

Strengthening competitiveness through cooperation:

European Research in Information and
Communication Technologies



Information Society
and Media



European Commission

Information and Communication Technologies - Meeting The Union's Goals



Europe faces tough challenges in the coming years. In a context of market globalisation and ever-faster pace of technological change, we must achieve superior growth, high quality jobs and a sustainable future. We must modernise our public services and tackle security issues, which are of great concern to the general public.

To face these challenges, Europe must continue to master and shape the future development of key technologies and ensure that innovative services and products are taken up and used to deliver the maximum possible benefits for citizens and businesses.

Information and Communication Technologies (ICT), that extraordinary convergence of computing, communications, broadcasting and media technologies, play a crucial role in this respect.

Virtually every facet of industry, commerce and government is touched by ICT. By mastering, shaping and mobilising these technologies, we can boost productivity, innovation and creativity across industry and service sectors. We can meet the rising demand for health and social care and modernise services in the fields of education, security, energy and transport. ICT is a catalyst for advancing other fields of science and technology as it transforms the way researchers conduct their research, co-operate and innovate.

Higher and sustainable economic growth: a precondition for meeting all our social and economic aspirations.

ICT is an "enabling technology" that can generate productivity gains across the economy. The adoption of new information and communication technologies by businesses accounted for about half the productivity gains in Europe from 1995-2000. Deployment of ICT by enterprises enables faster product development, reductions in cost and overheads, faster and more reliable transactions, better relationships between customers and suppliers and enhanced collaboration opportunities. The ICT sector itself is an important player in our economy. The sector grew from 4% of EU GDP in the early '90s to more than 8% today.

ICT is therefore an essential element of the European Union's relaunched and refocused "Lisbon agenda" – the drive to make ours the most dynamic knowledge-based economy in the world, guaranteeing sustainable economic growth and jobs. This is why Wim Kok, reviewing the Lisbon strategy, recently stated:

"The EU needs a comprehensive and holistic strategy to spur on the growth of the ICT sector and the diffusion of ICTs in all parts of the economy"¹.

The Commission's i2010 strategy – European Information Society 2010 – proposes three policy priorities: to promote an open and competitive information economy, a doubling of European investment in ICT research and innovation, and a high level of accessibility of the Information Society. It situates ICT research and innovation within a global set of policies designed to strengthen Europe's position in ICT developments and use. The strategy builds on the increasing convergence of the Internet, telecommunications and broadcasting. It aims at reaping the full benefits of the availability of digital content, exploring Europe's diversity and cultural assets. It is supported by two important Commission proposals:

1. **The 7th Framework Programme for Research and Development²** will prioritise strategic ICT research around key technology pillars and ensure that technological progress is transformed into innovative applications and services. The significant increase proposed for Community funding of ICT research should attract and stimulate private investments and should be complemented by similar increases in national research budgets.
2. **The ICT Policy Support Programme** will, as part of the new Competitiveness and Innovation Programme, stimulate innovation through the wider adoption and better use of ICT to enhance productivity and improve services in areas of public interest.

Through this holistic approach, increased ICT research spending can be harnessed to deliver the growth and jobs that we need to implement the Lisbon Strategy. It also enables us to monitor and take account of the impact of ICT developments on all aspects of our lives including ethical issues and privacy concerns.

This brochure discusses the importance of ICT research, the strengths and weaknesses of Europe in this domain, and the priorities for the future. As such, it explains the second pillar of my i2010 initiative.

