

# Lecture 8. Information Society Technologies (IST) – FP6 Priority 2

European research activities are structured around consecutive four-year programmes, or so-called Framework Programmes. The Sixth Framework Programme (FP6) sets out the priorities - including the Information Society Technologies (IST) Priority 2 - for the period 2002-2006.

This lecture provides essential information for participating in the IST Priority:

- ⇒ IST overview
- ⇒ IST 2005-2006 Work Programme
- ⇒ IST Strategic Objectives
- ⇒ Future and Emerging Technologies (FET)
- ⇒ IST calls
- ⇒ References

## IST overview

### IST vision

The IST thematic priority will contribute directly to realising European policies for the knowledge society as agreed at the Lisbon Council of 2000, the Stockholm Council of 2001, the Seville Council of 2002, and as reflected in the e-Europe Action Plan.

The strategy adopted in Lisbon 2000 is for an accelerated transition to a competitive and dynamic knowledge economy capable of sustainable growth, with more and better jobs and greater social cohesion. This requires wider adoption, broader availability and an extension of IST applications and services in all economic and public sectors and in society as a whole. IST are the key underlying technologies for easier and efficient knowledge creation, sharing and exploitation.

*The objectives of IST in FP6 are therefore to ensure European leadership in generic and applied technologies at the heart of the knowledge economy. It aims to increase innovation and competitiveness in European businesses and industry and to contribute to greater benefits for all European citizens.*

*The focus of IST in FP6 is on the future generation of technologies in which computers and networks will be integrated into the everyday environment, rendering accessible a multitude of services and applications through easy-to-use human interfaces. This vision of 'ambient intelligence' places the user, the individual, at the centre of future developments for an inclusive knowledge-based society for all.*

*This research effort will therefore **reinforce and complement the eEurope 2005 objectives** and look beyond them to the 2010 goals of the Union of bringing IST applications and services to everyone, every home, every school and to all businesses.*

eEurope2005 aims at a wider deployment of IST, including modernising further public services such as eGovernment, eHealth and eLearning, and creating a dynamic business environment. It also aims at ensuring higher security of the information infrastructure and wider availability of broadband access.

eEurope will therefore contribute to the adoption of the research results as they emerge. It will also provide feedback about their acceptance and the problems related to their use. This close articulation between research and policy initiatives is a key component of the Union strategy to achieve the Lisbon goals.

The European Community (EC) support for IST in FP6 will help mobilise the industrial and research community around high-risk long term goals. It should facilitate the aggregation of public and private research effort on a European scale and enable the development of a European Research Area (ERA) in IST.

## **IST in FP6: coverage and main targets**

Realising the vision requires a coherent and integrated research effort that addresses the major societal and economic challenges and ensures the co-evolution of technologies and their applications.

The FP6 instruments, such as Integrated Projects, will enable the integration of various research activities from knowledge generation and technology development to their application and transfer. They provide an opportunity to combine, as appropriate, applied and generic technology research. This will help pull the technology developments with applications and services addressing the socio-economic challenges and will help focus the applied research on the development of relevant innovative technology platforms.

### ▪ **The main societal and economic challenges to be addressed are**

- ⇒ Solving "**trust and confidence**" problems so as to improve dependability of technologies, infrastructures and applications. These should ensure security, privacy and protect property and individual rights. Improving trust in the knowledge society is a key requirement for its development.
- ⇒ Strengthening **social cohesion by providing** efficient, intelligent and easy to use systems for health, transport, inclusion, risk management, environment, Technology-enhanced Learning and Cultural Heritage.
- ⇒ Enabling **sustainable growth and improving competitiveness** both of large and small businesses as well as the efficiency and transparency of governments. This includes the development of mobile eCommerce and business and eWork processes and will provide for more and better jobs.
- ⇒ Supporting complex problem solving in science, society, industry and businesses. The aim is to harness the computing and knowledge management resources across Europe and bring them to the desktop of any researcher, engineer or other end user.

### ▪ **This requires progress in three main technology building blocks**

- ⇒ Pushing the limits of miniaturisation and minimising the costs and power consumption of **microelectronic components and micro-systems**. This includes breaking new barriers with current CMOS technology below the 10 nano-meter. It also includes the exploration of alternative materials allowing further miniaturisation or organic flexible materials for displays, sensors and actuators so that they can be placed anywhere, even in the human body, and take any shape.
- ⇒ Developing mobile, wireless, optical and broadband **communication infrastructures as well as software and computing technologies** that are reliable, pervasive, interoperable and can be adapted to accommodate new applications and services. Europe's strengths both in communication technologies and in embedded software and systems provide a clear opportunity to lead and contribute to the development of the next generation of products and services. The development of open standards and open source software will be encouraged when appropriate to ensure interoperability of solutions and to further innovation.
- ⇒ Developing **user friendly interfaces** which are intuitive, can interpret all our senses such as speech, vision and touch and that understand our gestures and various languages. This should be coupled with more powerful and flexible **knowledge technologies** that are semantic-based and context-aware. They should prepare for the

next generation Web and make access to, and creation of digital content more effective and more creative.

