funding through the Research Council of Norway. In the Research Council's budget for 2006, ICT research accounts for NOK 410 million or 7.8 per cent of the Research Council's total budget. Figure 5.3 below shows the trends in the period 2000 to 2005 in the Research Council of Norway's funding allocations to projects in the five priority areas identified in the 1999 research report. ICT research, financed through the Research Council of Norway shows stagnation in real terms, while growth in the other priority areas has increased from 60 per cent to 110 per cent.

During the same period, the government established the *Skattefunn* tax offsets scheme (see box 5.3), which to a great extent funds ICT-related R&D.

Norway's total investments in ICT research are relatively low in international terms. Measured as a percentage of GDP, expenditure on ICT research in Norway amounted to 0.24 per cent in 2003. This places Norway in the bottom half of OECD countries, but ahead of countries such as Great Britain and Australia. Finland ranked highest with its total expenditure on ICT corresponding to 1.27 of GDP, followed by Korea and Sweden with approx. 1 per cent. Norway's ranking is to some extent explained by its relatively high GDP level and relatively low total R&D commitment in business and industry.[3]

[2] NIFU – Studies in Research, Innovation and Education, 2004

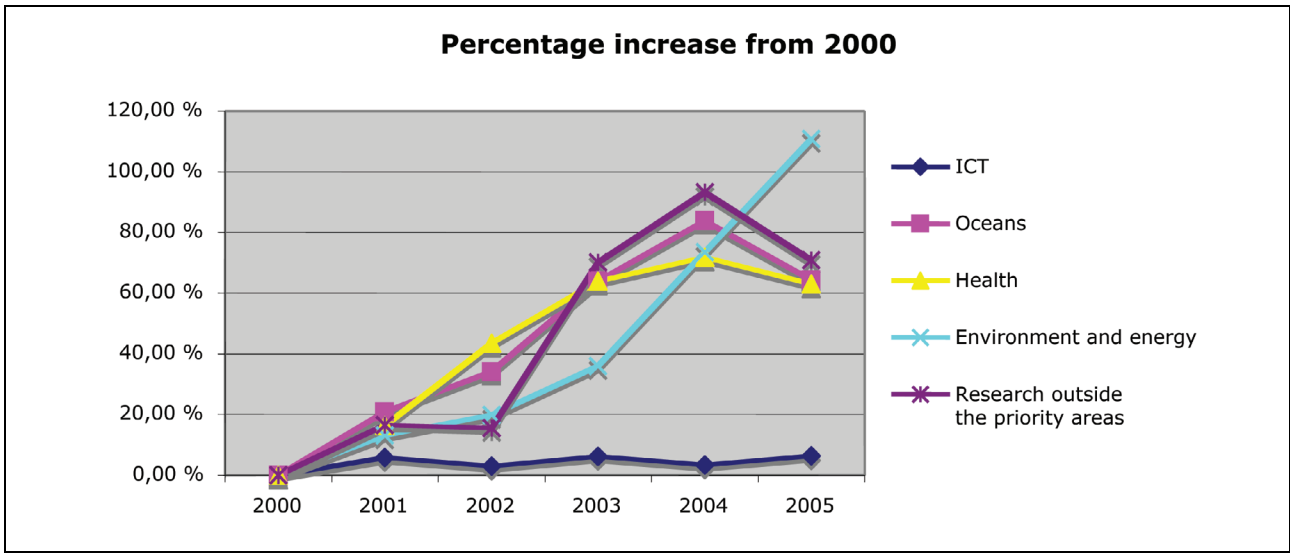

Figure 5.3 Percentage increase in Research Council of Norway allocations to the five priority areas in the 1999 research report.

Source: Research Council of Norway, 2006

If we look at the percentage share attributable to ICT research in R&D overall in business, Norway comes out of it better. In Norway, ICT research accounts for almost a third of business and industry's total expenditure on independently conducted R&D. This places Norway almost on a par with countries such as Denmark and France, but still a good stretch behind Ireland and Finland where ICT research accounts for 70 and 64 per cent respectively of total R&D in business.[4]

5.4 ICT research should be broad-based

ICT research is conducted predominantly into fields of *technology and science*, but also encompasses *social sciences, humanities* and *law*. This lends the breadth and depth to the research that is needed for responding to challenges in the information society. Issues in these three areas influence each other. By conducting ICT research of a sufficiently high standard and scope in all disciplines, Norway will be well placed to respond to developments in the information society. Research and development activities must be followed by pilot and feasibility studies.

Technological and scientific research

Technological and scientific ICT research will advance the development of new hardware and software and better understanding of technical correlations and potentials. This research covers a wide range of fields. In terms of hardware, it comprises microtechnology and telecoms technology, while the software-oriented research concerns itself with programming languages, user interfaces, the design of large-scale software systems (including systems for communication and communications services), databases and security issues. Norwegian business and industry research into communications technology is directed at fields such as network solutions, telecommunications equipment, communications services and middleware[5].

Business and industry research in software and its applications covers a broad thematic spectrum including system software, communications, services and user interfaces, and with applications in electronic commerce, telecommunications and data processing activities everywhere in society. Expertise in and capability for *software development* is becoming more and more important. Software development accounts for some 75 per cent of the cost of developing a mobile phone and around 50 per cent of the cost of developing a new car. It is crucial for innovation and is essentially linked to

[3] Source: OECD, Information Technology Outlook 2006.
[4] Source: Statistics Norway, Nøkkeltal om informasjonssamfunnet (Key figures for the information society) 2005

[5] Middleware: software that ensures a connection between components and applications.

R&D initiatives, both as regards supporting use of ICT in business and society generally, but also in terms of developing the ICT sectors. The technological and scientific research centres in Norway have strong expertise in software development and have proven innovative capacity. These centres should be further developed so they are geared to responding to future challenges and opportunities in the information society and will be able to underpin growth of the ICT sectors, which are among the fastest growing sectors.

The total volume of digital data worldwide doubles approx. every four years. The capability to process, distribute and make use of this data volume requires state-of-the-art electronic infrastructure. One key component of this is GRID infrastructure. GRID collaboration and use of research networks requires the development of applications capable of handling huge data volumes and organising data processors to interoperate as one.

Norway has also built up important electronic infrastructure in several areas: the State-owned company UNINETT AS operates networks and network services for universities, colleges and research institutions in Norway. In the years leading up to 2009, the campus network will be strengthened and coordinated to make a high-capacity infrastructure available to end users at all universities and colleges nationwide. Norway has also engaged in extensive collaboration on high performance computing (HPC). This collaboration involves a number of key actors in Norwegian research. Since 2004, the collaboration has been organised as a subsidiary of UNINETT AS (UNINETT Sigma). This company has been designated the Norwegian GRID coordinator, both in the pan-Nordic and European grid projects.

Substantial initiatives are in progress internationally to develop the GRID infrastructure. The challenge in future will be to develop a framework that will enable Norway, the Nordic Region and neighbouring regions to collaborate in such a way that the region will stand out as an attractive partner in this field, both in Europe and globally.

Scientific and humanistic ICT research

Scientific and humanistic ICT research is vital in order to acquire knowledge of how ICT systems should be designed in order to meet the needs of different users and in the interest of obtaining a broader perspective on what influences technological developments and how technologies influence culture and society. Research into the cultural and societal aspects of ICT provides an informed basis for public and private sector enterprises and for individual citizens. The development of digital learning resources for example require knowledge of genre trends in new media and of how different age groups use ICT. In addition, new commercial services are dependent on, for example, insights into technology, users, business models and regulatory framework conditions.

Legal ICT research

Legal research deals with the legislative aspects of ICT. Developments in ICT call for legislative amendments as a result of convergence between technologies and in respect of copyright and other intellectual property law, consumer law, contract law etc.

Most areas of society and activities are currently to a greater or lesser extent governed by law. As ICT is adopted and impacts on all areas, traditional, statutory regulation will need to be amended or adapted. In addition, potentials arise out of new technologies that entail reviews of legal framework conditions. Many changes result in products shifting between areas which were traditionally treated as separate. A typical example would be the transition from "products" to "services". Data were typically locked in a physical medium (a book, a record, a CD-ROM, a DVD) but are now also sold as an online service.

Legal informatics research covers *fundamental issues* arising as a result of the nature of information and communications technology, *unique legal informatics* issues which have arisen as a result of new technologies; issues pertaining to *markets for electronic products and services*, and *electronic administration*, in particular ordinary public service production.

5.5 Scientific expertise

Although ICT research embraces many disciplines, an ICT initiative will be particularly dependent on access to technological and scientific expertise. Firstly, there is a strong need for staff with a scientific training who will be capable of developing and using ICT solutions in business, public administration and society generally. Secondly, it is important that the best graduates have a means of pursuing a research career in ICT and ICT-relevant fields. Thirdly, it is necessary to have a sufficiently large number of teachers with scientific training to ensure future recruitment to the various scientific disciplines in the long term.

In Norway there is currently high demand for researchers and highly qualified personnel in ICT and ICT-relevant disciplines.

The percentage of students who graduated in science has fallen from 22.4 in 1994 to 17.8 % in 2004. However, there are signs that this negative trend may have been reversed. The increase in the number of applicants for engineering programmes is, for example, 17 per cent up on the previous year.

In spite of the encouraging upturn, there is still a need, at every level of education, to ensure future recruitment to the sciences. Follow-up on the government's national science in education strategy comprises a number of measures from pre-school to PhD level. As an element in pursuit of this strategy, the government has also established a National Forum for Sciences under the supervision of the Minister of Education and Research.

The government's follow-up on this and other initiatives to promote recruitment to the sciences will be highly influential on future initiatives in ICT research in Norway.

5.6 Participation in international research and development in the ICT area

ICT research is inherently international. The internationalisation of Norwegian research is a general research policy priority. The internationalisation of Norwegian ICT research serves to raise the quality and relevance of ICT research and to promote innovation and value creation in the ICT sector. To that end, Norway has a declared policy of engaging actively in the EU framework programmes, the network for market-oriented R&D, in R&D programmes through the European Space Agency (ESA), other organisations and through bilateral research partnerships.

5.6.1 Participation in EU research programmes is essential

The EU framework programmes for research and technological development constitute the most important international collaborative arena for all Norwegian R&D initiatives. Of particular importance is the relationship building with other researchers, research institutions and business and industry that Norwegian actors have to achieve in order to secure funding and participation in an EU project. The EU framework programme also influences Norwegian policy and research policy priorities through new initiatives in and linked to the programme.

Since 1994, Norway has participated, through the EEA Agreement, in the EEA-relevant components of the EU's Framework Programmes for research on a par with EU Member States. ICT is the largest thematic area. The EU's 7th Framework Programme for research and technological development (FP7) starts in 2007 and will run until 2013. The programme has four specific pillars:

- Collaborative R&D within prioritised thematic areas through the Cooperation programme
- Basic research through the research frontier in the Ideas programme
- Strengthening human resources and mobility through People
- Potentiating research capacity in Capacities, with a focus on infrastructure and SMEs.

Norwegian participation in the ICT component of FP6 is substantial, amounting to approx. 15 per cent of total Norwegian participation. Out of IST (Information Society Technologies) applications with Norwegian participation, 22 per cent have been recommended for funding, compared with an average of 17 per cent for all IST applications. Participating in FP7 for research and technological development is a means of boosting Norwegian ICT research and promoting Norwegian priorities. The two projects DIADEM (Delivering Inclusive Access for Disabled or Elderly Members of the community) and InterRisk (Interoperable GMES Services for Environmental Risk Management in Marine & Coastal Areas of Europe) are notable examples. The aim is for both Norwegian participation and Norwegian financial returns within the ICT programme to be stepped up in FP7.

The EU has actively supported the establishment of more than 30 *European Technology Platforms* (ETP). Norway should be an active participant in these. The platforms can be used strategically to develop Norwegian commercial ICT research. The Research Council of Norway should promote participation in the ICT platforms, work for the creation of Norwegian arenas capable of collaborating with relevant European technology platforms, and ensuring good linkages with national programme activities.

The government attaches importance to active and strategic participation by Norway in the formulation and implementation of relevant Joint Technology Initiatives also.

The EUREKA collaboration is a European network for market-oriented R&D in which several European ICT companies have taken the initiative

for major programme projects (ICT clusters) in areas such as microelectronics, telecommunications, software and multimedia. Norwegian involvement is primarily within the areas of software technology, telecommunications and microsystems. Norwegian business and industry regards the market proximity of the EUREKA collaboration as relevant and positive. Norwegian EUREKA participation in the ICT area should be continued and if necessary boosted.

As of 2007, the EU will be running a dedicated framework programme entitled "Competitiveness and Innovation Programme" (CIP). This programme will comprise ICT initiatives for stimulating new *e*Commerce markets, electronic content in European media and increased use of digital technology, collaboration and development on *e*Health, *e*Government and *e*Inclusion. Components of ICT research in FP6 will also be transferred to CIP. This will include areas which the EU finds are more allied with development efforts, such as *e*Government initiatives. The government is currently deliberating the question of Norwegian participation in CIP.

5.6.2 Global collaboration on ICT research

The global nature of the ICT area dictates that Norway's participation in international ICT collaborative research should not be restricted to Europe although participation in European collaboration is of particular importance also in view of the fact that Norway is part of the EU's Single Market.

Norway has signed a number of bilateral agreements which pave the way for collaboration at researcher and institutional level within the ICT area also. Collaboration with *North America* is important for Norwegian ICT research and the ICT sector and is based on collaborative relations forged over many years between Norwegian and North American academic centres in a number of ICT fields. The universities and ICT businesses often also enjoy more dynamic partnerships in North America than in Europe and this can give vital impetus to Norwegian ICT research.

With key *Asian* countries also, increasing collaboration is occurring both on R&D and market penetration. Schemes and initiatives to promote bilateral R&D collaboration should be continued and if necessary boosted. A new bilateral research agreement with *India* was signed in November 2006 and a new, corresponding agreement with *China* is under negotiation.

5.6.3 Measures to boost Norwegian ICT research

Information and communications technology has great and mounting influence on economic growth and productivity, is adopted increasingly by the whole of society and impacts society in new ways. The government will promote a culture of innovation and entrepreneurship in all research fields, through interaction between business and industry, the public sector and research centres. The government wishes to see ICT research make substantial contributions to this type of culture and this type of interaction. The government will be intensifying ICT research on a broad front:

- The government has the objective of extending the aggregate research effort in Norway to 3 per cent of gross domestic product by 2010. This is an ambitious objective that will entail a strong government commitment and a strong increase in R&D efforts in business and industry.
- The government will prioritise and boost ICT research in the general R&D appropriations in line with the guidelines laid down in Report to the Storting no. 20 (2004–2005) *Vilje til forskning (Commitment to Research)*.
- In initiatives for the High North, the government's priorities will include ICT research.
- The government will be working to strengthen ICT research through a wide array of instruments under the Research Council of Norway and will be instrumental in ensuring that diverse initiatives are seen in context. The VERDIKT programme on core competence and growth in ICT will be a key instrument.
- The government will promote recruitment to ICT and ICT-relevant disciplines, among other things by pursuing the Ministry of Education and Reform's science strategy and the Research Council of Norway's strategy for pure research in mathematics, science and technology.
- Besides appropriations for R&D, the public sector plays a key role in business growth as a client for and procurer of different products, development projects and services. The government will be further developing the public sector's role as a good and demanding customer in the ICT area.
- The government wishes Norway to participate in the EU's Seventh Framework Programme for research and technological development and will be presenting a bill on Norwegian par-

ticipation once the final resolutions have been passed in the EU (due early 2008).

- Norway has accepted an invitation to participate in the design of European technology platforms. This is important for both Norwegian ICT research and for other Norwegian participation in European collaborative research. The government will be calling for the establishment of additional Norwegian national technology platforms where European technology platforms have been established with active Norwegian participation.
- The Government will be proposing that Norwegian EUREKA participation in the ICT area be continued and if necessary strengthened.
- The Government is considering regular participation in various action programmes within the ICT area in the EU.
- The Government will also be strengthening collaboration on ICT research with countries outside of Europe, among other things by drawing on the bilateral agreements with the USA and key Asian countries.

6 ICT and business policy

6.1 The Government's goals and ambitions

Nowadays most of the value creation in business occurs within service provider enterprises and the volume of private services is twice that of public sector services. The significant advances in ICT over the past fifteen years have changed the organisation, supply channels and services in a way that has injected great dynamism into international commerce.

Over the last decade, advances in ICT have influenced developments in and operating conditions for the service sector. With turnover of NOK 177 billion in 2005, an increase of two per cent on the previous year, the ICT sectors are sizeable in themselves. Equally significant is the very nature of ICT: a pervasive technology that is deployed in and raises productivity in a number of sectors in the economy, from feed in agriculture and fisheries, through automation in industry, to radical changes in widely differing sectors such as retailing, banking and insurance. In a short space of time advances in ICT have enabled knowledge-intensive commercial services especially to achieve increased penetration, knowledge sharing and worksharing across large distances. ICT enterprises are characterised by being knowledge-intensive and environment-friendly. A strengthened ICT sector therefore advances the transition to a green knowledge economy.