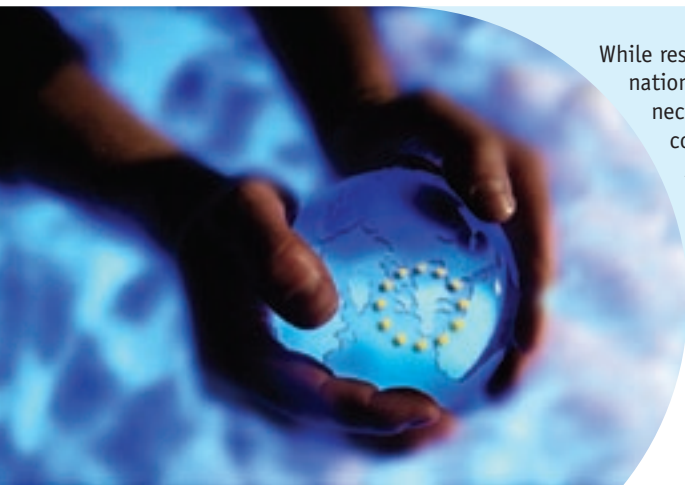
Viviane Reding

Commissioner for Information Society and Media

¹ "Facing the Challenge: The Lisbon Strategy for Growth and Employment" Report from the High Level Group Chaired by Wim Kok, November 2004

² "Proposal for FP7: Building the Europe of Knowledge", COM(2005)119, 6 April 2005

European partnership: a key asset for ICT research for Europe



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While research will continue to be undertaken at regional and national levels, increasingly it is at European level that the necessary leverage is to be found. It is through cooperation and coordination on a European scale that strategic direction can be provided, that the necessary critical mass can be generated from a wide range of interdisciplinary resources and that common goals can be pursued.

EU investment in ICT research stimulates public-private partnerships.

Public investment in ICT research is instrumental, not only in preparing the next waves of innovation, but also in attracting and stimulating private funding. EU funding does not replace the market but stimulates it by supporting investment in long-term, pre-competitive research. The exploitation of this investment is maximised through solid industry-academia cooperation.

EU research programmes provide a stable, institutional framework for rapid partnership development.

This framework is essential, not only for cooperation between organisations, industry and academia across Europe, but also as a means of fostering coordination between member states' policies and research actions.

Europe needs to embrace the world's best.

Research programmes in Europe seek to embrace the best of international research, including research from third countries. This helps the European Union develop worldwide standards and interoperable solutions and ensures that research results and their deployment in products and services are applicable across Europe and beyond.

Everything points towards the need for Europe to do more ICT research, to do it together, and to do it on a European scale.

To strengthen interactions at European level, the role of Community research programmes is essential. Experience has shown that in the areas where a focused research effort was undertaken on a European scale, important successes were achieved.

This is clearly the case, for example, in mobile and wireless technologies and in micro and nano electronics. Investment at European level has brought together national, public and private efforts in these fields. It helped develop the critical mass of effort needed for a quantum leap in these technologies. It also helped establish worldwide standards, underpinning important commercial successes.

Investments of tens of millions of Euros at Community level in these fields have generated hundreds of billions of Euros in revenues for European businesses and have generated hundreds of thousands of highly qualified jobs.

Only through a renewed and more intensive pooling of research efforts at European level will we be able to make the most of future opportunities, exploit new global markets and respond to emerging societal and economic challenges.

EU-Supported research in information and communication technologies

Enabling Europe to master and shape the future developments of ICT and meet the demands of its society and economy.



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ICT is a catalyst for advancing science and technology

The objectives – making a difference.

Three overall objectives of European ICT research can be identified:

1. to strengthen the competitiveness of all industry in Europe by building on strengths and fostering the ability to master ICT for innovation and growth;
2. to reinforce the competitive position of the European ICT sector by enabling it to build industrial and technological leadership;
3. to support EU policies by mobilising ICT to meet public and societal demands.

In addition, and as a function of these three objectives, ICT research should aim to strengthen the European science and technology base in ICT-related fields. This “horizontal” objective cuts across the other three as a pre-condition for success.

Build on strengths, recognise specificities, and seize opportunities.