IST today	The IST in FP6 vision
PC based	"Our surrounding" is the interface
"Writing and reading"	Use all senses, intuitive
"Word" based information search	Context-based knowledge handling
Low bandwidth, separate networks	Infinite bandwidth, convergence,...
Mobile telephony (voice)	Mobile/Wireless full multimedia
Micro scale	Nano-scale
Silicon based	+ new materials
e-Services just emerging	Wide adoption (eHealth, Technology-enhanced Learning,...)
< 10% of world population on-line	World-wide adoption

### Focus on a limited set of Strategic Objectives

In order to ensure concentration of effort and critical mass, the IST Work Programme is **focussed on a limited set of Strategic Objectives** that are essential to realise the IST in FP6 goals. They have been defined to mobilise researchers Europe-wide and bring together the effort necessary to address the relevant challenges.

The Strategic Objectives have been selected following an intensive consultation process that included IST Advisory Group (ISTAG) analyses exploring Europe's options at economic, social and technology levels.

They cover technology components, integrated systems and pull-through applications that have been carefully identified so as:

- ⇒ **to reinforce European strengths in areas where it has established industrial and technology leadership have been:** this is the case for example in mobile and wireless communications, microelectronics and microsystems embedded systems, and applied IST for health, transport and business support tools
- ⇒ **to overcome weaknesses in areas which are critical for European competitiveness and for addressing societal challenges:** this is the case for the areas of generic software and computing systems, and in content development tools. The development of ambient intelligence provides an opportunity for Europe to reposition itself for the next generation of generic products and services building on a large user industry and service providers
- ⇒ **to exploit new opportunities and respond to emerging needs:** examples include advanced interaction techniques, new sensors and Microsystems, context-aware knowledge handling and Grid-based systems to solve complex problems in the areas of environment, health or engineering
- ⇒ **to ensure the co-evolution of technology and applications** so that technology advances are exploitable in innovative products and services. Particular attention will be paid to users' needs and to usability and accessibility of technologies and applications. The IST priority seeks to promote integrated approaches to address the vision

In addition, IST in FP6 will support research to investigate and experiment with future visions and emerging technologies (FET) at the frontier of knowledge in the IST field. This will help new IST-related science and technology fields and communities to emerge, some of which will become strategic for economic and social development in the future and will feed into the mainstream IST activities in the future.

## IST 2005-2006 Work Programme

The IST 2005-2006 Work Programme sets out in greater detail the objectives and scientific and technological priorities of the IST priority thematic area of the FP6 for "Integrating and Strengthening the European Research Area". It defines the objectives and technical content of calls for proposals, the implementation plan and the criteria that will be used for evaluating proposals responding to these calls.

The priorities reflect input received from a series of consultation meetings, workshops and web-based consultations, from the ISTAG, and from the IST Programme Committee. They also reflect the lessons learned from the first IST Calls that were launched in 2002, 2003 and 2004. This has led to a strong focus of the Work Programme on a limited set of Strategic Objectives that need to be addressed at a European level.

### A changing environment for ICT research

The Strategic Objectives for 2005-06 have been defined in a changing environment for undertaking research in Information and Communication Technologies (ICT):

- ⇒ ICT research is increasingly organised on an international scale, as firms seek to relocate their R&D activities in the face of accelerating competition in global markets
- ⇒ innovation processes are more open, with wider and faster exchange of ideas, people and resources
- ⇒ technology chains are increasingly complex, making it more difficult for any single player to establish industrial leadership in any ICT field
- ⇒ new promising fields are emerging at the cross-over between ICT and other disciplines such as biotechnologies, materials and cognitive sciences

At the same time, ICT are becoming more pervasive; new ways of using ICT are at the origin of innovations in most products, services and processes:

- ⇒ **For the economy**, ICT are central to boosting productivity and improving the competitiveness of all businesses and industries. The ICT industry itself is one of Europe's largest economic sectors, and ICT innovations underpin progress in all other major science fields.
- ⇒ **For the public sector**, ICT enable services to be delivered more efficiently, as well as new services that correspond to people's evolving needs.
- ⇒ **For society at large**, ICT offer new solutions to meet societal demands. ICT is one of the few technologies - if not the only technology - with such a far reaching impact.

### ICT research a key pillar of Community policy for the Information Society

To fully exploit the uniqueness of ICT, three conditions need to be fulfilled:

- ⇒ First, to stimulate research and development of ICT so as to master the technologies that will drive future innovation and growth
- ⇒ Second, to promote the widest and best possible use of ICT-based products and services by all citizens
- ⇒ Third, to create the right regulatory environment: one that ensures fair competition and eliminates obstacles to the adoption of ICT. It is also necessary to make sure that ICT based products and services are trustful and comply with the requirements for public health, safety, consumer and environmental protection, and that risk assessment is part of technology life cycles

The EU's ICT policy is built on these interlinked pillars. By addressing these aspects through a coherent strategy, EU policy aims to enable Europe to take full advantage of ICT.