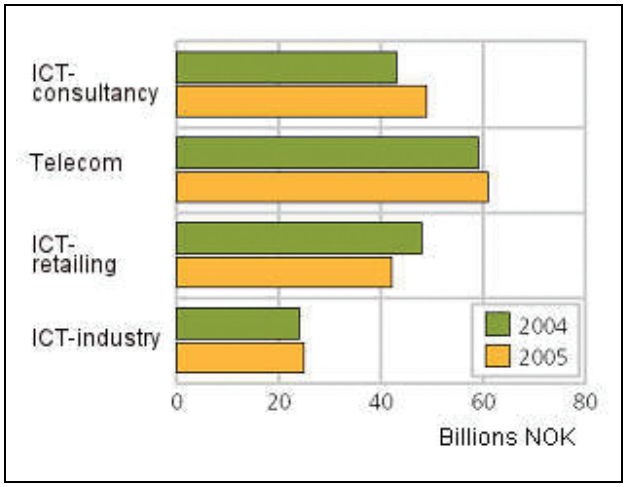

Figure 6.1 The ICT sector in figures

Source: «Nøkkeltall om informasjonssamfunnet 2005», SSB 2006

As discussed in Chapter 3, the ability to tap into the opportunities brought in the wake of these developments is a source of great economic potential. Economies of scale and network effects make it difficult to compete with the large international suppliers of the standard types of ICT equipment and software, yet internationalisation also creates opportunities for the Norwegian ICT sector. This means that business policy in ICT needs to operate with two types of focus:

- Further development of the use of ICT in business and society generally in order to raise Norwegian competitiveness.
- Identification of niches and development of clusters in which the Norwegian ICT sector has special preconditions for making its mark.

Norwegian niches should be associated with areas in which we have special preconditions for success. This will often, but not necessarily, be associated with challenges which are especially manifest in Norway such as:

- Shipping and activities in the North Sea dictated the need for satellite communications and navigation equipment and have been drivers for manufacturers and operators in these industries;
- Norwegian topography made radio communications highly attractive and turned Norway into a leader in wireless communications;
- High exploration and production costs in the North Sea have intensified demand for effective seismic surveys substantially in the Norwegian petroleum sector and both Norwegian and international firms are developing the necessary software here in Norway.

In future, initiatives in the High North will pose substantial challenges in terms of ICT solutions suitable for exacting climatic conditions (such as automation, handheld terminals etc.). Integrated operations and *e*Operation in the petroleum sector will extensively facilitate the development of new

solutions which will be of great value to Norway as a solutions exporter.

The Government's objective is for Norway to be one of the leading, innovative, dynamic and knowledge-based economies in the world within the fields in which we possess advantages. Norway is to be a good country to do business in.

6.2 Challenges associated with innovation and efficient use of ICT in business and industry

6.2.1 Business and industry must be sufficiently adaptable

Efficient use of ICT in business and industry promotes radical changes in costs, productivity, quality and service through the restructuring of production and other business processes. This places new demands on logistics and distribution, which in turn requires new organisational forms based on professional deployment of ICT.

The interaction between an ICT-supplier industry and corporate use of new technologies has great influence on general economic growth. Both in value chains and networks, the links between the actors are close and the synergy effects between them are substantial. Innovation studies indicate that customers and suppliers are the most important sources of company innovation. In order for business to become a more advanced and proactive user of ICT it needs to be in close contact with a skilled ICT-supplier industry – and in order to achieve a booming ICT sector it in turn needs demanding customers to spar with, both at home and abroad.

According to the latest productivity estimates from Statistics Norway[1] the highest productivity growth over the last decade was enjoyed by private service providers, and commodity trading and domestic transport especially. According to Statistics Norway, there is strong indication that innovation through the deployment of new technology is one of the factors driving this growth. These sectors have also carried out large-scale organisational restructuring projects on the back of heavy investment in ICT solutions.

However, this trend also embodies certain negative elements. Many firms have found that developing new ICT systems was far more expensive and more time-consuming than estimated, and the benefits far weaker than expected. New competitors emerge, often unexpectedly and change the ground rules and threaten the profitability of established actors. A key challenge is therefore to build the ability of businesses to assess the potentials of a new technology, to develop a strategy for ICT investments and to plan for its use in line with business strategy and competitive parameters.

6.2.2 Business and industry requires both user skills and high-end expertise

Information and communications technology is also a tool for effective development and administration of skills and expertise in business and industry. This comprises both *e*Learning (web-based/IT-supported learning) and IT-supported skills management in individual enterprises or enterprise networks. One critical factor in the skills picture is access to ICT skills in business and industry in the shape of what might be called 'strategic ICT skills', which are necessary for making efficient use of the inherent capabilities of the technology and high-end expertise in technology, which is a precondition for further innovation and development in the ICT industry. In addition there is the need for operational ICT skills.

User skills: Studies indicate that large businesses are best-in-class in terms of having a workforce with good/advanced ICT skills, while they are also relatively quick in and conscientious about adopting and using ICT tools in order to further strengthen the business's competitive edge. There is much to suggest that the biggest demand for skills still lies with the small and medium-sized enterprises (SMEs).

High-end expertise/strategic skills: Great optimism prevails in Norwegian business and industry, but there are reports of mounting recruitment problems in the knowledge industry (e.g. the 2006 corporate survey of Aetat, the Norwegian Public Employment Service). The consequences may be many. The obvious ones being that Norwegian business and industry, the ICT sector especially, will have to recruit from abroad to secure talent for their vacancies.

The fast-track scheme for processing of residence and work permits for foreign professors and PhD students works relatively well for large organisations, but there is an evident need to provide information about this option for SMEs.

[1] Statistics Norway, Økonomisk utsyn 2006 (Economic outlook 2006).

6.2.3 eCommerce is important for value creation in business and industry

Technological progress will ultimately entail large-scale structural changes in the economy. But they also offer commercial prospects within a number of new areas. Electronic commerce provides cost savings in sales, sub-contracts, purchasing, payment services and distribution.

Efficient use of information technology generally and electronic commerce specifically makes it possible to build competitive advantages within SMEs. The technology serves to counter some of the challenges associated with being a small operator in an increasingly global and competitive market and of being based far away from the main business markets.

In 2004, approximately one in five Norwegian enterprises had turnover from orders placed over the Internet. This was a substantial increase over the previous year. Essentially, it is the largest enterprises that have established systems and solutions for e-commerce over the Internet.

Mounting international competition and the new business prospects offered by *e*Commerce for small enterprises make it essential to identify any barriers against the use of *e*Commerce in these enterprises. It is also important to determine what role the public authorities can and should play in this context.

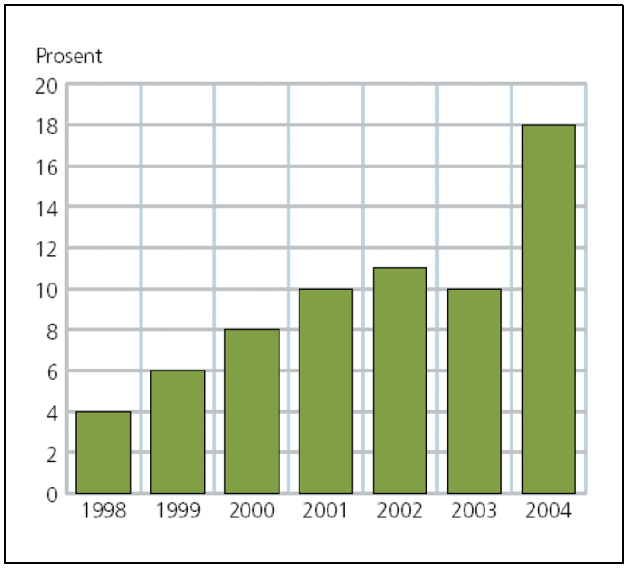

Figure 6.2 Percentage of Norwegian enterprises with turnover from sales over the Internet.

Source: Statistics Norway 2006

6.2.4 ICT and sustainable local communities

The government wishes to create conditions conducive for profitable and competitive business communities throughout Norway. The growth of regional business and industry is conditional on the presence of stronger regional competency and innovation centres, ideally sited with universities and colleges. It is important to build up and develop these centres and to encourage partnerships between them and regional business and industry, other competency centres and national and international networks.

The government will facilitate the emergence of strong regional programmes: Norwegian Centres of Expertise (NCE), Centres for Future Studies and Centres for Research-Driven Innovation (SFI) designed to stimulates centres with especially high potential. ICT centres are just one of several types of centre that will receive funding from these schemes. The business-oriented boost to policy on development of Norway's outlying districts must be geared to several areas. Firstly, it is important to promote greater awareness of expertise and innovation among existing business communities. Strategies and frameworks for the use of policy instruments should focus more intently on competency building and innovation. Secondly, a greater effort must be made to encourage start-ups of more competitive, future-oriented and innovative enterprises. This will entail a special challenge in encouraging start-ups in sectors with high value-creation capacity. Efforts to incorporate entrepreneurship in the education system at all levels should be stepped up. Finally, it is important to promote business-to-business partnerships and between businesses and knowledge institutions by fostering good regional value creation centres.

6.2.5 Innovation challenges for business and industry

In modern knowledge economies, innovation is the main driver of value creation. Developing new concepts and realising these in a market entails a risk, but is vital for all businesses or countries seeking to retain and build their competitiveness. Innovation is driven by several factors other than research, but R&D still remains core to the innovation process.

Through comprehensive studies, the Research Council of Norway[2] has identified four innovation challenges facing drives to increase future value creation: (1) innovation in existing business, especially within our strongest fields; (2) interaction

with innovation activities in the public sector; (3) innovation and growth in new, knowledge-intensive business, and (4) commercialisation in interactions between business and R&D institutions. The Research Council of Norway believes that an increased public sector R&D drive in these areas is essential for spurring the necessary innovation and value creation.

The main public sector actors in the promotion of business enterprises are usually referred to as the "policy instruments system", and they include. Innovation Norway, SIVA – Industrial Development Corporation of Norway and the Norwegian Research Council. The policy instruments system is discussed earlier in this chapter.

Innovation in existing business and industry

Norway has a number of business and industry centres with strong international positions. The most prominent examples are in petroleum, aquaculture and light-alloy metals, along with the marine and maritime industries, while Norway also has a competitive edge in niches in the wood processing and food industries. It is worth noting that in these industries, Norway also attracts globally leading companies and researchers, while they also gained prominence in the EU Sixth Framework Programme.

Interaction with innovation activities in the public sector

Public authorities are responsible for creating conditions that favour innovation. In addition, the public sector itself plays a key role in the innovation system in exercising its authority, as a service producer and infrastructure provider. This makes it especially important to retain focus on innovation in the public sector as part of a cohesive innovation policy.

The public sector can also provide a direct basis for innovation in business and industry, and represents a large and important market for private suppliers when it comes to products and services. Like large enterprises, public bodies can act as drivers for business growth. As a demanding client, the public sector can contribute to innovation in supplier firms. Innovation as it occurs within public bodies can be transferred to private enterprises and thereby contribute to increased value creation. Innovation can also be undertaken through public-private partnerships (PPP).

Through active use of the Norwegian system of public research and development contracts ("OFU" contracts), under which public institutions procure R&D from firms, the public sector is instrumental in building up the product spectrum and technical expertise in Norwegian business and industry, thus improving its competitiveness. The OFU contracts scheme is a targeted instrument for adaptation and market-orientation in Norwegian business and industry, while it is also to improve efficiency in public administration.

As regards research and development contract schemes, the percentage of the total adjustable allocation earmarked for PPP contracts has been heavily reduced since the 1990s. Funding schemes for research and development contracts under Innovation Norway are the principal instruments for promoting increased R&D partnerships within the private sector and between the private and public sectors. Innovation Norway is therefore working to increase the number of PPP projects under the scheme.

Innovation and growth in new, knowledge-intensive business and industry

Norway has one of the highest levels of education in the world, but its level of knowledge is not fully reflected in Norwegian business and industry. Norwegian industry is obviously less knowledge-intensive than industry in immediately comparable countries. New, knowledge-intensive business and industry is often fostered by strong expertise and commercial centres.

Research initiatives tend to yield the greatest economic returns where there is a centre to carry research and research findings forward, including private equity and venture capital environments. In the absence of such environments, there has to be dedication and ability to pursue long-term and cohesive priorities in order to achieve economic returns on R&D investments. This means that investments in research have to be followed up by instruments that promote enterprise start-ups and growth. In certain instances, it is desirable to promote access to private equity through government measures in order to realise economically favourable projects that would otherwise have gone unfunded. The government holds that public financing provisions should supplement private equity where the capital markets do not function as desired.

[2] Research Council of Norway: Research for innovation and value creation, contribution to Report to the Storting no. 20 (2004-05) – Vilje til forskning (Commitment to Research)

Government financing for commercial enterprises is substantial, both in terms of the scale and numbers of financing programmes. The financial instruments comprise low-risk loans, subordinated loan capital, venture capital loans, guarantees, subsidies, grants and equity and are aimed at both single enterprises and private seed and venture funds. The greater proportion of public loans and grants, including loans to private seed funds, are channelled through Innovation Norway. Equity investments in private venture funds are placed by Argentum Fondsinvesteringar AS.

Commercialisation in interactions between business and R&D institutions

In order to generate innovation and value from the results of R&D, these results have to be commercialised. In other words, ideas, technologies or new expertise have to be applied or realised in a market. Good ideas in themselves are not enough: there must also be the ability to extract value from them. This can be achieved by the R&D institutions dealing with commercialisation themselves or by the results being transferred to a commercial actor or implemented in the public sector. One condition for capitalising on research results is to secure the intellectual property rights to them.

Commercialisation uses and creates value from the knowledge and know-how developed through R&D investments. The Norwegian institutions of higher education (universities and colleges) have recently been charged with a responsibility for extracting financial benefit from research results.

One bottleneck for commercialisation of R&D results is the lack of early-phase financing. Commercialisation of knowledge-intensive products and services is associated with high risk and substantial, long-term capital requirements. State instruments can assist in carrying projects over to a phase in which they are able to achieve financing in the ordinary capital market.

6.2.6 Intellectual property rights

The ICT sectors are distinctive in terms of intellectual property rights in the sense that all types of rights are relevant to them. This applies to copyright, database protection, circuit layout rights, patents, registered designs, trademarks etc.

In its political platform (Soria Moria Declaration), the Government states that it will improve Norwegian patent policy to ensure that we can secure patent rights commensurate with those of competing nations. To that end, in February 2006 the Government decided that Norway should join the European Patent Organisation (EPO) by 1.1.2008. After broad consultation, the government has now presented a Bill to the Storting and a Bill to the Odelsting concerning the expedience of ratification and legislative amendments to that end.

In June 2006, the government decided to sign an agreement with Denmark and Iceland on the founding of a Nordic Patent Institute (NPI), the implementation of which must be approved by the Storting. The object of the NPI will be jointly to obtain more profitable and competence-building contracts from abroad, while benefiting from synergies and shared learning effects from the joint enterprise. NPI was already approved at the World Intellectual Property Organization's (WIPO) AGM in September 2006 as a signatory of the Patent Cooperation Treaty (PCT) of 1970. NPI will undertake the operative activities on Norway's accession to the EPO.

6.2.7 Re-use of public data

The value creation potential from re-use of public data is high. Increasing use of information technology has created wholly new means of using information from diverse sources and for collating and refining that information. Public information such as map data, meteorological data, business information and traffic information can be used as the basis for new products and services and are thus a vital economic resource. The information already available in the public sector can be an important factor in the digital knowledge-based economy and one objective is therefore to ensure efficient re-use of public information in the interests of increased value creation and the development of new services. This forms the basis for EU Directive 2003/98/EC on the re-use of public-sector information, as implemented in the provisions laid down in the new Freedom of Information Act adopted by the Storting in May 2006 (and which is due to enter into force on 1 January 2008).

The fundamental principle of the directive is that no discrimination must be made between actors seeking to re-use information from the public sector (non-discriminatory conditions). The right to re-use may be restricted by legislation on protection of personal data or intellectual property rights. However, the directive calls on the public sector to waive its own copyrights.

The non-discriminatory condition entails that information must be priced the same for the same types of actors and that exclusive agreements on access to information are as a rule prohibited. In

the light of the new rules on re-use, it may therefore be necessary to review the financing models currently in use in the public sector in connection with the production of digital services and products.

One important challenge going forward will be how to sustain the high quality of digital products and services if these can no longer be operated as a commercial undertaking, and external private actors are to be granted cheaper access to information. The government wishes to avoid a situation in which the quality of public data and services is impaired as a result of revised financing models, which would do business and industry, the content industry in particular, no favours.

For information sorting under the principal articles of the Freedom of Information Act [3], under the new Act it will be permissible only to apply rules regarding charges to recover administrative costs if data access involves a large volume of copies, transcripts or printouts or reproductions of high-cost media[4]. However, it will also be permissible to apply rules concerning charges to recover costs over and above purely administrative costs[5]. Here the Act sets an upper limit corresponding to that set out in Article 14 of the Directive on re-use. This prescribes that the total income should not exceed the actual costs of collecting, producing, reproducing and disseminating information, together with a reasonable return on investment.