- **Europe should also further develop its industrial strengths.** Europe should leverage technological advance in the ICT sector and improve the competitive edge of important ICT-intensive sectors through innovative high value ICT-based goods and services and through improvements in business processes.
- **Cooperation between suppliers and users.** ICT are increasingly driven by the uses made of technologies. Bringing technology closer to people and organisational needs means paying more attention to issues such as service innovation and user-experience research.
- **Europe should build the necessary capabilities to seize opportunities arising from new technological developments.** This involves expanding the borders of ICT research. Developments at the crossroads between ICT and other disciplines are very likely to trigger the next revolutions in many areas.

This also requires a **balance between basic research and applied industrial research** – it is critical to ensure the flow of ideas from theory to practice, from academia to market place. It is the combination of market demand, or *applications-pull*, on one side and of *technology and science-push* on the other that leads to innovation and breakthroughs.

- **Embrace the creativity and innovation capacity of small and medium-sized enterprises (SMEs) and other small entities.** Smaller players often generate the most revolutionary ideas and are frequently leaders in turning original ideas into innovative market applications. Research programmes and innovation systems must be based on their active and fair participation.

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Innovation must flow from research to market place

Research Framework Programme for 2007-2013: strategic research priorities for Europe's future

The European Commission proposes to double EU research spending for the period 2007 to 2013. The new research funding will focus on technologies which most effectively promote competitiveness and employment in Europe. The ICT priority within the 7th Framework Programme recognises the need to build on Europe's past successes, but also to focus firmly on technologies of especially strategic importance for future growth and jobs.



Strengthening the ICT Technology Pillars:

pushing the limits of performance, usability, dependability, cost-efficiency

A pre-condition for success is a strong European science and technology base. Research must focus on areas where Europe already has recognised strengths such as nano-electronics, embedded systems and communications. The new Framework Programme will prioritise strategic research in areas where European added value is greatest and where impact on growth and jobs is highest.

The key technology pillars of the ICT priority are:

- Technologies for knowledge and creativity, including cognition
- Simulation, visualisation, interaction and mixed realities
- Advanced and open communication networks with unlimited capacity
- Adaptive and dependable software and grids
- Embedded systems
- Nano-electronics



Converging computing, communications and broadcasting media promise exciting new consumer services

Integration of technologies:

We are witnessing the gradual mainstreaming of ICT and its increasing pervasiveness in a wide range of contexts. New products, services and applications can be developed for a wider range of users through integrating different technologies and adapting applications to the users' needs and preferences. This means making technology very simple to use, available and affordable, and revealing functionality only when needed.

The future scope for such services and applications lies especially in a number of key areas:

- Personal services and devices;
- Home environment: new consumer electronic services and the entertainment potential of converging computing, communications and broadcasting media;
- Robotic systems, including personal and domestic robots;
- Intelligent infrastructures: systems to increase the safety and efficiency of water, energy and transport systems.

Strengthening competitiveness and building leadership.

To strengthen competitiveness of all industry, technological leadership must be built and transformed into practical, innovative applications and services for the public and private sector. Other policy areas can be supported by mobilising ICT to meet public and societal demands. The new Framework Programme will focus on integrated ICT solutions, secure services and collaboration tools, to ensure a new era of successful e-business and efficient public services.

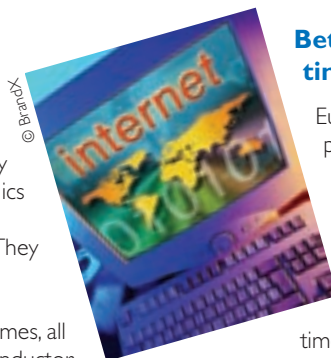


bringing technology closer to users

Building on the successes of European research collaboration

Nano-electronics:

The leading European chip manufacturers STMicroelectronics in France and Italy, Infineon in Germany and Philips in the Netherlands have been very successful in mastering the nano-electronics technologies required to manufacture advanced complex circuits and systems. They invested billions of euros to exploit the outcome of their research. Thanks to European and national research programmes, all three are now among the top 10 semiconductor manufacturers worldwide whereas there were no Europeans in the top 10 in the early 90s.