## **More than ever, partnering at EU level is the way forward**

In face of the competition in research from all major and emerging economies, Europe needs not only to increase its public research effort but also to improve its attractiveness to private investment in research. It is the EU as a whole that can offer to companies the best pooling of high quality research resources.

Progress in ICT requires the mastery of increasingly complex technology chains spanning a range of components, devices, infrastructures and services. It is very rare that any one organisation or country in the EU today can afford the costs and cover the know-how, capabilities and skills needed to master the complete range. Partnering is essential to be able to compete and lead world wide.

The exploitation of ICT research results implies also their integration in services and solutions to be applied across countries and regions. Partnering at European level helps ensure that research results and solutions are applicable across Europe and beyond; it enables consensus building and the development of EU- and world-wide standards and interoperable solutions.

**Thus, in today's world, partnering in research has become the norm. It is through cooperation and coordination on a European scale that critical mass can be created, that leadership can be built and that common goals can be pursued.**

Community supported research provides a stable institutional framework for rapid partnership development. Experience has shown that in the ICT areas where a focused research effort was undertaken at European level, successes were achieved such as in microelectronics and mobile systems. Europe's approach to ICT research today needs to build on these successes.

## **IST Work Programme 2005-06: continued focus on a limited set of Strategic Objectives**

While helping realise the above vision, Work Programme (WP) 2005-06 aims also at aligning research in a way that responds to the emerging policy and market contexts and puts Europe in a position to exploit future opportunities. It covers the areas indicated in the IST priority for the Specific Programme on Integrating and Strengthening the European Research Area and, in particular, puts more emphasis on:

- ⇒ Mastering complexity by pioneering new approaches to cope with the infinitely small as well as the very large. Examples include research into System on Chip (SoC) in nanoelectronics, complexity in software development, broadband communications and Grids
- ⇒ Exploring multidisciplinary fields combining ICT with other science and technology fields: this is done across the Work Programme such as in micro and nanosystems, in ICT for Health, in Cognitive systems and in Future and Emerging Technologies (FET)
- ⇒ Promoting innovation from ICT use by bringing services and technology developments closer together. This is the case for example for mobile communications and for micro and nano systems

In order to ensure concentration of effort and critical mass, the IST Work Programme 2005-2006 continues to focus on a limited set of Strategic Objectives that are essential to realise the IST goals in FP6. The distribution of resources between the Strategic Objectives aims also at reinforcing European strengths in areas where Europe has established leadership whilst seizing new opportunities and ensuring the co-evolution of technologies and applications.

## **Support Instruments**

The FP6 instruments<sup>7</sup> aim at the integration of various research activities from knowledge generation and technology development to their application and transfer. They provide an

opportunity to combine, as appropriate, applied and generic technology research. This will help pull technology developments with applications and services addressing the socio-economic challenges:

- ⇒ **Integrated Projects (IPs)** will be used as a priority means, when appropriate, to realize the IST priorities of FP6
- ⇒ **Specific Targeted Research Projects (STREPs)** will be used to address specific parts of the technology or value chain or to explore new ideas
- ⇒ **Networks of Excellence (NoEs)** will be used to structure research in specific IST domains
- ⇒ Other instruments such as **Coordination Actions (CAs)** and **Specific Support Actions (SSAs)** will be also used

The instruments and in particular IPs will help integrate research activities, bringing together European and national actions in the context of creating the European Research Area.

## **An integrated approach**

The Strategic Objectives address technology components, their integration into systems and platforms as well as the development of innovative applications and services. They are therefore interlinked and should not be seen as separate isolated activities. A proposal addressing a specific Strategic Objective would cover all the research that is necessary to achieve its goals. This could span the value chain from technology components to applications and services.

A key component of this integrated approach is the need to bring together different types of communities from the IST user and supply industries, from academic research laboratories and from large and small companies. IST in FP6 will therefore help establish solid frameworks for collaboration both within and across industrial and technology sectors.

There are several issues that are important to all parts of the Work Programme. These include notably the needs of small and medium-sized enterprises (SMEs), integration of the IST research effort in an enlarged Union, the involvement of Associated Candidate Countries and Associated States, and the international cooperation dimension.

### ▪ **Small and medium-sized enterprises (SMEs): building on lessons learned from the first calls**

The participation of SMEs in IST research activities is essential given their role in promoting innovation in this field. SMEs play a vital role in the development and nurturing of new visions in IST and transforming them into business assets. A significant involvement of SMEs is expected, both as suppliers and as users of knowledge and technologies.