The government believes that, in the interest of maintaining the high quality of digital products and services in the public sector, it will be crucial for the price to be based on recovery of costs, but that as a rule no profit should be applied.

eContentplus

The Storting has resolved that Norway is to participate in the EU eContentplus programme, which has a framework budget in excess of NOK 1 billion/€149million over three years (2005–2008). The programme aims to address use and re-use of public digital quality content in a common European context. eContentplus will promote the accessibility of more digital content across linguistic and cultural borders in Europe for the benefit of citizens and for a growing content and content processing industry. The needs of citizens are discussed in more detail in Section 4.2.3.3.

6.2.8 Convergence

Technological advances[6] have resulted in number of sectors gaining a common foundation in digital technology. This in turn means that the traditional sectoral divides are becoming blurred, erased even. The Internet can now be communicated over television networks and telephone services. Telephone services can now be communicated over the Internet and television networks. TV can now be communicated over the Internet and telecoms networks.

This 'intermingling' of telecoms, datacoms and media sectors is referred to as *convergence*. The convergence trend influences what services are offered and how the market responds. The changes result in actors offering more services over the same infrastructure, the same services over different infrastructures and recipients receiving more services on the same terminal. The change processes occur throughout the value chain.

The legislation in this area essentially implements EU regulation which Norway is obligated to comply with under the EEA Agreement. In the drafting of further regulations, regulation of the sectors should as far as is merited be taken in context to ensure that the different regulations function well together and that they are sufficiently future-proof. It is particularly important that regulations in overall terms do not impose undesirable rules determining which services succeed in the market.

The Ministry of Trade and Industry in conjunction with the Ministry of Culture and Church Affairs, the Ministry of Transport and Communications and the Ministry of Government Administration and Reform will be establishing an interministerial convergence group. The main object of the group will be to promote the growth of convergence. The establishment of this working group will entail no changes in the respective ministerial authorities. In connection with the establishment of the interministerial convergence group a liaison committee (reference group) will also be appointed for the ICT sectors, composed of members of the interministerial convergence group along with representatives of actors on the market.

[3] That is, documents concerning public bodies' exercise of their authority.
[4] § 8, 2nd part of the new Freedom of Information Act
[5] § 8, 3rd part

[6] Convergence is also referred to in Chapter 2.5.3

6.3 Government measures

A substantial number of the government's business and industry measures are generalised and not ICT-specific, although several schemes are of singular importance for the ICT sector. As discussed earlier in the report, the government finds it necessary to promote business expertise, to support conducive conditions for sustainable local business, to build business innovation and to address the regulatory challenges posed by technological progress and the diffusion of new services. Government measures in these areas are as follows:

Measure 6.1: *Increase appropriations for "Program for basiskompetanse i arbeidslivet" (Programme for basic skills in working life)*
The government wishes to increase funding for this programme and has proposed an appropriation of NOK 35.4 million for the programme through the 2007 government budget. The appropriation for 2006 was NOK 25 million.

Measure 6.2: *Increase appropriations for the "fast track" scheme*
The government wishes to boost the "fast track" scheme and in the budget for 2007 has proposed earmarking NOK 2.5 million to raise capacity within the Norwegian Directorate of Immigration for the processing of applications from skilled labour. The budget also proposes that the Labour and Welfare Service be allocated NOK 7.5 million for the programme to increase support for employees seeking to recruit foreign labour through EURES (the European Job Mobility Portal)

Measure 6.3: *Sustainable local communities*
The government wishes to create conditions conducive to profitable and competitive business communities throughout Norway. This should be achieved through the policy instruments systems of Innovation Norway and SIVA – Industrial Development Corporation of Norway.

Measure 6.4: *Innovation in existing business and industry*
The government wishes to promote innovation in existing business and industry by providing funding for industrial research and development contracts ("IFU" contracts). The IFU programme is a targeted grants scheme for small and medium-sized Norwegian enterprises operating as suppliers to large enterprises located in Norway or abroad.

Measure 6.5: *Create conditions conducive for new knowledge-intensive business and industry*
In order to create conditions conducive for knowledge-intensive business and industry, the government will increase the appropriations for start-up grants and incubator-grants.

Measure 6.6: *Re-use of public-sector information*
The government will pursue a cohesive policy to ensure efficient re-use of public information for increased value creation and the development of new services.

In order to facilitate re-use of public sector information, the main rule that access should be free of charge must be observed and charges shall be applied only in special circumstances under which the principle of cost recovery shall be the guiding rule.

7 Round-the-clock public administration – ICT within and in partnership with the public sector

7.1 Objectives and ambitions

The government's aim is for the public sector to be robust and efficient and for it to undergo reform in line with developments in the economy. In line with the government's political platform (Soria Moria Declaration), the programme of reform is to achieve greater prosperity and less use of resources for administration. The keywords in this initiative are usability, openness, efficiency improvements, quality and involvement. To that end the government will be working with employees, voluntary societies and organisations to build a good public sector.

In the reform efforts, ICT will be an important resource. Norway is at the forefront internationally in using ICT in the public sector. But the sector is large, the actors are many, and interaction between them could be improved. Each individual government organisation is responsible for its own procurements or development of in-house ICT solutions, while we also have an autonomous municipal sector. The result is that many electronic services are scarcely coordinated.

The aim is for the users[1] to be met by a more user-oriented and efficient sector through facilities such as electronic self-service solutions. These facilities should allow them to provide and receive electronic services 24 hours a day, i.e. from what we call a " round-the-clock electronic public administration". Round-the-clock public administration will pose challenges for organisational, legal and administrative processes in the public sector.

The government has decided that the realisation of a round-the-clock public administration is to be based on these main principles:

a) Electronic self-service facilities for citizens and business
b) Development of common ICT components for the public sector
c) Establishment of common architectural principles for the public sector

The project of realising these principles will call for reinforced cross-sectoral coordination functions. It will be necessary to identify new ways of organising and managing this project, including the necessity of a dedicated body.

7.2 Current status – ICT in a large and diversified public sector

Norway has a large public sector which is involved in many areas of society and organised through various types of affiliation. In 2005 central government administration accrued 234,200[2] normal man-years, while local government administration accrued 337,800. All told, central and local government administrations accounted for approx. 29 per cent of total employment (in normal man-years). Publicly financed service production has seen a strong increase over the last 30 years.

Electronic interaction in and with the public sector

Use of ICT in the public sector in Norway has essentially been based on the need to raise internal efficiency through the automation of service production and administrative processes and through more user-oriented services.

Electronic coordination in the public sector is still increasing, both horizontally and across the administrative levels (central/local government). The complexity of this coordination is enormous. The many organisational units have a large number of tasks and services to be performed using innumerable ICT systems. Statistics Norway reports that in 2005, 341 central government departments had independent decision-making responsibility in the ICT area. In the municipal sector, each local authority and county makes independent decisions in the ICT area (431 local authorities and 19 counties). The majority of public bodies/agencies have their own in-house system[3] for application processing and decision-making

[1] By users of public sector ICT services we mean citizens and businesses, as well as public sector employees

[2] Incl. employees in the health authorities. Source: Statistics Norway

support. These are often developed and enhanced over a long period of time and typically represent the backbone of the organisation.

The need for coordination between the public and private sectors is showing a growing trend, in parallel with coordination internally within the public sector. In certain contexts, public administration tasks are also dependent on the public sector and private business and industry having coordinated their electronic services. In certain areas of society, administrative authority is delegated to private or semi-private institutions or agencies.

A second variant of the interaction with the public sector is that business and industry is presented with many requirements laid down in legal acts and rules, notably those associated with reporting of statutory information to various types of authority. The need for coordination and streamlining of this dialogue has been conveyed on numerous occasions by representatives of business and industry. Many enterprises have made investments in ICT solutions to support their business critical and administrative processes. Public bodies should be able to benefit from this by ensuring that public sector ICT solutions are interoperable with business systems so as to prevent duplication of work and unnecessary paper routines. Excellent examples of such interoperability already exist. A number of payroll and finance systems have developed functionality which at a few keystrokes ensure that enterprises can report required information to the national authorities. As at November 2006, 4 in 15 of the most frequently used forms for business reporting are not available electronically.

7.2.1 User-oriented services

For some time now, the public sector has been committed to greater usability of services through the use of, for instance:

- the Internet as a channel for service provision and information publishing, and
- system-to-system communications for automated exchange of reports between systems, without manual interventions in the actual transmission of data [4]

In Norway we have a wide array of public sector websites. All the local authorities have their own websites, as do almost all central government bodies and in addition there is a large number of themed portals.

[3] By 'in-house system' we mean an ICT system that is customised or developed to cater to the organisation's specific, internal core procedures.

[4] This type of interaction is particularly widespread in and for the business sector, as well as for internal use in public administration.

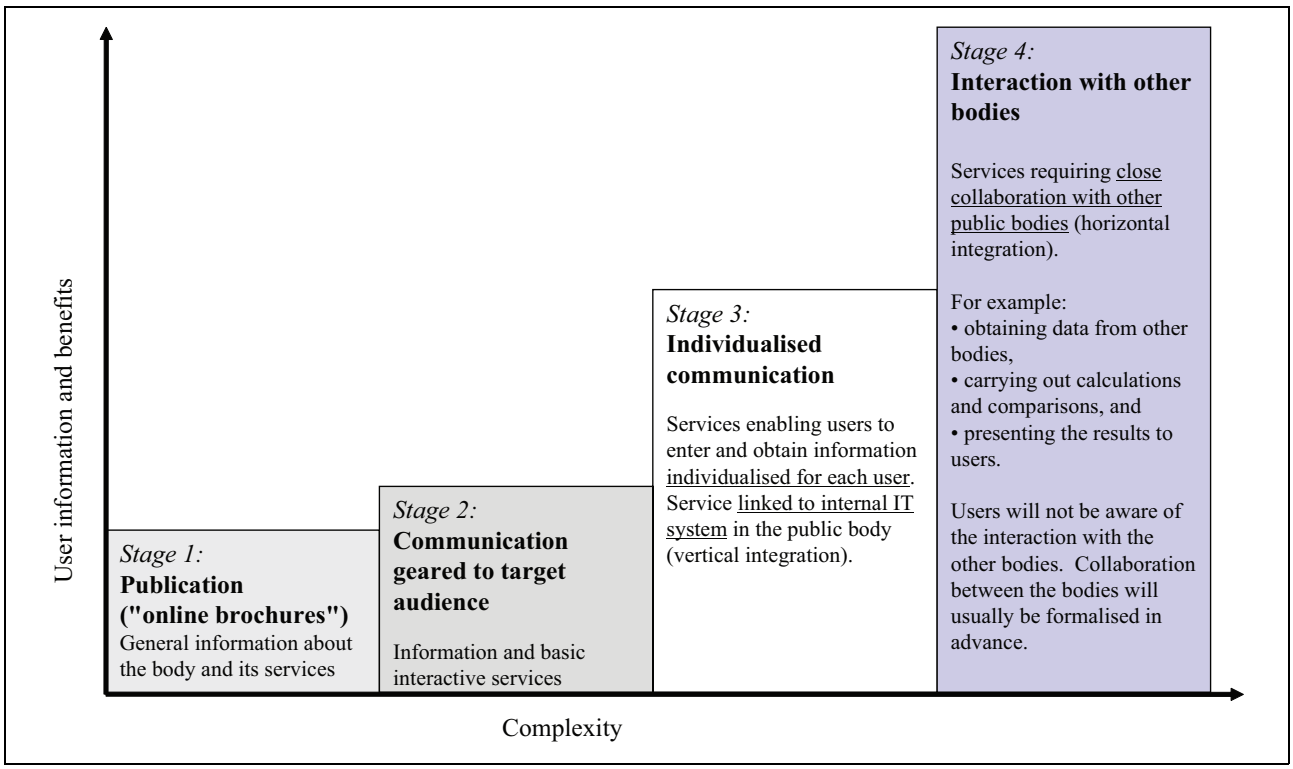

Figure 7.1 Service stages

However, large differences remain in terms of the complexity of the facilities and the resources required for providing round-the-clock public administration services. In *basic electronic services* it is sufficient to have solutions for information publishing and basic communications solutions such as e-mail or web forms which are not directly linked to the organisations' in-house systems. In more *advanced electronic services* users essentially perform the entire service-process themselves via an *electronic self-service solution*.

The establishment of efficient electronic self-service solutions is a demanding project. The figure below illustrates that increasing service and the user-orientation of electronic services entails a substantial increase in complexity[5].

Most of the public sector faces the challenge of making the transition from passive information mediation and basic electronic services (stages 1 and 2) to being able to offer more advanced services (cf. stages 3 and 4 in Figure 7.1). Not until this transition has been made will the public sector and the users be able to reap the substantial rewards of digitisation.

7.2.2 Key cross-sectoral initiatives/common solutions in the field ICT

In order to streamline everyday procedures for users and raise the efficiency of how resources are used in public sector systems, a number of specific coordination initiatives have been implemented.

Altinn

Altinn ("AllIn") is a common portal for business sector communication with the public sector. On the portal, businesses have access to electronic services from a number of public bodies. Eventually businesses are to have access to all services, forms and information from the public sector through "AllIn". In addition to the Internet portal, "AllIn" provides system-to-system information exchange. This enables data to be exchanged directly between a company finance system and "AllIn" for example. For a number of statutory obligations such as self-reporting for the self-employed and companies, 80–90 per cent of form data is submitted directly from user-sited systems. The fact that this is possible is presumably the main explanation for why use of "AllIn" has been adopted so extensively.

[5] Complexity here refers to the need for interaction between multiple ICT systems in order to establish effective services

The number of services offered within "AllIn" is still growing, as is the number of public bodies that have adopted the solution. However, there is still much potential for improvement

Miside

The citizens' portal, *Miside* ("Mypage") was launched in December 2006 with the object of consolidating access to public services and dialogue with public administration. On "Mypage", each individual citizen can have public services performed, gain access to information about him/herself in public registers and a secure electronic mailbox for messages to and from the authorities. Through "Mypage", all citizens are assigned a personalised page.

"Mypage" makes numerous public services available in one place, while responsibility for the services is still lodged with the respective public bodies. It should be noted that the citizens' portal is not a new, large registry containing data on all Norwegian citizens. "Mypage" allows users to look up and gain access to information that is already recorded in different public registries.

Electronic ID and electronic signatures for the public sector

Making electronic self-service solutions available on the Internet imposes special requirements on the security of electronic communications. Both the sender and the recipient must be sure of whom they are communicating with. In addition, the parties must be able to rely on the contents of what is being communicated.

In response to these challenges, in 2004, a joint Requirements specification for PKI in the public sector was prepared. The strategy sets out in essence three primary measures:

- Establishment of a public approval scheme for providers of *e*ID and e-signatures in the public sector in conformity with a joint requirements specification.
- Establishment of a general agreement concerning a joint security portal for the entire public sector, including the municipalities.
- Establishment of a general agreement concerning an enterprise *e*ID and employee *e*ID for internal use in the public sector.

The security portal was conceived as a joint login and signature solution for public websites. In July 2005, the State signed a general agreement on security portal services with a commercial sup-

plier. But many of the most relevant suppliers wanted to offer their services direct to the individual national bodies and municipalities. This meant that the security portal services were insufficiently used, which benefited neither of the parties. They therefore agreed in June 2006 to terminate the agreement.

In the autumn of 2006, the Ministry of Government Administration and Reform began working on a new strategy for *e*ID and e-signatures for the public sector. The strategy will be presented in the spring of 2007.

Register data – Source of knowledge for efficient and responsible administration

With increasing interaction, more and more public bodies, and individual private enterprises, have an increasing need for data from other bodies' registers for their internal procedures. Within the regulatory framework for the registers in question, access to register data is crucial for day-to-day procedure and service provision in the public sector.

The requirement for "common" information is especially acute for the identification of individuals, enterprises and property. Some of the public registers have been set up and developed with the aim of meeting such common requirements, such as the National Registry, the Central Coordinating Register for Legal Entities and the GAB (property) register.

In 2004, a working group produced the report *Arkitektur for elektronisk samhandling i offentleg sektor* (*Architecture for electronic interaction in the public sector*). The working group advised undertaking a thorough review of important common master data[6] in the public sector, with a view to cost efficiencies, quality improvements and usability of the services.

Digital Norway – Cooperation on geodata

"Digital Norway" is a broad cooperation between enterprises to acquire and facilitate the use of geodata. The cooperation covers the establishment, maintenance, administration and accessibility of geodata at municipal, region and national level. Participants can download geodata as required, direct from the original data owner. This will guarantee access to updated information when participants release copies and different versions of datasets.

[6] In the first instance, data elements for identifying individuals, enterprises, property and mapping data.

More efficient purchasing procedures

According to Statistics Norway, in 2005 public sector procurements totalled NOK 276 billion. Of this around NOK 120 billion was used for purchasing goods or services related to day-to-day operations, a type of purchase that is extremely well-suited to electronic commerce (*e*Commerce). The government's objective[7] is that, during 2009, 25 percent of the volume of public operational procurements must be wholly or partially acquired through competition based on electronic processes for interacting with the business sector. With the new regulations on public procurements in place in the near future[8], and sound solutions for electronic signatures and electronic invoices within reach, the conditions are now well set up for achieving this goal.

One important instrument for making public procurements efficient and ensuring the quality of the procedures is to use ready-made skeleton contracts and templates. There is therefore an aim to establish closer cooperation with relevant stakeholders in order to develop common standard agreements for the procurement of ICT products in the public sector for different procurement forms and processes.