Better public services save time and money:

Europeans expect a high level of public service, but public services must adapt and improve while becoming increasingly cost-effective. Deployment of ICT solutions offers a revolution in public services, cutting costs and bureaucracy and saving time for customers. For example, a survey in 2005 of eGovernment services found that EU citizens are saving seven million hours a year on the time it takes to do their income tax returns, and EU firms are saving about €10 per transaction on their VAT returns by doing them online.

GÉANT - the world-leading research network.

The internet research network GÉANT is co-funded by the EU and European research and education networks. It connects almost 4000 universities and research centres in 43 countries across Europe. Fully enabled for next generation internet protocol, IPv6, GÉANT operates at speeds of up to 10 gigabits per second – a performance and service which is revolutionising the way research is conducted. It offers unprecedented collaboration capabilities via internet to European researchers.



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Revolutionary developments in healthcare:

Developments in micro- and nano-technology are making possible a new generation of "smart" medical sensors and implants that offer major advances in clinical diagnosis and treatment. Remote sensors in clothing, or worn like a watch, allow doctors to monitor health "from a distance". These systems can inform emergency services of our location if we suffer sudden illness or have an accident. They allow elderly or infirm people to retain their independence, cared for at home, yet monitored by their healthcare providers.

Improving safety through technology:

An innovative EU-funded technology called "time-triggered architecture" (TTA) provides highly reliable electronic systems where safety issues are critical, such as in transport or energy engineering. These systems are particularly robust and dependable when data and commands must be processed with extraordinary precision and speed. Any errors that may occur are contained within a single subsystem and are not allowed to spread to other parts of the network. The first commercial success for TTA was achieved in 2002 when Airbus announced that they had chosen the TTA technology for their cabin pressure system for their new A380. In the automotive sector, DaimlerChrysler, Renault and Siemens implemented TTA within an electronic braking system combined with adaptive cruise control. And in railways, Alcatel used TTA as the basis for an advanced network control system standard.



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Broadband and mobile communications

European telecom equipment and systems providers, like Nokia (FI), Alcatel (F), Ericsson (S), and telecom services

providers, like Deutsche Telekom, France Telecom, Telefónica, British Telecom, Vodafone, Telecom Italia, are world leaders in the development and commercialisation of key communication technologies such as mobile communications and broadband data networks based on optical fibre network technology and access modem, and on the GSM. Early EU investments in the R&D of these technologies and the participation of these companies in the Framework Programmes have played a key role in these successes.



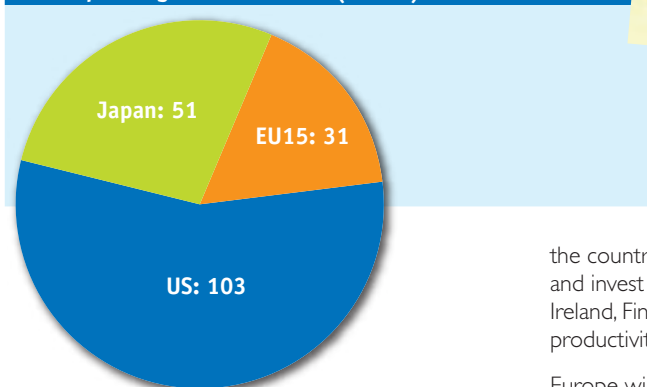
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Europe Lags in ICT Research: What is at Stake?

Evidence suggests that Europe's productivity gap with its chief competitors is to a large extent explained by its weaker investment in ICT.