The first calls have shown that SMEs are slower in adapting to the changes introduced in FP6 and in particular to the new instruments. Their participation increased between the two first IST calls but more can be done to further facilitate their participation. This is why WP 2005-06 includes several measures aiming at eliminating, when needed, the barriers for SME participation:

- ⇒ The balance between the traditional support instruments of the Framework Programme and the new instruments introduced in FP6 has been revised domain by domain. The aim is to ensure that in areas where SMEs are key drivers for innovation, their participation in projects reflect their role
- ⇒ Specific measures have been introduced in several Strategic Objectives to support the involvement of SMEs such as in microelectronics, Microsystems and eBusiness.

The ambition is to reach a participation of SMEs in IST research activities approaching the level achieved in IST under the previous Framework Programme.

### ▪ **The IST research effort in an enlarged Union**

Also learning from the first two calls, it is clear that the integration of the research effort in ICT in an enlarged Union requires additional attention and an effort at Community level and within the Member States. The participation of organizations from the Member States that joined the Union in May 2004 has increased between the first IST calls. WP 2005-06 includes specific measures to further strengthen partnership and collaboration in ICT research in an enlarged Union.

For that, a specific objective aimed at strengthening the integration in an enlarged Union is included covering areas of research where all Member States are active and using STREPs as a support instrument. This should help bring together small as well as large research entities and companies across Europe.

Proposers based in Associated States take part in the IST research activities on the same footing and with the same rights and obligations as those based in EU member states. In addition, this Work Programme underlines the importance of involving Associated Candidate Countries in the Community's research policy and in the European Research Area.

## **IST Strategic Objectives**

*"IST Vision: anywhere anytime natural access to IST services for all"*

These are the research activities that are eligible for funding under the IST priority, corresponding to the IST 2005-2006 Work Programme.

### **Applied IST research addressing major societal and economic challenges**

#### **▪ Towards a global dependability and security framework**

To build technical and scientific excellence, as well as European industrial strength in security, dependability and resilience of systems, services and infrastructures, whilst meeting European demands for privacy and trust. This will also seek to strengthen the interplay between research and policy development in line with the eEurope objectives both within the EU and world-wide, and contribute to standardisation activities in network and information security. It will give particular attention to involving all members of the enlarged Europe in a coherent EU security RTD strategy.

#### **▪ ICT Research for innovative Government**

To modernise and innovate public administrations at all levels, to foster good governance, to provide citizens and industries with new service offers, and thus create new public value. To contribute to easing mobility of European citizens within the Internal Market, making European Citizenship a reality, and supporting them as active citizens through innovative government services and through participation in decision making processes.

#### **▪ ICT for Networked Businesses**

To develop software solutions adaptable to the needs of local/regional SMEs, supporting organisational networking and process integration as well as improving adaptability and responsiveness to rapidly changing market demands and customer requirements.

To develop distributed and collaborative ambient intelligence-based network-oriented systems for efficient, effective and secure product and service creation and delivery. The aim is to explore how ambient intelligence technologies and the vision of duality of existence, in the real world and in cyberspace, can result in innovative products, services and business environments.

#### **▪ eSafety - Co-operative Systems for Road Transport**

To develop and demonstrate co-operative systems for road transport that will make transport more efficient and effective, safer and more environmentally friendly. Co-operative systems (as an extension to autonomous or stand-alone systems), in which the vehicles communicate with each other and the infrastructure, have the potential to greatly increase the quality and reliability

of information available about the vehicles, their location and the road environment, enabling improved and new services for the road users.

Such systems will enhance the support available to drivers and other road users and will provide for:

- ⇒ Greater transport efficiency by making better use of the capacity of the available infrastructure and by managing varying demands
- ⇒ Increased safety by improving the quality and reliability of information used by advanced driver assistance systems and allowing the implementation of advanced safety applications

▪ **Integrated Biomedical Information for Better Health**

Research and development on innovative ICT systems and services that process, integrate and use all relevant biomedical information for improving health knowledge and processes related to prevention, diagnosis, treatment, and personalisation of health care.

▪ **Technology-enhanced Learning**

The objectives, contributing to the overall goal of enhancing learning through technologies, are:

- ⇒ To explore interactions between the learning of the individual and that of the organisation in order to improve how current or emerging ICT can mutually enhance the learning processes for the individual and for the organisation
- ⇒ To contribute to new understandings of the learning processes by exploring links between human learning, cognition and technologies

The first is mid-term, reflecting the challenges posed by ubiquity of access and delivery in mixed formal and informal learning settings. The second is longer term and aims to build on and advance the inter-relationship between cognition and learning processes and exploit links to other disciplines.

▪ **Access to and Preservation of Cultural and Scientific Resources**

The aim is to develop systems and tools which will support the accessibility and use over time of digital cultural and scientific resources. This requires work to:

- ⇒ Support the emerging complexity of digital cultural and scientific objects and repositories, through enriched conceptual representations, and advanced access methods
- ⇒ Explore how to preserve the availability of digital resources over time, through novel concepts, techniques and tools

▪ **Advanced Grid Technologies, Systems and Services**

To advance the current generation of Grids towards the knowledge Grid and complete virtualisation of Grid resources. To foster uptake and use in business and society.