ICT cooperation in the municipal sector

The government wants to stimulate change and development work in the municipal sector. The municipalities have to master the statutory tasks, while, through their propositions to citizens and business and industry, they ensure long-term settlement, value-creation and welfare. Broadband and modern digital services help to reduce the problems of distance for business and industry and people in remote areas. There is an objective to manage resource consumption in the municipalities within the important and demanding tasks we face, within schools, health and care services. ICT is a key tool for achieving this goal. The municipalities should therefore try out ways of organising themselves so they can provide the necessary control over developments, which can bring about reduced costs, economies of scale and rational consumption of resources. These are challenges for the individual municipality itself to deal with. If the state is to override the municipalities, this must be done through statutes and regulations.

[7] See also the eNorway plan 2009, Ministry of Modernisation (2005)

[8] The new regulations will probably come into effect on 01.01.2007

7.2.3 Current coordination of ICT policy

It is an established management principle in the public sector that, to the greatest possible extent, each individual sector and enterprise shall itself determine what instruments it will adopt to meet the requirements and expectations of superior authorities. This also applies to the enterprises' use of ICT. This means that each individual sector and body also formulates its own ICT plans and strategies.

As of 1 October 2004, the Ministry of Government Administration and Reform has responsibility for the government's coordination of ICT policy. The Ministry thus has overarching coordinating responsibility for the ICT area vis-à-vis the municipal sector. The Ministry of Transport and Communications is responsible for telecoms policy and the Ministry of Trade and Industry is responsible for the ICT sectors and for research in the ICT area.

According to the OECD[9] Norway has a well-founded vision of electronic administration through the objectives set out for the public sector in *e*Norway 2009. The plan sets out an obligation, but provides little guidance for the ministry and departments on the organisation of specific measures. Additionally, it is pointed out that the strategic planning capacity in relation to the management and administration of the ICT area is weak in both the ministry and departments.

In the administrations, in the ICT area there are a number of coordinating bodies of a more or less formal nature, both between and within sectors.

7.3 Challenges and measures

In accordance with the linear responsibility principle, each individual public body is responsible for establishing and developing its own ICT infrastructure in those areas where the public body finds this appropriate. The linear responsibility principle ensures that quality is increased for ICT-based procedure and service provision within each individual sector/enterprise, but poses challenges in terms of the interaction between sector-based and enterprise-based ICT solutions. the Ministry of Government Administration and Reform has a coordinating mandate for the ICT area, but this is limited. In this situation, an increase in electronic interaction in and with the public sector may present major coordination challenges in the time to come. This will be discussed in more detail below, where we also discuss specific measures.

7.3.1 Electronic services to citizens and business and industry

Increasingly greater expectations on the part of users

Innovation and service development in the private sector are increasingly creating expectations which users and businesses are imposing in turn on public bodies. When bank statements can be downloaded at home in seconds, this goes quite a way to defining premises for what can be expected from the public sector.

Citizens and business and industry do not expect that they should need to know how public services are organised. They expect digital services to be cohesive and coordinated, where the user is able to complete some of the procedure through, for example, self-service options. Citizens and businesses want better access to details about themselves in the public sector and to information about the public sector.

Better coordination of public sector electronic self-service solutions

The public sector has responded to the increased expectations from users by, for example, focusing on portals. In evaluating the quality of public websites, www.norway.no has pointed out that portal developments have made good headway in the public sector in recent years. The public sector has developed a number of different types of portals, such as thematic portals, service portals, business portals, intermunicipal portals and national portals. On the whole, public sector portals have unclear boundaries and information and service content. They may also overlap to some extent and feature different presentations of the same themes. The strong growth in different types of portals has therefore created a confused situation for users. The Ministry of Trade and Industry is in the process of designing a paradigm for how the different information portals directed at business and industry can be better coordinated and structured, to make them as user-friendly as possible. This will be concluded during the first half of 2007.

There will be advantages to be had by making the development of self-service solutions more coordinated and coherent. This may be especially beneficial for the municipal sector where the electronic service provisions will be largely the same

[9] OECD, e-Government Studies for Norway (2005)

from one authority to the next. Forms portals have therefore been set up to offer the most commonly used municipal forms in such a way that they can be re-used and integrated with the municipality's procedural/archive and technical systems.

In the years to come, there will be a need for self-service solutions requiring the establishment of services which cut across enterprise boundaries; see Stage 4 in Figure 7.1. This is not a trivial matter, since it requires that the different enterprises interact closely on the development of services. Also, in some cases, personal privacy concerns limit how far the enterprises can go in exchanging information.

In terms of user information and efficiency, it is reasonable to prioritise electronic self-service solutions for dialogue with citizens and business and industry.

Government measures

Measure 7.1: *Establishment of electronic self-service solutions*
Each enterprise/sector must make relevant services available via the "Mypage" and "AllIn" portals, in addition to any communication via the enterprises own websites. The enterprise/sector has responsibility for following up on this measure.

Measure 7.2: *Establishment of a publishing service for public sector electronic mail records.*
This shall contribute to promoting openness and democracy by giving people much better knowledge of and insight into public sector activities, resource consumption and results[10].

Measure 7.3: *Systematic user surveys.*
All national public bodies shall carry out systematic user surveys which shall also include the enterprises' outward-facing ICT services. As a main rule, the results must be published.

7.3.2 ICT architecture in the public sector

The concept of ICT architecture can be described as a regulation scheme for using ICT, which describes ICT structures and relationships within and between public bodies. The objective of ICT architecture is to get different ICT systems to fit together and work together well. A well-functioning ICT architecture in the public sector can contribute both to better user information and to more effective use of public resources. By identifying, structuring and categorising elements, ICT architecture can increase the potential for cross-cutting re-use and reduce the extent of unnecessary duplication and hence reduce costs.

One consequence of a lack of architecture is a loss of flexibility which in turn makes it laborious to develop self-service solutions for citizens and business and industry. One particular challenge is that stricter requirements for integrated and straightforward self-service solutions for citizens and business and industry entail increased complexity and a need for more cooperation across organisational divides. A concern for usability will, in certain cases, be in direct opposition to the need for efficiency which each individual enterprise is subject to. An increase in the number of services from different enterprises in, for example, the "AllIn" and "Mypage" service portals will mean that individual enterprises will potentially have to adapt their services to the different contexts they are to be included in.

An increased requirement for user information and the development of electronic self-service solutions which require electronic interaction across bodies and administrative levels dictate the need to establish an overarching ICT architecture for the public sector. Such an architecture cannot initially cover every aspect of public sector ICT use, but should, in the first instance, focus on coordinating service provision over the Internet to citizens and business and industry.

The organisation of an overarching ICT architecture should look to the development trends seen within the organisational architecture and overarching ICT architecture in other countries. For example, Denmark, the UK and the USA have all recently focused strongly on establishing an overarching ICT architecture in the public sector. One common trait for these countries is that they have opted to develop a layered service-oriented architecture. This type of architectural model shares the components involved in different layers. It is customary to divide an overarching ICT architecture into three main layers: *presentation layer*, *shared component layer* and *enterprise layer*.

[10] The public electronic mail records ("OEP") service is expected to be operational from 1 January 2008.

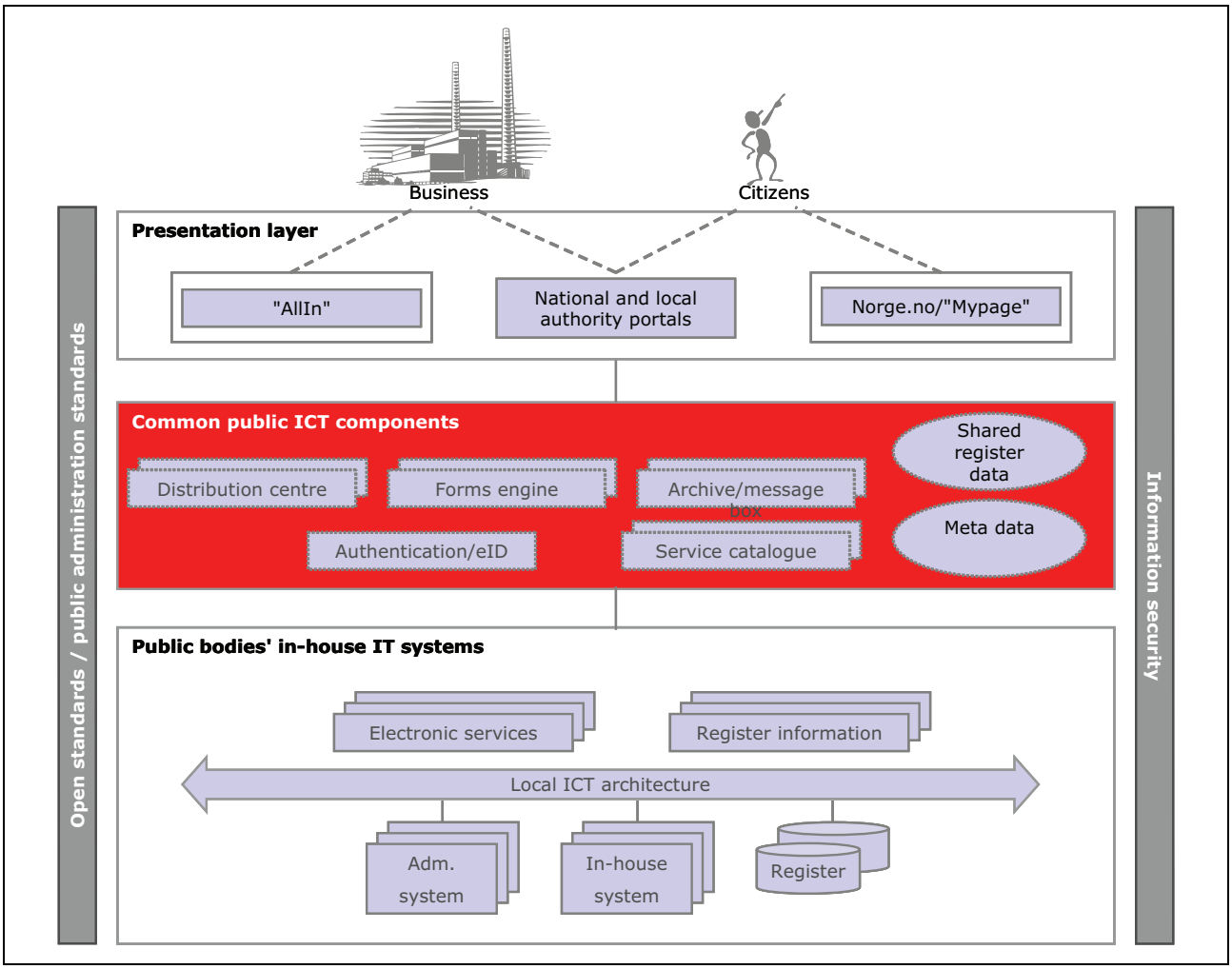

Figure 7.2 Common ICT architecture in the public sector

The model below illustrates a common ICT architecture for the public sector.

The presentation layer is the layer that citizens and businesses encounter and which displays public sector self-service solutions through, for example, centralised service portals (such as "AllIn" and "Mypage") and enterprise portals (the public bodies' and municipalities' homepages).

The shared component layer contains a range of shared ICT components which public bodies need in order to offer self-service solutions effectively. The joint development of such components and their use by several public enterprises saves the individual body development resources, since it does not need to create and operate expensive components itself. In addition, the public sector will be better placed to develop services for end users if public bodies have access to help services from other public bodies.

The different shared components which should be included in this layer are discussed in more detail in chapter 7.3.4. The necessary functionality for achieving interactivity and re-use will concern, amongst other things, form production, data transport, data definitions, electronic ID, dialog message boxes. The work on future common resources should also take account of the fact that data from important central registers, such as the Central Coordinating Register for Legal Entities and the National Registry, should be administrated and developed in a more coordinated manner, both technically and semantically.

The enterprise layer contains the enterprise's technical system, registers and administration systems (e.g. procedural, archive and finance systems). If the bodies are to offer self-service solutions or register information in the presentation layer, they will use elements from their own enterprise layers (and perhaps also others' enterprise layers) and the shared component layer. The enterprise layer is owned and administrated by the individual public sector/body.

What is common to all layers is that the interactions between them are based on clearly defined and open standards for interoperability; see Ch. 7.3.3. In addition, it is necessary to make exacting requirements from a comprehensive information security regime entailed by realisation of the overarching architecture.

The overarching ICT security architecture in the public sector must be flexible and adaptable, so that it interacts to the greatest possible degree with the ICT architectures that exist within the individual sub-sectors and the individual bodies. What ensues from the overarching ICT architecture must have the least possible negative impact on changes in the way public bodies perform tasks and organise themselves.

Government measures

Measure 7.4: *Establishing an overarching ICT architecture for the public sector.*
The architecture must be layered and, as a minimum, will consist of a presentation layer, a common component layer and an enterprise layer. The architecture must, to the greatest degree possible, be based on open standards and a regime for information security. Before the end of 2007, a more detailed description of the architecture principles with associated strategies, paradigms and guidelines will be prepared. The sectors' and public bodies' ICT strategies and major public ICT projects must be based on and support the overarching ICT architecture principles for the public sector.

7.3.3 Administration standards – Open standards

Internal electronic interaction within a public body, between bodies or with citizens and business and industry assumes that ICT solutions can "talk together". We therefore need *common standards* which ensure that interfaces between systems work as intended[11].

In Figure 7.2 the standards are illustrated as a component of the overarching ICT landscape in the public sector. Standards play a role at all levels of the structure. They enable the ICT systems in each individual organisation to work together. They are also important for the interaction with common public sector ICT components, and for the interface with the external world.

There is a need for different ICT standards. We need *technical standards* which make it possible for different systems to exchange data. But a stream of data is worthless if we do not know what it means. Therefore we also need *conceptual (semantic) standards* which ensure that everyone is interpreting data in the same way. There is also a need for *organisational and procedural standards* which mean that interacting parties have explicit divisions of responsibility and are agreed on, for example, the order of steps involved in a lengthy process. One example of the latter are the procurements regulations for the public sector which make it clear to all parties how the procurement process must proceed.

Through the growth of information technology, it has proved to be the case that software which attains substantial penetration in the market can to a great extent become a factor which other software suppliers have to adapt to. So-called vendor-owned standards can inhibit competition in the market and can lead to monopolistic conditions. As a counterweight to this, there are a number of international organisations which operate standardisation processes, in which different actors, through open debate, work to agree that individual specifications be accorded the status of so-called *open standards*. Such standards are subject to a shared control regime in respect of changes and updates, and the technical details are available to all interested parties. This produces a shared technological foundation allowing products from different vendors to interact more extensively.

It is not that any one open standard should necessarily be established for a public sector ICT system. Before a standard may be assigned such a status, it must be evaluated in accordance with a number of different criteria, such as how mature the standard is and its penetration in the market. Only exceptionally will it be appropriate to define standards specially for the purpose of Norwegian public service administration. Standards will be assigned a graded status, such as 'recommended' or 'mandatory' for use in the public sector. The preferred standards for the public sector will be presented in a so-called reference catalogue on the Internet. This will offer a list of guidelines and rec-

[11] We can draw a parallel with households: because there is a single standard for how electrical sockets are designed in Norway, we can be sure that the lamp we buy in the shop will fit the socket we have at home.

ommendations for the standards area for the development of ICT solutions and ICT procurements in the public sector. In addition to open standards, the catalogue will also, to a certain extent, indicate industry standards which are important for the public sector. It cannot be expected that all of these will be capable of being replaced by open standards in the first instance.

It may also be relevant to assign some standards a status of mandatory for public bodies, and in that case they must be given practical anchoring in the relevant regulations. The government will evaluate how and to what degree it is practical to do this. This will be affected by the degree to which the established guidelines and recommendations are followed in practice by the public bodies.

The work which the public sector undertakes in terms of open ICT standards will take place in dialogue with Norwegian business stakeholders and other relevant actors in Norway. It will also be of interest to establish cooperation with foreign authorities, e.g. in Denmark[12] and the EU[13]. Account must be taken of international standardisation processes and of the use of standards in Norwegian business and society in general.

Among the first specific problems that the government will address are the following:

- Information from the public sector aimed at the public must be available in an open document format
- Electronic storage must be in a format which will be readable and processable in the long-term
- Semantic standards will be established to define the meaning of register information and data that is frequently exchanged between the public sector and its externalities
- Public websites and Internet solutions must be designed so that they work with a wide selection of browsers and meet other requirements concerning accessibility; see Ch. 4.2.

In addition to participating in standardisation work for the Ministry of Government Administration and Reform, activities are planned in the municipal sector to increase the use of open standards. In its *e*Kommune (*e*Municipality) 2009 strategy and action plan, the Norwegian Association of Local and Regional Authorities (KS) has established a goal for all municipalities and counties to have incorporate requirements for open standards in their ICT steering document during 2007. All municipalities and counties shall also have implemented relevant requirements for the use of open standards by 2009[14]. In order to assist the municipalities and counties to achieve these goals, KS aims to establish a set of administration standards for data and document exchange in the municipal sector based on relevant national administration standards. KS will establish a standardisation body for ICT in the municipal sector. Cooperation between this body and the overarching Standardisation council for the public sector under the Ministry of Government Administration and Reform will bring about the harmonisation of municipal and multi-authority ICT standards.