ICT R&D ¹	EU15	US	Japan
Private sector investments	23 B€	83 B€	40 B€
Public sector investments	8 B€	20 B€	11 B€
Inhabitants	383 m	296 m	127 m
Investments / inhabitant	80 €	350 €	400 €
ICT R&D as % Total R&D	18%	34%	35%

R&D spending on ITC in 2002 (B Euro)



Productivity growth in Europe will be impaired since the intensity of research in ICT is directly correlated with productivity growth. Within the EU, the countries that have a large ICT-producing sector and invest the highest levels in ICT research, like Ireland, Finland and Sweden, also have the highest productivity growth rates.

Europe will continue to trail its competitors in the global race to knowledge, to innovation and to advanced science and technology. And responses to escalating economic and societal demands will slow down.

An indigenous ICT research capacity is essential to master and assimilate the technology of innovation and growth. Yet, Europe invests much less in ICT research than its main competitors.

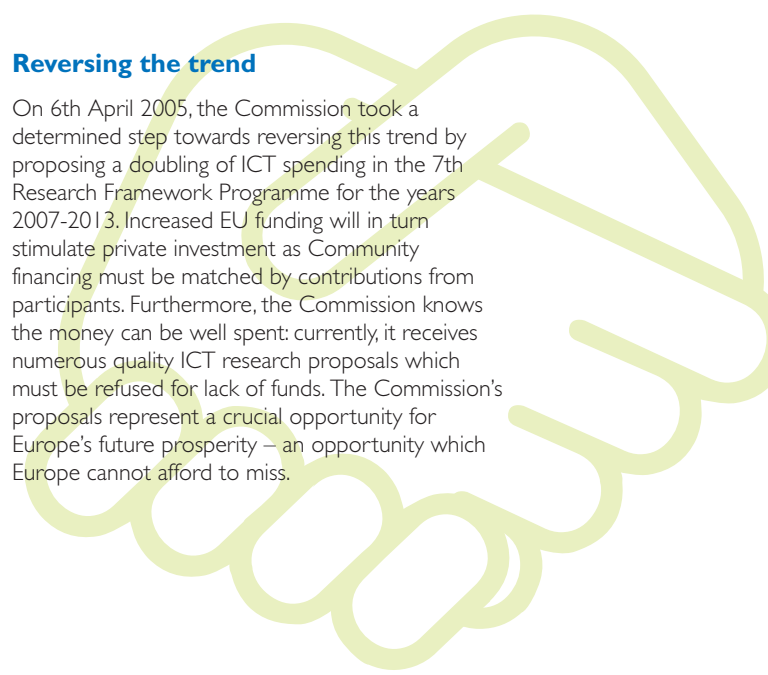
ICT research represents the highest proportion of research investment in all major economies totalling more than a third of total research. In Europe, however, ICT research represents only 18% of total research effort. Public investment in ICT in the EU is about €8bn compared to roughly €20bn in the United States. The picture is similar for private investment. In 2002, only 8% of private investments worldwide in microelectronics were in Europe.

Overall, the gap in ICT research investment represents half of the total gap in research spending between the EU and the US. The results are clear: economic growth in the European Union trails that of the United States.

If the trend of under-investment in ICT research continues, it will further undermine Europe's capacity to compete in all sectors of the economy (not only in the ICT sector), to meet the demands of its society, and to innovate in all science and technology fields

Reversing the trend

On 6th April 2005, the Commission took a determined step towards reversing this trend by proposing a doubling of ICT spending in the 7th Research Framework Programme for the years 2007-2013. Increased EU funding will in turn stimulate private investment as Community financing must be matched by contributions from participants. Furthermore, the Commission knows the money can be well spent: currently, it receives numerous quality ICT research proposals which must be refused for lack of funds. The Commission's proposals represent a crucial opportunity for Europe's future prosperity – an opportunity which Europe cannot afford to miss.



¹Source : "Investment in ICT Research, Comparative Study", IDATE 2002

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Information Society portal on Europa:

http://europa.eu.int/information_society/

A great deal of additional information on the European Union is available on the Internet.
It can be accessed through the Europa server (<http://europa.eu.int>).

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