To reduce the complexity of Grid-based systems, empowering individuals and organisations to create, provide access to and use a variety of services, anywhere, anytime, in a transparent and cost-effective way, realising the vision of a knowledge-based and ubiquitous utility.

▪ **ICT for Environmental Risk Management**

This Strategic Objective covers ICT aspects of services for GMES (Global Monitoring for the Environment and Security) end-users and those aspects that are relevant to the monitoring, the preparation and the response phases of environmental risk/crisis management co-ordinated at European level.

▪ **eInclusion**

To mainstream accessibility in consumer goods and services, including public services through applied research and development of advance technologies. This will help ensure equal access, independent living and participation for all in the Information Society.

To develop next generation assistive systems that empower persons with (in particular cognitive) disabilities and aging citizens to play a full role in society, to increase their autonomy and to realize their potential.

▪ **Strengthening the Integration of the ICT research effort in an Enlarged Europe**

To develop and validate innovative and efficient ICT-based systems and services in key application areas for the societal and economical development of the enlarged Europe, with a view to strengthening the integration of the IST European Research Area.

▪ **Collaborative Working Environments**

To develop next generation collaborative working environments, thereby increasing creativity and boosting innovation and productivity. These environments should provide collaboration services to make possible the development of worker-centric, flexible, scalable and adaptable tools and applications. This will enable seamless and natural collaboration amongst a diversity of agents (humans, machines, etc) within distributed, knowledge-rich and virtualized working environments. Professional virtual communities and nomadic personal access to knowledge should be supported.

## **Communication, computing and software technologies**

▪ **Broadband for All**

To develop the network technologies and architectures allowing a generalised and affordable availability of broadband access to European users, including those in less developed regions, peripheral and rural areas.

Outcome expected from this work is:

- ⇒ Optimised access technologies, as a function of the operating environment, at affordable price allowing for a generalized introduction of broadband services in Europe and in less developed regions, and notably for the enlarged Europe in line with the eEurope objectives
- ⇒ A European consolidated approach regarding regulatory aspects, and for standardized solutions allowing the identification of best practice, and the introduction of low-cost end user and access network equipment

▪ **Mobile and Wireless Systems and Platforms Beyond 3G**

To realise the vision of "Optimally Connected Anywhere, Anytime" supported by all system levels from access methods and networks to service platforms and services. Preparatory work has characterized Systems beyond 3G as a horizontal communication model, where different terrestrial access levels and technologies are combined to complement each other in an optimum way for different service requirements and radio environments.

Outcome expected from this work is:

- ⇒ A consolidated European approach to serving mobile users with appropriate enablers for applications and services. These may include the personal level (Personal/Body Area/Ad Hoc Network) the local/home level (W-LAN, UWB) the cellular level (GPRS, UMTS), the wider area level (DxB-T, BWA) and also DVB-H in the context of broadcasting to mobile handheld devices, possibly complemented by a satellite overlay network (e.g. S-DMB)
- ⇒ A consolidated European approach to technology, systems and services, including location-based services, notably in the field of future standards (e.g. for access) and in international fora (WRC, ITU, 3GPP-IETF, ETSI, DVB...) where the issue of systems beyond 3G is addressed
- ⇒ A consolidated European approach regarding the spectrum requirements (terrestrial and satellites) in the evolution beyond 3G and a clear European understanding of the novel ways of optimising spectrum usage when moving beyond 3G

- **Networked Audiovisual Systems**

To advance "Audio Visual" systems and applications in converged and interoperable environments encompassing broadcasting, communications, mobility and IP. Globally, the objective is to favour the emergence of horizontal competitive markets across the value chain, to lower market entry barriers, to enable viable business models and to open new markets. At the technological level, the aim is to ensure a guaranteed level of service delivery across complex interoperable environments as well as an optimised use of underlying delivery network bandwidth/QoS characteristics, allowing for availability of high added value scalable multimedia contents and programmes and seamless device connectivity.

- **Software and Services**

To support the competitive position of European software industry (notably SMEs) in more globalised and service-oriented markets. This requires advanced capabilities in the engineering and management of software systems, services and applications and is to be addressed by creating and extending open and interoperable platforms, methodologies, middleware, standards and tools. The results will enable the design and management of complex software systems and, particularly, the simple and low-cost creation of new types of services and applications, including those for the mobile user.

- **Embedded Systems**

To develop the next generation of technologies, methods and tools for modelling, design, implementation and operation of hardware/software systems embedded in intelligent devices. An end-to-end systems vision should allow to build cost-efficient ambient intelligence systems with optimal performance, high confidence, reduced time to market and faster deployment.