Government measures

Measure 7.5: *Preparation of a reference catalogue of administration standards.*
Administration standards will be established which will be collated in a so-called reference catalogue. The reference catalogue will provide public bodies, suppliers and other stakeholders with an overview of recommended and mandatory administration standards relevant to ICT solutions in the public sector. The reference catalogue will be compiled gradually over time and in 2007 will be expanded to include specific standards in several new areas.

7.3.4 Shared ICT components in the public sector

In order to achieve more effective electronic transactions and to avoid having to develop complex solutions more often than necessary, there is a need to establish a number of shared public sector ICT infrastructure components. Among other things, figures from Statistics Norway reveal that 40 per cent of local authorities state that a lack of shared public sector ICT solutions and infrastructure is one of the main challenges in the establishment of electronic administration.

The need for shared solutions in the public sector can be justified on the basis of considerations of effective use of public sector resources. Large public bodies with a large number of interactions with

[12] Please see for instance Denmark's reference catalogue at www.oio.dk/standardar

[13] Notably the EU IDABC programme

[14] This requirement is in line with corresponding requirements for the public sector in the eNorway 2009 plan.

citizens and business and industry have invested in systems components for managing multiple users safely and securely. Many of these components can be coordinated and used in a wide number of areas in the public sector, e.g. in health, education or for collecting taxes and contributions.

Based on experiences from, for example, the development of the "AllIn" business portal and the "Mypage" citizens' portal, in the first instance there is a need to review and coordinate the need for shared components within areas such as electronic IDs/e-signatures, data transmission, form development, data definitions and service pledges (the list will be dynamic). This will be expanded on below.

Electronic ID – electronic signatures

There is a need for solutions/components which support secure electronic transactions both between public bodies and end users and internally in the public sector. The need for security is linked to at least four conditions:

- Who is one dealing with (authenticity)
- Is the information being submitted/exchanged genuine and not falsified (integrity[15])
- Is the information being submitted/exchanged protected from view (confidentiality)
- Can one trust that the sender is responsible for the information (non-deniability[16])

Distribution centre

A distribution centre/message centre is a solution which supports public data exchange between two or more parties, usually private sector providers and public sector recipients. For example, a distribution centre is used to transmit customs messages between forwarding agents and the Directorate of Customs and Excise. The solution is most often used when a number of suppliers have to send data to many recipients. There are currently a number of commercial distribution centres in Norway.

Forms engine

A forms engine provides support to allow a user to register and check data which is to be sent from a sender to a recipient over the Internet. The user employs a browser to access the form and fill it out and check the data. A form engine provides support for developing and maintaining web forms and verification rules. A forms engine is an integrated solution which may comprise one or more (standard) software components. The "AllIn" solution currently contains a forms engine solution which is used extensively connected to the Tax Directorate's electronic services. Other actors are also developing forms engines for use in the public sector, including for the municipal sector. To avoid the municipal sector having to develop proprietary and partially overlapping solutions, the Norwegian Association of Local and Regional Authorities (KS) has developed a standard for representing user dialogs in electronic forms. The format is based on open standards and can be used by all forms suppliers.

Shared register data and meta data

A more uniform administration regime in the register area within, for example, ICT architecture, standards, methods, storage, accessibility, pricing and contracts can offer better services and more efficient administration. The work in progress on evaluating contents, quality and access to personal data based on the National Registry is an important measure in this area. This will also offer input into other coordinating measures for the register and metadata area at an overarching level.

The coordination tasks under discussion are highlighted in Figure 7.2 in the shared component layer. This will largely be policy and strategy work. The aim is then not to develop *new* shared registers in the shared component layer, in any case not initially, but rather to underpin and coordinate the work among the administrators of the most important registers in the public sector.

Service catalogue

A service catalogue contains technical descriptions and interface definitions for electronic services which have been generated in the public sector and which are re-usable. This type of catalogue is aimed in particular at developers of digital services.

Government measures

Measure 7.6: *An assessment will be made as to whether to establish shared components.*

In order to support the increasingly complex electronic transactions in and with public administration and

[15] Integrity means that information to be processed is not changed or damaged as a result of intentionally unauthorised or unintentionally authorised processing.

[16] Non-deniability means that a person is not subsequently able to deny having sent or authored the information

also contribute to a highly user-friendly administration which utilises scarce resources as efficiently as possible, an assessment will be made as to whether to establish shared components for the public sector. The measure will involve evaluating how this should be financed, managed and organised.

Measure 7.7: *Cooperation with large-scale ICT projects on shared components.*
Large-scale new national ICT projects are to be assessed as to whether they can use the State's shared ICT components or whether they may have or can develop components which can be made available to all. It is a precondition that these assessments must not result in especially negative consequences for the project and for innovative operating solutions etc. linked to it.

Measure 7.8: *Assess compilation of a new national register.*
In conjunction with the work on shared personal data, the government will evaluate a new national register.

7.3.5 Organisational challenges linked to shared components in the ICT area

The management of ICT projects is strongly linked to management guidelines within each individual sector. The management models which exist nationally at a cross-sectoral level are largely linked to informal contact networks, various advisory bodies and steering groups. As a rule, such groups arise on an ad-hoc basis in order to solve specific collaborative challenges between different public bodies. The management challenges linked to shared solutions are substantial, not least in the municipal sector. The freedom of municipalities to select their own ICT solutions may be somewhat impractical in a wider context. The tasks encountered are largely the same in all municipalities and it may be beneficial for the municipalities to act more collectively and concertedly in the ICT area. More collaboration and joint measures in the ICT area can produce better municipal services and a more efficient municipal sector. This is one of the core messages in the eKommune (*eMunicipality*) 2006 plan from the Norwegian Association of Local and Regional Authorities (KS). It is illogical and expensive not to be able to evaluate more collaboration and re-use of systems and components in the ICT area.

The management challenges are also connected with the division of labour between the private and public sectors. The establishment of shared solutions/components will require a review of what is practical to lodge with the public sector and what can be left to the market in terms of development and realisation.

Government measures

Measure 7.13: *Clarify the organisation of work on shared components.*
The government will assess how the work on a shared ICT architecture for the public sector, the establishment of shared components, further work on administration standards etc. going forward should be organised, managed and financed.

7.3.6 ICT security in the public sector

In order to facilitate the wider diffusion of electronic administration, it is important for citizens to have confidence that electronic procedure is performed as securely and under the same legal terms as for traditional paper-based procedure. By establishing electronic administration solutions, such as Internet self-service solutions, a specific assessment will be made of the planned solutions before the security requirements are prescribed.

ICT systems should be seen as one of the most critical resources in the public sector. Emphasis should therefore be given to assuring operational security and quality, to compliance with legislative requirements and to ensuring the systems are user-friendly, i.e. without unnecessary, cumbersome security schemes. ICT security should be built into ordinary systems as far as possible to make them highly robust against defined threats.

Government measures

Measure 7.9: *Assess shared national requirements for ICT security processes.*
For areas where there are special legal requirements, contractual conditions or some special risk, the government will evaluate the need for certification[17]. ICT security in the public sector will be founded on

the national strategy for information security; see Ch. 9.5. Success in implementing electronic administration is therefore predicated on systematic management of the authorities' and public bodies' ICT security. For other security measures, please see Ch. 9.

7.3.7 Open source software

Open source software is software code that is offered under special licensing conditions which grants the user organisation access to read the source code (in a readable programming language) and the right to modify or develop the software.

The development model on which open source software is based is characterised by openness and information sharing. This type of software has its origins in technical environments where non-profit objectives and technical prestige are more powerful driving forces than commercial considerations.

Roughly half of public bodies use open source software for at least one area of functionality. There are reasons to believe that among these bodies open source software comprises only a small proportion of the total software portfolio. Overall, current usage is restricted.

The issue of open source versus proprietary software is not one of either/or, but rather both together. This applies both on the basis of cost-benefit assessments at the individual public body level, but also from a socio-economic perspective with regard to cost, competition, competency-building and innovation. In practice, these categories of software will co-exist in most public bodies going forward.

The Government wants public bodies to make more extensive use of solutions based on open source code for several reasons:

- Use of open source software can facilitate the re-use of solutions across and between public bodies[18]. There may be benefits to be obtained in this way especially in the municipal sector, since all municipalities have to offer essentially the same type of services to their citizens.
- Increased use of open source software in the public sector can also provide the basis for increased competency building in society. A culture of sharing software developed "in-house" will benefit organisations, businesses, students and ICT specialists.
- The emergence of solutions based on open source software may contribute to increasing competition within niche areas in the software market.
- Greater public sector attention to open source software may stimulate the Norwegian ICT sector which is focused on open source.
- Open source software is often based on the use of open standards and may therefore contribute to boosting public sector initiatives in this area.

From a legal point of view, the development and extensive use of open source software presents a number of challenges. One of these concerns copyright problems. Open source software challenges the established actors in that it has become an innovative way of commercialising code and skills, in other words, a different way of exercising copyright. This will present a challenge in relation to information and the use of open source software licences for commercial purposes.

The foundation for the acquisition of ICT solutions in the public sector is the legislation on public procurements. Article 5.4 of the Public Procurement Act imposes a requirement of objectivity and non-discrimination in the criteria for selecting suppliers and awarding contracts. It is therefore important to take objectivity into account so that suppliers are not excluded where they could otherwise have been capable of offering solutions.

The greatest barrier to increased use of open source software relates to competence. Decision-makers and ICT experts, in conjunction with ICT procurement must evaluate a number of aspects where open source software differs from proprietary solutions, including legal and licensing conditions, skills, the security aspect and how the software code will be maintained and administrated in practice. There is therefore a need for a centre of expertise capable of supporting decision-makers and IT specialists in public bodies. Such a centre should be able to offer instructional material, practical advice and overviews of relevant projects in the public sector.

[17] Based on, for example, the NS-ISO/IEC 17799 standard

[18] This does not however apply only to open source software. Sound re-use of software can also be achieved using proprietary solutions.

Government measures

Measure 7.10: *Establishment of a national centre of expertise for open source software.*
To provide public bodies with better conditions for an active relationship with open source software, a centre of expertise will be established to serve as a key resource for public bodies in this area.

Measure 7.11: *Preference for open source software.*
The government will consider laying down a policy of preference in favour of open source software, so that public bodies must choose open source software in particular when such solutions are equally cost-effective and of sufficient quality compared with vendor-owned software. The Ministry of Government Administration and Reform will also assess establishing a general principle that software developed under contract to the public sector must be made available as open source software.

Measure 7.12: *Open source software as a theme in relevant education.*
The government will evaluate how to promote training in and awareness of open source software in further education and collaborate on improved educational courses in this area at college and university level.

8 Personal privacy

8.1 Introduction

8.1.1 What is personal privacy?

Personal privacy can be defined and described in many different ways. However, what is key is that each individual is inviolable and has a right to respect from other people, respect for his/her own integrity and for his/her privacy. Personal privacy is thus closely linked to the individual's right to a private life, self-determination (autonomy) and self-realisation. The right to privacy ensues from the European Convention on Human Rights (ECHR) article 8 and is a central aspect of the EU Data Protection Directive (95/46 EF).

Personal privacy affects the balance of power in fundamental relationships in society, including the relationship between public authorities and citizens, between employers and employees and between businesses and consumers. Public authorities can, for example, strengthen their position vis-à-vis citizens by using personal data to raise the efficiency by which they exercise their authority. The ability to withdraw into a protected personal sphere is, for many people, a prerequisite for active democratic participation in the public domain. It can therefore be said that personal privacy is a prerequisite for a well-functioning democratic society. In addition, the protection of personal privacy affects the degree of pluralism and democracy in society in a broad sense.

It also influences economic conditions in society. Electronic commerce and electronic administration are areas of major economic and welfare significance, where the degree of participation depends on trust between people. One important aspect of this trust concerns the processing of personal data which is used in the new electronic solutions. While a good reputation for processing personal data can be a competitive advantage and facilitate the implementation of new initiatives, a poor reputation can have negative financial effects.

The various personal privacy interests will often be in conflict with other interests which do not represent personal privacy, especially in relation to commercial interests, efficiency, criminal investigations, sound health provisions, consumer interests, etc. It is especially the individual's interest in discretion which may conflict with other interests, since it limits access to information. At the same time, different personal privacy interests are often in conflict with each other. Interest in discretion may, for example, be in conflict with interests in a case being as transparent as possible through having complete, high-quality and up-to-date data. The individual is naturally interested in decisions being made on the basis of the correct information whether it concerns medical treatment or taxation. In this case, interest in discretion and interest in a matter being as transparent as possible may both be termed personal privacy interests even if they are in opposition to each other.

Both conflicts between different personal privacy interests and conflicts between personal privacy interests and other interests must be resolved through efforts to strike the right balance. An enterprise must, for example, only acquire and process data which are technically justified in the enterprise being operated, or are necessary if the data are sensitive.[1] There are more stringent requirements for processing sensitive data than for non-sensitive data.

8.1.2 Personal privacy and other societal interests

In weighing the regard for personal privacy up against other considerations, at times, the regard for personal privacy will have to cede. Efficiencies which require an extended duty to process data of a private nature, and more vigorous initiatives against crime through, for example, extended retention times for telecommunications data can be seen as a setback for personal data, protection. Some may argue that the position of personal privacy has recently been weakened by the strong priority given to the fight against terrorism and organised crime in the wake of the terror attacks of 11

[1] According to Section 2 (8) of the Personal Data Act, sensitive personal data are data concerning: "a) racial or ethnic origin, or political opinions, philosophical or religious beliefs, b) the fact that a person has been suspected of, charged with, indicted for or convicted of a criminal act, c) health, d) sex life, e) trade-union membership"

September 2001, 11 March 2004 and 7 July 2005. As a result of the international "war on terror", there has been an increase in surveillance and other monitoring measures which have put personal privacy concerns under great pressure.

In addition, measures implemented by other countries are increasingly having consequences for us. The US authorities have, for example, imposed requirements on the EU regarding electronic access to passenger lists from airlines which want to land in the USA. The Americans have also entered into an agreement on access to data from Europol. With prospects of specific benefits in the shape of cost savings, more efficient counter-measures against crime and so forth, it is easy to push the less tangible concept of personal data protection to one side. In this way, we may reach a situation where we approve each individual measure while the sum of the measures over time results in unacceptable personal data protection.

It is a demanding challenge to keep a view of the whole and ensure that we do not gradually erode fundamental rights "for the good of society". The concern for fundamental rights might mean that one is restrictive and "makes haste slowly" even if the argument for weakening personal data protection may seem powerful and legitimate. In all cases, such legal developments should as far as possible result from political debate and consideration.

8.2 Current status

8.2.1 Actors and key legislation in the personal privacy area

There are a number of key authorities in the personal privacy area. The Ministry of Justice and the Police is responsible for the Personal Data Act, the Ministry of Health and Care Services is responsible for the Health Act and the Ministry of Government Administration and Reform is responsible for personal data regulations, supervision of the Data Inspectorate and administrative responsibility for the Privacy Appeals Tribunal.

The Data Inspectorate is the special body for personal data protection in Norway and is an independent administrative body with cross-sectoral responsibility. It was created on 1 January 1980. The Inspectorate was established to ensure compliance with the Personal Data Act. The purpose of the Act is to protect the individual against violations of personal privacy through the use of personal data. The Data Inspectorate is both supervisory authority and ombudsman. In specific terms, this involves primarily supervisory tasks, licence processing, general information and investigation of breaches of the regulations. The Data Inspectorate also has an important role as ombudsman. This involves providing advice and information to individuals who contact the Inspectorate.

The Privacy Appeals Tribunal is an independent administrative body created pursuant to the Personal Data Act. The Privacy Appeals Tribunal deals with complaints against decisions made by the Data Inspectorate pursuant to the Personal Data Act, the Health Act and certain other acts.

8.2.2 Attitudes to and knowledge of personal privacy

Personal privacy is not constant. This also applies to the public's attitudes to and knowledge of personal privacy. Even if people are increasingly becoming generally less sceptical of advanced ICT solutions and the extended application of data processing they involve, this does not necessarily mean that people are losing interest in personal privacy issues. It may well be the case that people's concerns about personal privacy have a different focus than in the 1960s and 70s. While, at that time, most people were concerned about information technology in general, the concerns today are linked to a number of more specific risks which are often raised by the media – identity theft, the dissemination of MMS files, the saving of search terms in Internet search engines and so on. The fact that people generally feel less alienated by ICT, combined with few specific scandals concerning personal privacy, have caused the public debate on personal privacy to lose some of its force.

In Norway, attitudes to personal privacy are mostly characterised by very high confidence that one's details will be processed lawfully and responsibly. However, many enterprises do not appear to warrant trust. This emerged from two comprehensive surveys carried out by the Institute of Transport Economics (TØI) in 2005 for the Ministry of Modernisation (now the Ministry of Government Administration and Reform) and the Data Inspectorate. The surveys related to experiences of, knowledge of and attitudes to personal privacy and the Personal Data Act.

One of the surveys was aimed at the public, the other at enterprises in the public and private sectors. The public survey (TØI report 789/2005) shows that most people appear to have great confidence in the way enterprises process personal data. Public bodies in particular appear to enjoy great confidence. The surveys also reveals signifi-

cant omissions in people's knowledge of the area. For example, 56 per cent answered that they believed there was a body which ensured that personal privacy legislation was complied with, but only 33 per cent were able to identify the Data Inspectorate as this body. 41 per cent were unaware of the obligation in the Personal Data Act to provide information to registered persons.

In relation to Norwegian enterprises, the Institute of Transport Economics' survey (TØI report 800/2005) shows that most enterprises, in spite of very limited knowledge of the Personal Data Act and poor adherence to the Act's requirements, have a positive view of personal privacy and the Personal Data Act. To a question about knowledge of the act, a full 82 per cent responded "little knowledge" or "none". Only 4 per cent of the respondents stated that they met the five central requirements ensuing from the Act. However, the survey provided little insight into why compliance was so low.

There is cause to take a serious view of the disparity between the large degree of confidence the public shows and the poor compliance with the Act among enterprises in the public and private sectors. The conclusion is obviously that the public is not justified in its confidence. Such a conclusion however might be premature. It is possible that the enterprises actually handle personal data in ways which many – if they had detailed knowledge of the matter – would be satisfied with. That the legal norms have a poor impact does not exclude other norms within sectors and professions etc having positive effects on personal privacy.

8.3 Future challenges and proposals for measures

The international terror threat may have led to a lessening of the fear of a "big brother is watching" society. It is rather strange to recall the debate in the 1970s and 80s about the extent to which surveillance cameras should be permitted in public spaces.

Both individuals and society as a whole have developed much more tolerance towards registration and surveillance than previously. This is happening at the same time as technological developments are increasingly making new types of monitoring and surveillance into tools for more people.

8.3.1 Appointment of a personal privacy commission

The appointment of a personal privacy commission has been discussed in various contexts without, for the moment, any final position on the question being taken. A proposal to appoint a personal privacy commission was discussed in the Storting in the spring of 2006 and there was unanimous agreement on the intention. It was nonetheless left to the government to consider the matter more closely and, where appropriate, to return to the Storting with a proposal.

Any proposal to appoint a personal privacy commission will have to be evaluated in conjunction with relevant ministries and will describe a more specific mandate for a consideration of personal privacy.

Because of the diverse personal privacy challenges we currently face and will face in the future, there is a need for a full situation report on those challenges. In addition to a review of threats to personal privacy, legislation and other instruments for protecting personal privacy must be surveyed, evaluated and seen in context. The personal privacy issue transcends sectors and it is a challenge to ensure that different sectoral reforms do not lead to the overall level of surveillance growing too large.

Work in any commission should take place in parallel with the government's revision of the Personal Data Act. The government sees the need to undertake a wide-ranging inquiry into how it would be possible to prevent personal privacy in general from being compromised by the introduction of new information technology. Such an inquiry should propose concrete measures.

Government measures

Measure 8.1: *Appointment of a personal privacy commission.*

The commission will take up the vulnerable position of personal privacy in its encounter with technological developments and produce proposals to reinforce the status of personal privacy.

An examination will also be made of the relationship between the various provisions which regulate personal privacy in order to ensure coordination, harmonise terminology and prevent overlap-

ping, and to make the legislation more accessible.

- The relationship between the Personal Data Act and special legislation.
- The relationship between provisions concerning the duty of confidentiality in various areas
- The need for specific legal provisions in areas of life where there is a special need for clarifying personal privacy issues
- Development of more sector-specific guidelines

8.3.2 Electronic tracking

More and more of our daily activities are being registered and logged (electronic tracking). There is an increase both in terms of the amount of tracking and its level of detail, lifetime and purpose – often without the person the details may be linked to being aware of it.

Electronic tracking features both in personal electronic equipment (e.g. mobile phone, PC, onboard vehicle computer) and in toll booth electronic collection systems, banks' transaction systems and so on. Data are vulnerable to misuse depending on how well they are protected. The consequences of this are becoming more challenging. Previously, one could be reasonably sure that electronic tracks would be overwritten relatively quickly. Nowadays, storage capacity has become so large and cheap that one can no longer reckon on data gradually disappearing of its own accord.

Solutions where previously one left no trace, such as cash payments, will increasingly be replaced by solutions which identify you, such as bank cards. The anonymous solution, cash payment, will not be supported to the same degree by technology. The number of electronic solutions seems to be increasing rapidly and this is also true of the user groups who have access to them. There will be accumulations of services in portal solutions which will increasingly be able to gather information about users. The equipment we have at home will increasingly become more intelligent.

Since localisation data can often be linked to individuals (mobile phone user, end user), these are also considered personal data. This provides guidelines for how they may be supplied to others, e.g. other companies offering services via mobile phones (content providers).

8.3.3 The right to anonymity

The discussion on the requirement for identification is connected with the degree to which it should be possible to remain anonymous. This poses special challenges, notably because the normative status of anonymity in relation to fundamental human rights appears to be somewhat unclear. On the one hand it can be asserted that anonymity in itself is not an absolute right since it is only possible in areas where others (e.g. legislators) have not addressed and restricted the right to self-determination. On the other hand it is difficult to dissociate an interest in anonymity from the more general right to privacy laid down in, for example, article 8 of the ECHR. Nonetheless, there is a sound basis for asserting that consideration of precisely this right dictates that restrictions in the possibility to conceal one's own identity must have a sufficiently persuasive justification.

The right to remain anonymous is not explicitly prescribed by Norwegian legislation. Such a right can however be deduced from the fundamental rights in, for instance, article 8 of the European Convention on Human Rights and the EU personal privacy directive. These state that the individual's fundamental rights and freedoms must be respected, especially the right to privacy. In both the personal privacy directive and in the Norwegian Personal Data Act, the right to self-determination for each individual is a fundamental principle, principally expressed as that one must give a voluntary, informed and explicit consent to the processing of personal data.

Developments indicate a need for a broad, cross-sectoral, legal-policy discussion on the question of what kind of future there should be for the potential for anonymous activity. Whether or not personal identification must be a prerequisite for interaction should be one of the most important issues for discussion now and in the future.

Government measures

Measure 8.2: *The government advocates that there must remain an option for anonymoussolutions in contexts where it is not necessary to identify oneself.*
Anonymous authentication solutions must be available in contexts where this is expedient. The government will examine the options for

- Pseudonymous solutions as alternatives to full anonymity and full identification.
- Pseudonymous certificates in digital signature solutions where adequate
- Anonymous payment cards as alternatives to debit/credit cards linked to an identity.

8.3.4 eID and freedom of choice?

A prerequisite for using electronic services will frequently be some form of electronic identification. Most active Internet users now have an increasing number of user names, passwords, PINs, password calculators and other aids for identifying themselves and getting through electronic gateways. The responsibility for remembering, and the responsibility the individual feels for protecting all of these codes so that they do not fall into the wrong hands, may feel burdensome. The situation is becoming more and more impossible. The question is how to get rid of this code chaos. A first step may be to have a more uniform option for identifying oneself to public services. The public sector is working on facilitating the use of electronic communication and on *e*ID in communicating with the public sector. The Ministry of Justice is currently working on the issue of introducing a national ID card which could be used for *e*ID.

The drive to clear up the code chaos also raises more fundamental issues. The simplest solution would, of course, be to have one key which works everywhere – both for public and private sector services. But do we really want to develop "a general key to the life of each individual citizen"? We need to develop a very aware attitude to what sort of key system we want to create. It is by no means certain that the individual would be best served by a common general key to all aspects of life. Most of us will intuitively see the need for well-thought-out zoning, on both personal privacy and practical grounds, to protect us from intruders. These are some of the important issues under consideration in the joint efforts to establish *e*ID (see Ch. 7.3.4.)

8.3.5 Use of technology to reinforce personal privacy

There should be a balance between the authorities and the individual citizen when it comes to using digital technology. The increased use of technology on the part of the authorities must be balanced. One objective is for all public bodies to arrange for everyone to be able to obtain electronic personal data about himself/herself in a simple and secure manner. One example is "MyPage" which will offer each individual an insight into the personal data which public bodies have registered about that person.

In addition, more emphasis should be given to privacy enhancing technologies or PETs. Examples of these would be technologies for encryption and authentication (secure identification) of users, which prevent intruders from accessing personal data. The government has sought to promote more extensive use of certain types of privacy enhancing technology in national ICT policy. Cryptography is one example of this.

Government measures

Measure 8.3: *The government will implement measures to support use of privacy enhancing technologies.*
The public sector should lead the way in this
- work through
- Legislative changes which provide more direct support for the use of privacy enhancing technologies.
- Personal privacy requirements as standard in new ICT systems, including:
- Requirement for implementation of more fine-meshed administration of access rights to information on a need-to-know basis
- Requirement for possibility to log transactions

Measure 8.4: *The government will implement measures to improve enterprises' compliance with the Personal Data Act, including*
- preparing sectoral "best practice" instructions with advice for sound technological solutions
- preparing a thorough competency programme for different contexts

8.3.6 Automated procedure – automated decision support system

Electronic procedure can involve full or partial automation of judicial decisions. Traditionally this

means that legislation is expressed in program code. The development of such programs and the use of more modern tools in which legislation is specified involves in reality preprocessing conceivable cases.

It is presently up to each individual organisation to establish a methodology which provides for the legal security guarantees in the legislation, to the extent that they apply. The question is whether it is not time to look more closely at how current legal security guarantees can be catered for in more expedient and suitable ways in relation to fully or partially automated solutions. The challenge will be special provisions on actually determining the legal content, access to a complaints procedure, and rectification of any errors. This applies to documentation of such programs, how accessible they are and their openness to inspection.

Government measures

Measure 8.5: *The government will examine how legal protection can be catered for satisfactorily in relation to fully or partially automated decision-making solutions.*
The opportunity for making a complaint and the rectification of any errors, openness to inspection and documentation and how accessible the different programs are will all be examined.

8.3.7 Legislation

The laws and regulations linked to personal privacy are dealt with in various acts and provisions and may appear to lack transparency and hence be difficult to access. There is therefore a need for better harmonisation and coordination in order to prevent duplication and facilitate access, in relation both to the Personal Data Act and special legislation and to confidentiality regulations in various domains. Current regulations are based extensively on paper-based processing and do not take sufficient account of the current challenges posed by electronic communications. This is liable to be increasingly problematical in terms of the aim of further development and digitisation of the public sector.

By incorporating the personal privacy aspect earlier in a legislative process, it will often be possible to reach a solution which caters both for personal privacy and for the law's primary objective. For the same reason that it is important to take account of personal privacy at an early stage of a legislative process, it is important to do the same in specific procurement and development situations. In these cases, personal privacy considerations may appear to be barriers or factors that make ICT usage more expensive. It is nonetheless rare that personal privacy presents a definitive barrier to achieving improvements with the aid of ICT. To the extent that there are extra costs associated with catering for personal privacy, these costs can often be reduced by taking account of personal privacy early on in the development or procurement process. This is the responsibility of the individual procedural officer and is an issue essentially of competency.

Government measures

Measure 8.6: *The government will implement a fact-finding process to inquire into:*
- How regulations can be designed to support the use of privacy enhancing technologies
- The development of tools for performing internal monitoring in accordance with the Personal Data Act
- The development of general tools for catering for the requirement for information security
- How the Personal Data Act can be made more effective through simplification and the removal of difficult terminology
- The need for harmonisation with other regulations in the personal privacy area

Measure 8.7: *The government will review the division of labour between the Data Inspectorate and other supervisory authorities* which have remits which include the processing of personal privacy data, with in the interests of facilitating closer cooperation and coordination.

8.3.8 Large-scale information systems – pressure on personal privacy

Many private enterprises, organisations and public bodies are now working on merging large-scale information systems. This is true in the finance,

health, welfare and research sectors, among others. A common trait here is the readiness to offer better service, be more efficient, offer better customer processing and provide more comprehensive data.

Many actors also want to store data over increasingly extended periods of time. The more retention times increase, the more likely that data will be used in new contexts. The wish to store data may in itself appear sound and well-founded, but the totality of stored data on each individual person may however represent a threat to personal privacy.

It is important that the altered risk which large-scale information systems may represent for individual personal privacy is examined satisfactorily and that necessary security measures are implemented. Privacy enhancing measures, such as better and more fine-meshed access control and data encryption, may help to keep the risk at a satisfactory level.

8.3.9 Publishing on the Internet

More and more personal data are being published on the Internet. These range from details voluntarily published on a personal website, letters sent to public administration, standard contact details, job information or invidious images published for purposes of harassment.

Publication of personal data happens in many cases without the consent of the person the details relate to. This is not without problems, either in relation to ethical considerations or in relation to the Personal Data Act. The problem can be exacerbated by the person responsible for publication citing freedom of expression as justification.

From a personal privacy perspective, the greatest problem with publishing on the Internet is that the individual loses control of the information about himself/herself. Data spreads rapidly, whether they consist of photos taken with a mobile phone camera, film clips or false information published in order to bully or intimidate. The Internet has a number of special characteristics relative to other media. For example, there are very limited opportunities for replying or for getting false information deleted.

Government measures

Measure 8.8: *Measures will be implemented to ensure that making children and young people aware of personal privacy is focal in education, through targeted information about technological facilities and challenges in the personal privacy area.*

8.3.10 Public documents on the Internet

That the administration's documents and personal data should be "public" in accordance with the Freedom of Information Act is not to say that they should be electronically searchable on the Internet. How access can be provided to public records and documents using the Internet while providing satisfactory personal data protection is therefore a substantial challenge in both legal and technical terms.

8.3.11 Competence

Legislation alone can scarcely protect personal privacy in a satisfactory manner. Legislation must be seen in context and work in conjunction with other administrative instruments. Emphasis must be given to information, use of privacy enhancing technology, competence-building and debate.

Government measures

Measure 8.10: *The government will implement measures which ensure sufficient competence, understanding and internal methodology* which means that assessment is made of incorporating personal privacy issues and expedient measures early on in the development of legislation which deals with procurement and other development processes among authorities and enterprises.

8.3.12 Research

As mentioned, protection of personal privacy is a key human rights obligation for states. Both within the EU and in Norway, significant resources have been devoted to ensuring sound personal privacy. We need figures to inform us of the impact of legislation and policy in this area and results to explain why the figures are as they are. In other words, there is a need for figures on the extent to which enterprises are complying with the law and, for example, explanations of why some enterprises fail to comply. Similarly, we need to know more about the effect technological innovations have on personal privacy. The objective must always be to have

the best possible basis for a meaningful and effective policy.

In order to ensure an informed personal privacy debate and a factual foundation for governance, we need independent research. Such research must look at the overall picture and interrelationships and should involve legal, social and ICT aspects.

Government measures

Measure 8.11: *The government will institute measures for systematising and promoting research initiatives for the personal privacy area.* A multidisciplinary research programme for ICT and personal privacy in the broad sense of the issue should be established.

9 ICT security

The complexity of current ICT systems and networks is increasing, both in business and in public administration. When socially critical and business critical systems are also connected to the Internet, we face substantial security challenges. The work on *ICT security* in this context covers the protection and the development of information systems and networks to make them robust and secure. It is also about introducing new ways of thinking and acting in the use of information systems and networks and in exchanging information. Only an approach which takes proper account of the interests of all the actors and of all kinds of systems, networks and associated services can ensure effective ICT security.

Security on the net deals primarily with the issues of confidence in use of the technology and being aware of both the benefits and drawbacks of using the Internet. The problems involved in this area, in addition to general personal privacy challenges, are pornography, violent content, bullying, and so on. A special focus is aimed at protecting minors against illegal and harmful content on the web. eSafety (Internet safety) is closely linked to digital skills.

Chapter 9 deals only with *ICT security* as defined above. *eSafety* was dealt with under Section 4.4.2. Current status – Digital skills. Personal privacy issues were discussed in chapter 8.

9.1 The government's ambitions and objectives

Most electronic products and services currently available in the market assume that the systems are readily accessible, are stable and that the information which is distributed or collected is accurate. The dynamics of the area make it more difficult to maintain a stable security level in a modern communication and information system where information is saved, processed and transmitted electronically than when information is kept in a physical medium. This situation also raises to legal issues.

The government wants general ICT security in society to be sound. ICT infrastructure of critical importance for society must be robust and secure in the face of the potential threats to which it is exposed. Critical information systems must be secure so that the harmful effects of any breaches of security are no greater than what may be defined as 'acceptable risk'. General awareness must be raised of the risks associated with information systems and networks, of policies, routines, measures and procedures that are available to counter these risks and of the need for these to be adopted and implemented.

Issues surrounding ICT security involve many actors and interests. Everyone must assume responsibility in accordance with their role and take the necessary measures to promote security in information systems and networks. This applies equally to the individual user as to suppliers of products and systems and the authorities. Manufacturers have a special responsibility for developing products with satisfactory security levels in line with user requirements. Security features must be documented and communicated to users. As with all other security and contingency work in society, all efforts in ICT security must be founded on the principles of responsibility, equality and proximity. This means that the enterprise which has initial responsibility for ICT security in an information system or network in daily operation also has responsibility for implementing the necessary security and contingency measures in order for the system to function satisfactorily in a crisis situation as well. The state has an overarching responsibility for ensuring that society's overall requirement for ICT security is met. This applies in particular in cases where it cannot be expected for the individual owner of a socially critical information system or network to assume responsibility for ICT security on his/her own.