- **Research networking testbeds**

To integrate and validate, in the context of user-driven large scale testbeds, the state-of-the-art technology that is essential for preparing future upgrades of the infrastructure deployed across Europe. The work is essential for fostering the early deployment in Europe of Next Generation Information and Communications Networks based upon all-optical technologies and new Internet protocols and for incorporating the most up-to-date middleware. This work is complementary to and in support of the activities carried out in the area of Research Infrastructures on high-capacity and high-speed communication networks for all researchers in Europe (GEANT) and to high performance Grids, which represent major components of the eInfrastructure concept.

## **Components and microsystems**

- **Nanoelectronics**

The technical goals are to reduce the transistor size deep into the nano-scale, to radically transform the process technologies through the integration of a large number of new materials, and to master the design technologies for achieving competitive systems-on-chip and systems-in-package with increasing functionality, performance and complexity. This should be obtained without compromising on reliability, energy consumption and costs of such systems. The aim is also to secure the necessary design skills and stimulate the use of technologies in areas where these are insufficiently used. The work supports, and is in line with the orientations proposed by the Technology Platform 1 on nanoelectronics.

- **Micro/nano based sub-systems**

To validate integrated micro/nano systems technology for new products and services in key application fields such as miniaturised autonomous robotic systems, mass storage systems and visualisation systems. Micro/nano-based integrated medical systems are also targeted to explore the many opportunities offered by combining bio-, nano- and information-related technologies.

- **Technologies and devices for micro/nano-scale integration**

To push the limits of integrated micro/nano systems through research on a family of mixed technologies (combining for instance micro-nano-technology, ICT and bio-technology) and integration technologies for very high density or for integrating micro/nano devices in various materials and into large surfaces. Validation and demonstration of maturing silicon-based and polymer-based technologies, manufacturing and design issues are also targeted.

- **Photonic components**

To develop advanced materials, solid-state sources and micro- and nano-scale photonic devices, and to integrate photonic functions in micro/nanoelectronics components ('Photonic system on a chip').

Projects are expected to address research challenges for mid-term to long-term industrial exploitation in one or more of the following application contexts:

- ⇒ "Information technologies for health care and life science": bio-photonic functional components and sub-assemblies
- ⇒ "Communications and Infotainment": components and subsystems for low-cost or high-performance

## **Knowledge and interface technologies**

- **Multimodal Interfaces**

To develop natural and easy to use interfaces that communicate intelligently via several modalities or with multilingual capabilities.

- **Semantic-based Knowledge and Content Systems**

To develop semantic-based and context-aware systems to acquire, organise, personalise, share and use the knowledge embedded in web and multimedia content. Research will aim to maximise automation of the knowledge lifecycle and to achieve semantic interoperability between heterogeneous information resources and services, across content types and natural languages. To pioneer intelligent content, which will be self-describing, adaptive to context and user information needs, and exhibit a seamless interaction with its surroundings and the user.

- **Cognitive Systems**

To develop artificial systems that can interpret data arising from real-world events and processes (mainly in the form of data-streams from sensors of all types and in particular from visual and/or audio sources); acquire situated knowledge of their environment; act, make or suggest decisions and communicate with people on human terms, thereby supporting them in performing complex tasks.

## **Future and Emerging Technologies (FET)**

FET activity, although not incorporated as a Strategic Objective due to its wider scope, is complementary to the IST objectives of FP6.

FET is the IST Programme nursery of novel and emerging scientific ideas. Its mission is to promote research that is of a long-term nature or involves particularly high risks, compensated by the potential of a significant societal or industrial impact.

As such, FET is not constrained by the IST Programme priorities but rather aims to open new possibilities and set new trends for future research programmes in Information Society Technologies.

FET goals will be achieved in two ways:

- ⇒ Via the **proactive scheme**: a 'top down' approach which sets the agenda for a small number of strategic areas holding particular promise for the future
- ⇒ Via the **open scheme**: a 'roots up' approach available to a wider range of ideas

## Proactive Initiatives

FET proactive initiatives aim at **focusing resources on visionary and challenging long-term goals that are timely and have strong potential for future impact**. These goals provide a common strategic perspective and a focal point around which a critical mass of research can be assembled and synergies developed.

### ▪ **Topics covered by the Proactive Initiative**

Proactive initiatives are launched on topics where early ground breaking work has already demonstrated an important potential, but where significant scientific or technological barriers and risk justify a concerted action at basic research level before the area can be taken up as mainstream industrial research. The initiatives usually involve multidisciplinary work at the frontier of information technology and other disciplines such as physics, chemistry, life sciences, psychology, *etc.*

The choice of topics includes on the one hand, an evolution of successful initiatives in earlier calls and, on the other hand, new topics added to the portfolio. While the choice of topics to be included in a new call is being finalised, IST is actively looking for inputs for the definition of topics for later calls. In particular, a forum has been established for proposing and discussing topics that may be the object of future proactive initiatives.

### ▪ **Implementation in FP6**

While in FP5 proactive initiatives were implemented as project clusters, the intention in FP6 is to implement them exclusively through the new instruments: Integrated Projects (IPs) and Networks of Excellence (NoEs). Each proactive initiative will typically consist of one or more IPs and, in some cases, a NoE.