ICT-related security is not a problem that can be solved once and for all. The rapid technical upheaval in the ICT area is leading to more new and changed circumstances for ICT security. The work of promoting society's ICT security must accordingly take place as a continuous process with long-term objectives. ICT security work must necessarily be technically oriented, but there is

also a need to look more closely at the administrative aspects of security work.

9.2 Status – Protection of the information society

To date, security has not been a driving force in development. On the contrary, the development of the Internet, for example, has been characterised by entrepreneurs who have been focused primarily on innovation and commercial development. The need for ICT security has not presented itself to any great extent and security has not been a barrier to creativity, either for users of the technology or among criminals. ICT security has simply not been especially high on the agenda of the individual user. The top of the agenda has been the immediate response to needs and curiosity.

The concept of information security is based on these three basic qualities:

- Integrity – that the system is secured against manipulation of the system's functionality and data.
- Accessibility – that the system is secured against stoppage of its intended functionality and that the system has access to necessary data.
- Confidentiality – that the system's functionality and data are secured against unauthorised access.

Accidental failure or a directed attack against the information within an infrastructure will consist of a set of tools aimed at one or more of these qualities.

ICT infrastructure comprises an increasingly large share of critical infrastructure in society. Socially critical ICT infrastructure is defined here as installations and systems which are essential for maintaining functionality critical for society which in turn covers fundamental needs in society and the population's sense of security. What comes under the concept of socially critical infrastructure for electronic communication will increasingly be determined by what electronic communications services are needed to enable users with socially critical functions to perform their socially assigned remits. If some of these users can find alternative services, they will be able to establish redundant solutions which make the socially critical ICT infrastructure less vulnerable.

9.2.1 Facts about the status of ICT security in Norway

Primary responsibility for protecting information systems and networks is lodged with the owner or operator. This *enterprise responsibility* is not independent of other responsibilities which an owner and/or operator of an enterprise has. At central authority level, this principle means that the individual ministry has overarching *sectoral responsibility* for protection of the sector's ICT infrastructure and for preventive ICT security work within the sector being kept at a satisfactory level. This means both making it less likely that unwanted events occur and reducing damage if such events do occur. The ministry can independently propose State instruments for protecting the sector's critical ICT infrastructure, such as regulatory instruments, financial instruments, etc. The ministry also evaluates what preventive ICT security measures are required at any time in order for ICT security in the sector to be at an acceptable level of risk.

Statistics Norway produces annual surveys of the security state nationally, in business, in municipalities, at county level and in homes. Statistics Norway's figures from 2005[1] show that the figure for users who have been subject to one or more ICT security events is increasing. At the same time, the statistics indicate that more and more enterprises in the private and public sectors are now taking ICT security seriously and are implementing various types of security measures. Nearly all those surveyed, in whatever sector, now use technical protective measures of one kind or another. In addition to Statistics Norway's surveys, NorCERT (the Norwegian Computer Emergency Response Team) in the Norwegian National Security Authority (NSM) issues monthly reports which provide an assessment of the risk of a serious data attack on critical information infrastructure in Norway. These are available on NSM's website (http://nsm.stat.no/vdi).

The public statistics say little about the extent of data crime and the threats directed at ICT systems. There is a general opinion that data crime and unwanted events are not often reported to the police or to the authorities. Regrettably, many ICT security events deriving from accidents or mishaps are rarely or never communicated outside of the enterprise in question. To obtain an overview of the situation, since 1989, Næringslivets sikkerhetsråd (NSR) (The Business Security Council) has under-

[1] Statistics Norway: "Key figures on the information society 2005" (Statistical analyses 80).

taken 5 surveys in order to disclose hidden statistics in the area. The purpose of these "hidden statistics" surveys is to calculate the real extent of data crime and ICT security events in the private and public sectors, as well as surveying the security level and security measures in enterprises and evaluating their significance.

Based on details in NSR's *Mørketallsundersøkelsen* 2006 (Hidden statistics survey) and Statistics Norway's statistics on business structure in Norway, it is estimateed that Norwegian enterprises[2] were exposed to some 3,900 data breaches in 2005. This result is in stark contrast to the police statistics which only show 61 reports in this category. Similarly, there are estimated to have been 8,900 cases of misuse of enterprises' ICT resources in this period. Here, there have been only 11 reports to the police. The NSR's survey reveals that hidden statistics are still large when is comes to data crime. Especially alarming is that the surveys reveal that a third of enterprises do not know whether they have experienced unwanted ICT security events.

Increased use of Internet services in business activities has made Norwegian enterprises more vulnerable even to short interruptions of operations. More and more enterprises are saying that they would have significant problems from a halt in operations of one day, some even after only an hour. *Mørketallsundersøkelsen* 2006 (Hidden statistics survey) estimates the annual costs related to ICT crime and unwanted ICT events in Norwegian enterprises at NOK 1.8 billion. The survey offers no general view of the size of the loss to private households resulting from a lack of ICT security in the home. There is however no reason to believe that the security situation in private households is better than in the private and public sectors.

[2] As at 01.01.2006, there were 451,908 businesses registered in Norway. 99.5 per cent of businesses had fewer than 100 employees.

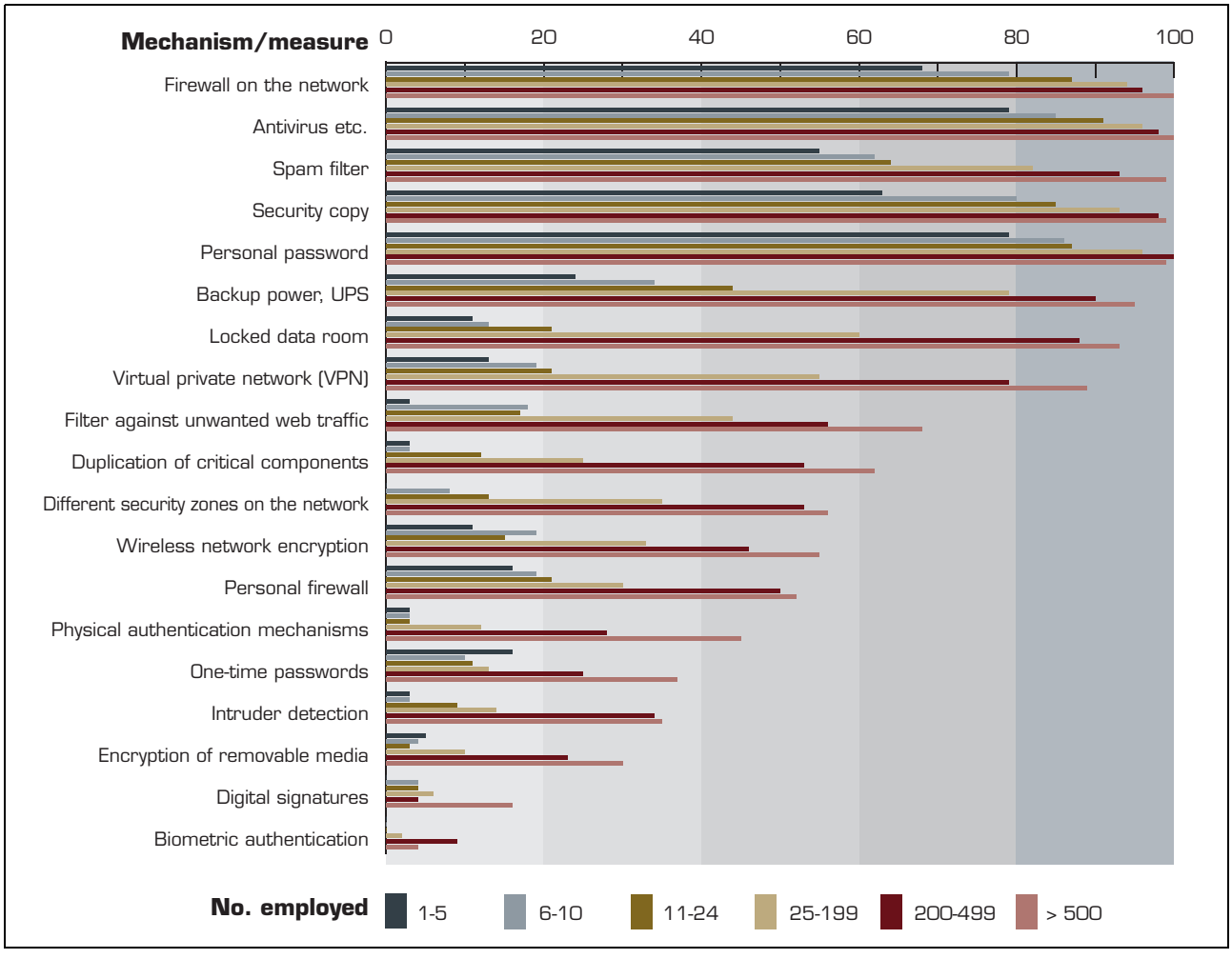

Figure 9.1 Technical security measures – size of enterprises

Source: Mørketalsundersøkinga 2006 (Hidden statistics survey)

Technical protective measures

More or less all Norwegian enterprises have implemented technical protective measures. The commonest technical solutions are passwords and antivirus solutions. The use of security copies is also generally widespread. All major enterprises have firewalls installed. 83 per cent of small and medium-sized enterprises have implemented this security measure. The surveys reveal however than only 15 per cent of the enterprises which have installed a firewall have regularly reviewed its rules, settings and security logs.

Organisational measures

In general, the use of organisational measures has not grown in line with enterprises' exposure to threats. Among large enterprises, most have guidelines for implementing ICT, but only a quarter of small enterprises do so. There is a notable lack of instruction of employees in the safe use of IT and a lack of preparations for managing a security breach.

A more detailed overview of the enterprises' technical security measures is given in the table below.

Socially critical infrastructure

11 per cent of enterprises state that they perceive themselves as part of the socially critical infrastructure. These enterprises also state that they are more vulnerable, in that 40 per cent believe that they would encounter serious problems within one hour of key ICT systems being out of operation.

A more detailed overview of what security measures enterprises with socially critical functions have implemented is shown in the table below.

International cooperation on ICT security

Because information and communications technology are global in nature, work on standardisation and policy creation takes place largely in the international arena. Beyond product and service suppliers, the key actors are international organisations

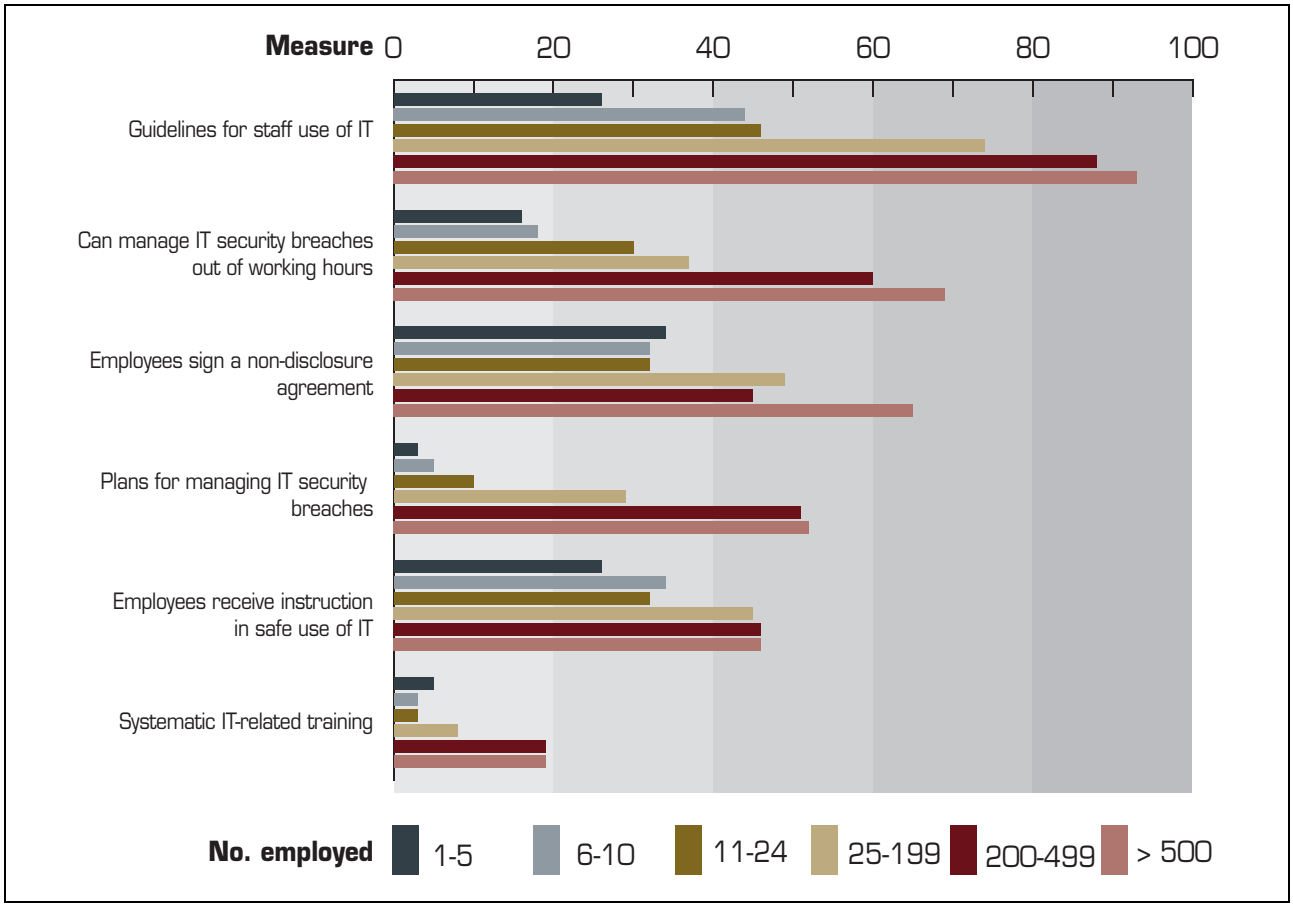

Figure 9.2 Organisational measures – Size of enterprises

Source: Mørketalsundersøkinga 2006 (Hidden statistics survey)

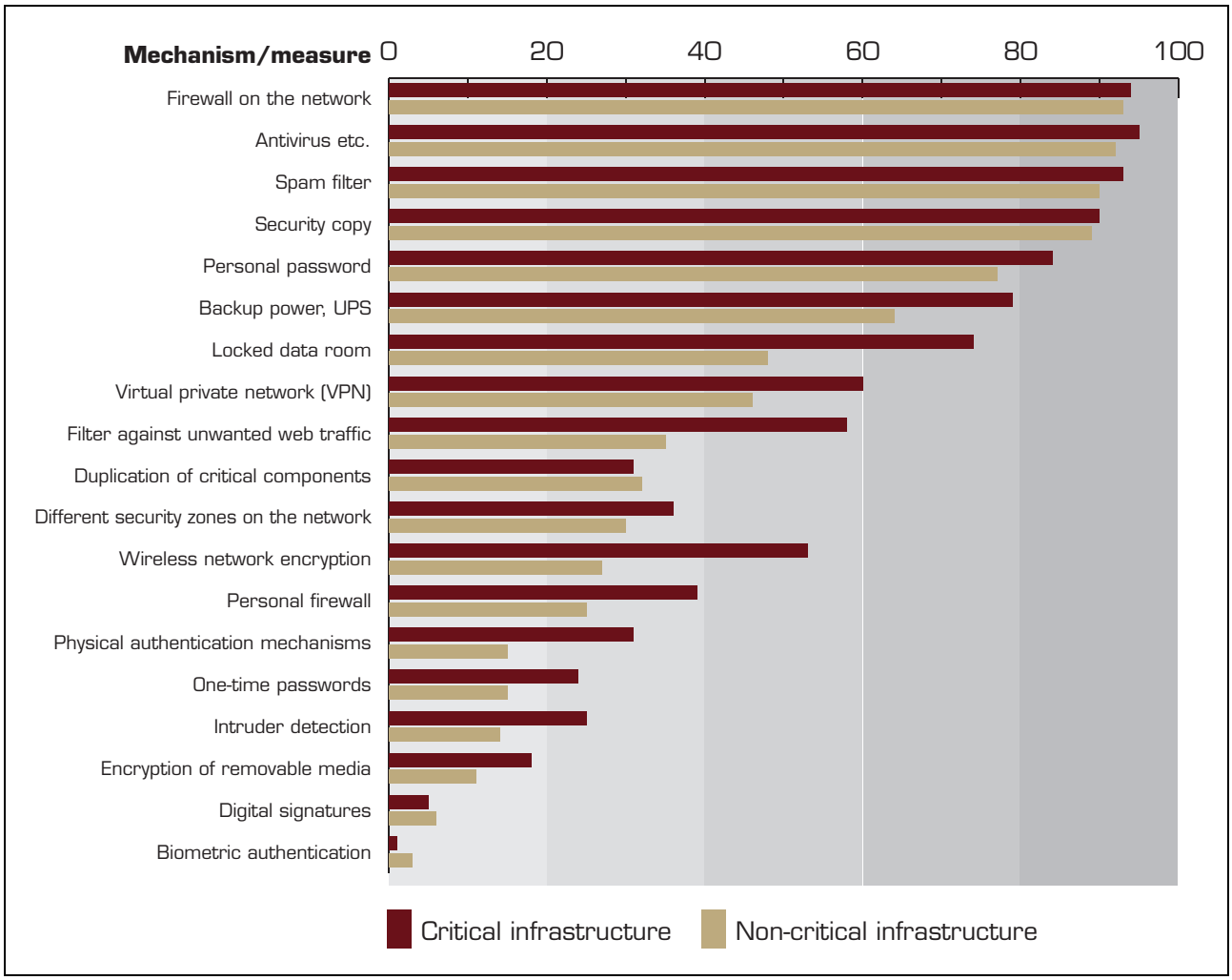

Figure 9.3 Security measures – Critical infrastructure

Source: Mørketalsundersøkinga 2006 (Hidden statistics survey)

such as the Internet Corporation for Assigned Names and Numbers (ICANN), European Telecommunications Standards Institute (ETSI), the EU, OECD, the UN, NATO etc. The development of the Internet is very much more outside of Norwegian control than is the case for other more traditional infrastructures. Because the technology is so complex, Norway participates actively in a number of international technical arenas. All work takes place essentially within the frameworks of several different international organisations. The purpose of Norwegian participation in international ICT security work is two-fold. Firstly, the outcome of this work contributes to greater information security in Norway. Secondly, it gives Norway an opportunity to take part in designing a globally more secure Internet.