For each proactive initiative it is planned to have an **advisory board**, common to all projects, composed of high-level scientists, industrialists, or other stakeholders. The role of the advisory board will be to provide the Commission with a critical assessment of progress in the initiative, as well as provide advice on strategic, technical and managerial issues. The members of the board are selected by the Commission in consultation with the projects.

During the lifetime of a proactive initiative, new solutions and ideas could emerge that are more suitable for the achievement of the objectives of the initiative than the solutions originally envisaged. A **flexible management approach** and **flexible budget allocation** will therefore be necessary, with the ability to quickly re-orient projects if parts of them become obsolete or in order to seize new opportunities. In this context, self-assessment activities and a dynamically revised research roadmap (to be elaborated by the IPs and/or the NoE) will be important for the proactive initiative as a whole. It is planned to hold regular meetings, involving participants of the integrated projects and/or network of excellence within each proactive initiative.

### ▪ **Links with national activities**

Proactive initiatives should pursue co-operation with related initiatives in the Member States and the countries associated to FP6, seeking to maximise synergies with national research programmes and the leverage effect of European funding. Each IP should clearly demonstrate how its work relates to projects taking place at national level; and NoEs should attempt to identify national or private funding that could be secured to further their aims and increase the strategic impact of the proactive initiative as a whole.

### ▪ **International Collaboration**

IPs and/or NoEs of a proactive initiative may consider to collaborate with and integrate in their teams research entities from non-associated third countries. Such collaboration is strongly recommended when these entities are bringing into a project critical knowledge and expertise not available within the EU and the countries associated to FP6, and which are considered essential for realising the project objectives.

In most cases, such entities participate in the project at their own cost. However, when an entity is coming from Russia, New Independent states, Mediterranean Countries (including the western Balkans) and Developing Countries, its financing is possible within the limits of the budget available.

Participants from other third-countries than the above (*e.g.* USA, Japan, Canada, *etc.*) may also get financial support in duly justified cases (*e.g.* integrating an entity that would permit a project to save spending substantial resources for catching up the state-of-the-art in an essential sub-area of research).

## **FET Open**

The purpose of FET open is to enable a range of ideas for future and emerging technologies to be explored and realised. The scheme is open to the widest possible spectrum of research opportunities that relate to Information Society Technologies.

FET Open supports IST-related research which is:

- ⇒ interdisciplinary, on highly innovative new ideas involving high risk
- ⇒ embryonic
- ⇒ moving significantly beyond the state-of-the-art
- ⇒ high quality long term, of a foundational nature

Any research addressing the general FET objectives but **not IST-related** should consult the related New and Emerging Science and Technology (NEST) programme.

FET open offers funding implemented through Specific Targeted Research Projects (STREP) for work that could lead to breakthroughs or major advances, in particular:

- ⇒ The realisation of bold ideas that would involve high risks, or
- ⇒ High quality longer term research with sound objectives

FET-Open also supports the shaping, consolidation, or emergence of research communities and the coordination of national research programmes or activities in any IST-relevant area of advanced and longer term research. Such activities are implemented through Coordination Actions (CA) and Specific Support Actions (SSA).

### ▪ **The widest possible spectrum of research opportunities**

The evolution of the information society involves the interplay of a range of technological, social and economic elements. IS technologies do not exist in a vacuum - they co-evolve in a complex manner with other societal and economic factors. It is a quickly moving field with many inter-relationships. Keeping the door open to the latest ideas as they arise from the roots, and allowing the best of these to be realised, helps aim funding at leading developments. For these reasons FET is open to any idea related to information society technologies. It not only includes the development of new technologies, but also encompasses new ways of doing things as well as creating new roles for technology. Proposals are receivable at any time, for practically the whole duration of the programme.

### ▪ **Bold ideas that would involve high risks**

In reality many breakthroughs have depended on sparks of the imagination that resulted in leaps and bounds that were inherently unpredictable. Sometimes new ideas can seem to be 'crazy', or impractical; yet, trying out what seems to be risky can often materialise into 'new things', or 'new ways of doing things' that can ultimately become trend-setting. For this reason, it is important to have an environment within which invention and creativity can thrive. Therefore, FET is open to considering bold ideas whose realisation would involve high risks. The philosophy is to let people try things out - even if these things are only based on a dream, or a hunch, with the promise of really leading to something in the future. In this context there is no distinction of how

far or how close to the market an idea might be - the important issue is the potential that it has for leading to a breakthrough.

- **Longer term research with sound objectives**

At the same time it would be wrong to think that it is only 'wild' ideas that lead to major advances. Good, sound ideas can often take a long time and a lot of research in order to come to fruition - they too lead to major advances in the longer term. This is often the case for research work of a generic nature that could ultimately underpin a wide range of application areas. It is also true that one idea leads to another and that progress sometimes comes from the accumulation of many small innovations (for example, innovative superefficient algorithms). Many ideas may thus have matured past the 'wild phase' and been tested and proved valid to some degree, but still need persistent and long term work in order to take them to levels acceptable for industrial or commercial take-up.