9.3 The government's specification of the ministerial coordinating and sectoral responsibility for ICT security

As for other work on security and contingency, all ICT security work is based on three fundamental principles:

- The responsibility principle: The person who is responsible under normal operation is also responsible in the case of extraordinary events.
- The equality principle: The organisation in operation in everyday life will, as far as possible, be equal to the one in operation during crises.
- The proximity principle: Crises must be dealt with at the lowest possible level.

The majority of all work on ICT security will therefore, be conducted within *sectors* and primarily in the individual enterprise. Securing of the sectors' socially critical ICT infrastructure has the highest priority. In all key sectors (e.g. banking and finance, energy and telecommunications), there will be considerable financial and human resources devoted annually to maintaining an adequate level of ICT security. In order to promote sectoral coordination, a number of legislative administrators have taken the initiative to establish separate crisis and coordination councils within their areas of responsibility. Two examples of these are Beredskapsutvalet for finansiell infrastruktur (BFI) (Contingency Council for Financial Infrastructure) in the banking and finance sector (under the leadership of Norges Bank) and the Samvirkegruppa i telesektoren (Telecoms Sector Coordination Group) (will be led by the Norwegian Post and Telecommunications Authority (NPT)). The object of the councils is to determine and coordinate measures in the sector in a given crisis situation in addition to preventing situations which might result in major disruptions to the sector's ICT infrastructure. The work of the councils will also emphasise detection of vulnerable points which might generate spreading effects in the sector's infrastructure and thus be significant for stability and confidence in the systems and networks in question.

The Office of the Auditor General has operated with an overarching coordinating perspective in its fact-finding report. A great deal of emphasis has been given to work carried out at the executive coordinating level. ICT security work carried out in the individual sectors – which comprises the cornerstone of national ICT security work – is not emphasised to the same degree. The report provides valuable input in terms of how organisation of responsibility at the overarching level can be improved, but overall the Office of the Auditor General's inquiry has served to create an impression that the security status of the field of ICT in Norway is weaker than is actually the case.

Primary responsibility for securing information systems and networks is lodged with the owner or operator. The ministries have an overarching *sectoral responsibility* for looking after the security of the sector's ICT infrastructure and for the satisfactory state of preventive work on ICT security in the sector. They also assess what preventive measures are necessary and can independently propose measures for protecting critical ICT infrastructure in their sectors. In addition to sectoral responsibility, many ministries, boards and councils have various cross-cutting remits. Two central *coordinating ministries* are the Ministry of Justice with coordinating and supervising responsibility for society's civil security and preparedness, and the Ministry of Government Administration and Reform with coordinating responsibility for ICT policy, including work on ICT security.

Preparedness, operational assistance and crisis management on the one hand and general preventive work on the other hand constitute a primary difference in terms of which ministry has coordinating responsibility within work on ICT security. On the basis of this difference, the government has made the following specification of responsibilities within ICT security:

The ministries' sectoral responsibility for ICT security

Each ministry is responsible for assessing how necessary it is to implement measures of a preventive nature, as well as preparedness measures and crisis management within its sector. Individual ministries for a sector have a more central role in the national work on ICT security than others. This applies to the Ministry of Transport and Communications and the Ministry of Defence. The Ministry of Transport and Communications, as sectoral ministry, is responsible for ICT security linked to electronic communications networks and services. Sectoral responsibility includes preventive security work, preparedness and crisis management. The provisions of the Electronic Communications Act also cover the Internet. The Norwegian Post and Telecommunications Authority, as the authority under the Ministry of Transport and Communications, has special responsibility linked to security and preparedness in electronic communications networks and services. The Ministry of Defence has all responsibility for work on ICT security linked to the military sector, including preventive measures.

Coordinating responsibility for preventive ICT security beyond sectoral responsibility

The Ministry of Government Administration and Reform's coordinating responsibility for ICT security is anchored in the *coordinating responsibility for IT policy* and relates only to preventive cross-sectoral work on ICT security, with the exception of the Ministry of Justice's supervisory responsibility. The Ministry of Government Administration and Reform's coordinating responsibility includes contact with business in conjunction with preventive work on ICT security.

The Ministry of Justice and the Police has a coordinating and supervisory responsibility for *society's civil security*. The Ministry of Justice's r*esponsibility for ICT security is limited to a general coordinating responsibility*, and the executive technical responsibility for preventive security services in the civil sector. The coordinating and supervisory responsibility means that the Ministry of Justice is to collate reports and conduct system-oriented supervision with the ministries and prepare reports for civil contingency. Such supervisory responsibility shall cover planning for ICT contingency measures in the same way as other contingency measures in the ministries.

9.3.1 Who is responsible during a crisis?

Each specialist ministry has responsibility for 1) relevant enterprises in the sector (e.g. owners of socially critical infrastructure or where weaknesses in the enterprise's ICT system can impact life and health) have a plan for crisis management, 2) necessary coordination if crises escalate and 3) restitution, reporting and follow-up being performed after crises have occurred.

The Ministry of Justice has an overarching coordinating and supervisory responsibility for society's civil security. This does not alter the departmental ministers' responsibilities. All crises must be handled in accordance with the principles for central crisis management; at the lowest possible level in the enterprises that have responsibility under normal conditions. No difference must be made between an ICT crisis and other crises. The Ministry of Government Administration and Reform accordingly has no coordinating responsibility in a crisis situation, without regard for how ICT-related a crisis may be, beyond the sectoral responsibility the Ministry of Government Administration and Reform has for its own councils etc. This division is a clarification of the coordinating responsibility of, respectively, the Ministry of Government Administration and Reform and the Ministry of Justice, and implies a limitation in relation to the sectoral responsibilities of the Ministry of Transport and Communications and the Ministry of Defence.

9.3.2 National coordination of warnings, advice and assistance for information security

The lack of conscious and systematic security work in Norwegian enterprises are a cause of daily security breaches linked to problems of access, integrity and confidentiality and hence financial and societal losses. ICT systems and solutions are becoming generally more advanced and complex. Needs for mobility and an increased threat picture in constant change impose greater requirements on security. In order to manage these trends, the enterprises must establish more professional work processes in the management of ICT systems. The public sector has a special responsibility for protecting security in socially critical ICT infrastructure owned by the public sector, but also to be a driving force for private owners of such infrastructure to take good care of security.

Over recent years, the central authorities have worked purposefully to implement a nationally coordinated warning and advisory service in the ICT area. This is primarily to take care of the authorities' responsibility in the area, but private business and the individual user also stand to benefit from some of the knowledge and products which issue from this. One key priority has been to develop a warning system for protecting socially critical infrastructure, competence networks, a system for knowledge-dissemination, and to develop and operate targeted advice and opinion-forming work within the information security area.

There are essentially three national units which have been charged with the various practical tasks in this context:

- Norwegian Computer Emergency Response Team (NorCERT) integrated with the Varslingssystem for digital infrastruktur (VDI) (Warning system for digital infrastructure) in the Norwegian National Security Authority (NSM) (Pilot project from January 2004. Formally created on 01.01.2006).
- Norsk senter for informasjonssikring (NorSIS) (Norwegian Centre for Information Security) (Pilot project from April 2002. Formally created on 01.01.2006).
- The Norwegian Post and Telecommunications Authority (NPT)

The budgetary responsibility for NorCERT has initially been lodged with the Ministry of Government Administration and Reform as the coordinating ministry for ICT security in the civil sector. From 2007, budgetary responsibility and funds for NorCERT will be transferred to the Ministry of Defence which has budgetary responsibility for the National Security Authority (NSM).

NorSIS, after research activities for three and a half years' at SINTEF in Trondheim, was established on a permanent basis in association with Gjøvik kunnskapspark AS and Bluelight/NISlab at

the Technical College in Gjøvik from 1 January. The Ministry of Government Administration and Reform has budgetary responsibility for the units.

NPT is an independent administrative body under the Ministry of Transport and Communications. The body's primary areas of responsibility are to regulate and monitor the post and telecommunications sector in Norway. NPT is self-financed, primarily through fees from the telecoms operators. Funding for telecoms security and preparedness is appropriated from the national budget.

The three units' *areas of responsibility* are described below:

– **NorCERT** has a primary responsibility for analysis and threat assessment, advice, assistance for and management of major security events related to the Internet. NorCERT shall also deal with preventive measures for effective event management. NorCERT shall be the Norwegian contact and coordination point nationally and internationally to protect against and respond to security events which have a severe or acute impact on networks and system access, confidentiality and integrity. NorCERT is available 24 hours a day, seven days a week.

  NorCERT is an extension of the Varslingssystem for digital infrastruktur (VDI) (Warning system for digital infrastructure). VDI was initially a cooperative project between the security authorities and a selection of participants who own socially critical IT infrastructure. They engaged in a cooperation on active monitoring of traffic (not the content) from the Internet to a representative selection of enterprises with such infrastructures. Using sensors positioned on the network, it is possible for the VDI system to provide early detection of coordinated attacks and warn the relevant bodies and other owners of socially critical ICT infrastructure. The permanent establishment of NorCERT has resolved the most significant limitations of the initial VDO project. The limitations lay primarily in the definition of target groups; VDI is a cooperation between a restricted number of public bodies and enterprises and private businesses which comprise a representative selection of enterprises within critical infrastructure. With NorCERT, the authorities are seeking to reach out to all enterprises which have socially critical infrastructure and information. In practice, the development of VDI, i.e. the creation of NorCERT where VDI is now a warning and verification system, has served to create greater transparency through information which is acquired and analysed being distributed to a much larger target group than previously. Technical and more policy-oriented meetings have also been established. NorCERT/VDI also produces more reports than previously and new products are on the way, including customised reports for a single sector or a specific enterprise and reports which will be published. These reports are available on NSM's website, www.nsm.stat.no.

– **NorSIS** has the overarching goal of improving security and making information and communications technology in society generally less vulnerable. NorSIS will raise awareness of threats and vulnerabilities, advise on security measures and contribute to advocacy through skills development, information exchange and advice of a *preventive nature*. NorSIS's target group is primarily SMEs in the private sector and the public sector including local authorities. NorSIS shall also, as far as possible, support citizens' needs. Information from NorSIS shall be "open" and all social groups shall be able to benefit from NorSIS's services (web, guidelines, reports, courses, conferences, etc.) NorSIS also cooperates with the media to reach its target groups. NorSIS will also work to build skills among the population in general.

  NorSIS shall assist in promoting a culture of security among users of information systems and networks, for example, through acquiring greater awareness of risks, routines, measures and procedures. The centre's activities shall also contribute to instilling confidence among all users of information systems and networks and in the way they are developed and used. NorSIS has also commenced a cooperation with technical colleges and to some extent also sixth-form colleges with a view to preparing curricula and teaching modules for the ICT security area.

  NorSIS also provides advice and instructions for the information security area. The NorSIS website – www.norsis.no – offers a wide range of downloadable guidelines.

– **NPT** has been assigned special authority for security and preparedness in electronic communications networks and services. NPT's responsibility is primarily preventive, but, in a crisis, it may act as an important support for the ministry which "owns" the crisis. NPT's target groups are providers and users and electronic communications networks and services. NPT's tasks include determining security and preparedness requirements for communica-

tions networks and services and verifying that the stipulated measures are implemented. Other tasks include raising awareness and competence, and preparing guidelines for providers and users of electronic communications. The establishment of the nettvett.no portal is one example of the NPT's instructional undertakings within the security area.

NPT continuously maps the entire physical infrastructure established by all the actors in the Norwegian market and uses this information to find vulnerabilities in the critical infrastructure and to coordinate cooperation between the actors in a crisis or contingency situation. NPT will also collate risks and vulnerability assessments from providers and produce an overall risk assessment. This provides an important basis for clarifying which contingency measures should be financed by the authorities.

The division of labour and the coordination between NorCERT, NorSIS and NPT is as follows:

NorCERT and NPT collaborate regularly on preventive security work aimed at providers of electronic communications services and networks. As an operational organisation, NorCERT will have good insights into threats linked to the Internet and provide ongoing threat assessments. NPT has authority to follow up with any security measures aimed at Internet providers. NPT will also be able to contribute such knowledge about the market and the actors as is necessary to arrange security measures that distort the market as little as possible.

NorSIS and NorCERT complement each other in terms of developing and disseminating information to different groups in society. They meet regularly and collaborate closely in several specialist areas. NorSIS is defined by NSM as a special contributor to the VDI cooperation and receives alerts and information about attacks and threats in the same way as VDI participants. In practice NorSIS acts both as a sparring partner and as a collaboration partner with a view to disseminating NorCERT's alerts and vulnerability information to a larger target group.

NorSIS performs advisory, awareness raising and instructional work and has its own website (www.norsis.no) which offers news, advice, guidance primarily to SMEs in the private and public sectors including municipalities. NorSIS also helps to disseminate information concerning serious events.

Through its mandate from the Ministry of Transport and Communications, NPT has also created a website, www.nettvett.no, as an information point for ICT security. This offers practical information to all consumer groups and to SMEs. NPT works closely with representatives from consumer bodies, the police, banks, e-commerce and the ICT sector to develop and enhance the website. Through cooperation with these representatives, a warning service for Internet fraud attempts has also been created.

There is a limited area involving instructional work where there is an overlap between NorSIS's activities and the work NPT performs at www.nettvett.no. To manage this overlap, NPT and NorSIS have taken the initiative for practical cooperation aimed at exchanging information and re-using instructional material.

In parallel with the activities of NorCERT, NorSIS and NPT, suppliers of products and systems, consultants in the security area and the media will be key sources of information and training within various specialisms and product areas. Here, both NorSIS and NPT collaborate with a number of key private actors and voluntary organisations with the aim of developing and distributing free advice and guidelines for the information security area.

9.4 Objectives and strategy for promoting ICT security

Accessibility to, the security of and confidence in information and communications technology are prerequisites for achieving the aim of a sustainable information society for all. Security threats resulting from technological developments such as denial of service attacks which overload systems, virus attacks, hacking, phishing, botnets etc. must be addressed promptly to build confidence and secure operation of networks and systems. It is also important for the police to be able to find and convict those who use the Internet for criminal purposes. It is thus important for the police force to have high-level skills in the field of ICT and to be equipped with the best methods, tools and technologies.

A coordinated and effective participation from business, central and local authorities and the individual in the IT security area is predicated on a shared understanding of the challenges. The individual actors must also have the chance to contribute to a socially sound development. This means that they must have the greatest possible access to relevant information and that there is a productive

dialogue between the authorities and other actors in the field.

In order to secure the Norwegian information infrastructure, it is necessary to:

- provide for good protection of the information structure through **preventive** measures. The measures to be implemented will be both technical and administrative.
- Be able to respond effectively to ICT security events through **contingency measures**. The measures to be implemented will be both technical and administrative.
- Provide **sustainability** in security work through, for example, skills development and standardisation.

The National Information Security Coordination Council (KIS) has implemented a review of the National Strategy for Information Security. Because of the strong dynamics in the field, the present strategy is out-of-date in terms of technical content and measures. A new proposal for the strategy will be presented in mid-2007. The strategy work will take place in an open and inclusive way vis-à-vis the bodies working with information security.

Based on the security challenges and trends, some measures will probably be given more emphasis in the revised strategy. This applies in particular to the need to protect socially critical ICT infrastructure. Another key aspect is to promote a culture of security as a way of thinking, analysing and acting when it comes to operations and other circumstances relating to information systems and networks. Instilling a security culture will require both initiative and comprehensive participation and must result in strong prioritisation of security planning and administration as well as an appreciation of the security needs of all the actors. There is also a need to promote Norwegian research expertise within ICT security. Research must aim to promote and make available new knowledge which can assist in increasing ICT security and reduce vulnerable aspects through the use of today's and tomorrow's ICT systems and networks.

Changes in the risk picture dictate a need for reprioritisation. The government emphasises the significance of the authorities and all enterprises in the private and public sectors with ICT security and contingency remits organising their general plans and budgets as the new security challenges are revealed. To achieve robust information security, it is important to address damage prevention and damage limitation measures as a whole. Information security is a cross-sectoral challenge.