## FET structure



## IST Calls

The latest IST calls information is available at CORDIS FP6 website:  
[http://fp6.cordis.lu/fp6/calls\\_activity.cfm?ID\\_ACTIVITY=124](http://fp6.cordis.lu/fp6/calls_activity.cfm?ID_ACTIVITY=124).

### ▪ Call 5

IST Call 5 now open, closing date 21 September 2005:

⇒ [http://fp6.cordis.lu/fp6/call\\_details.cfm?CALL\\_ID=208](http://fp6.cordis.lu/fp6/call_details.cfm?CALL_ID=208)

### ▪ FET

Future and Emerging Technologies (FET) Open Scheme, closing date 20 September 2005:

⇒ <http://www.cordis.lu/ist/fet/int-o.htm>

## References

- Information Society Technologies (IST) website on CORDIS: <http://www.cordis.lu/ist/>
- IST Advisory Group (ISTAG) report: Ambient Intelligence scenarios for 2010, <http://www.cordis.lu/ist/istag.htm>
- eEurope website: [http://europa.eu.int/information\\_society/eeurope/index\\_en.htm](http://europa.eu.int/information_society/eeurope/index_en.htm)
- IST 2005-2006 Work Programme: [ftp://ftp.cordis.lu/pub/ist/docs/ist\\_wp-2005-06\\_final\\_en.pdf](ftp://ftp.cordis.lu/pub/ist/docs/ist_wp-2005-06_final_en.pdf)
- IST activities: <http://www.cordis.lu/ist/activities/activities.htm>
- FET Open Forum: <http://www.cordis.lu/ist/fet/id.htm>
- Detailed description of IPs and NoEs on Europa: [http://europa.eu.int/comm/research/fp6/instruments\\_en.html](http://europa.eu.int/comm/research/fp6/instruments_en.html)
- Background documents on FP6 instruments: <http://www.cordis.lu/ist/fet/usef.htm>
- List of groups of target countries for specific measures in support of International Co-operation (INCO): [ftp://ftpln.cordis.lu/pub/fp6\\_wp/sp1/en/sp1\\_annexc\\_wp\\_200203\\_en.pdf](ftp://ftpln.cordis.lu/pub/fp6_wp/sp1/en/sp1_annexc_wp_200203_en.pdf)
- International Cooperation (INCO) website: <http://www.cordis.lu/fp6/inco.htm>
- New and Emerging Science and Technology (NEST) website: <http://www.cordis.lu/nest/home.html>
- Specific Targeted Research Projects (STREPs) in FET Open: <http://www.cordis.lu/ist/fet/cal-o.htm#strep>
- Coordination Actions (CAs) in FET Open: <http://www.cordis.lu/ist/fet/cal-o.htm#ca>
- Specific Support Actions (SSAs) in FET Open: <http://www.cordis.lu/ist/fet/cal-o.htm#ssa>
- FET Open website: <http://www.cordis.lu/ist/fet/int-o.htm>
- FET Proactive Initiatives website: <http://www.cordis.lu/ist/fet/int-p.htm>
- FET Quantum Information Processing & Communications (QIPC) Proactive Initiative: <http://www.cordis.lu/ist/fet/qipc.htm>
- FET Global Computing (GC) Proactive Initiative: <http://www.cordis.lu/ist/fet/gc.htm>
- FET Emerging Nanoelectronics (NANO) Proactive Initiative: <http://www.cordis.lu/ist/fet/nid.htm>
- FET BIO-I3 and Other Neuro-IT Related Initiatives (BIO-I3) Proactive Initiative: <http://www.cordis.lu/ist/fet/bioit.htm>
- FET Universal Information Ecosystems (FP5-UIE) Proactive Initiative: <http://www.cordis.lu/ist/fet/uie.htm>
- FET Beyond Robotics (RO) Proactive Initiative: <http://www.cordis.lu/ist/fet/ro.htm>
- FET The Disappearing Computer (DC) Proactive Initiative: <http://www.cordis.lu/ist/fet/dc2.htm>
- FET Thematic Networks in FP5 (FP5-TN) Proactive Initiative: [http://www.cordis.lu/ist/fet/noe.htm#what\\_is](http://www.cordis.lu/ist/fet/noe.htm#what_is)
- FET Presence Research (PR) Proactive Initiative: <http://www.cordis.lu/ist/fet/pr.htm>

- FET Advanced Computing Architectures (ACA) Proactive Initiative: <http://www.cordis.lu/ist/fet/aca.htm>
- FET Complex Systems (CO) Proactive Initiative: <http://www.cordis.lu/ist/fet/co.htm>
- FET Situated and Autonomic Communications (COMS) Proactive Initiative: <http://www.cordis.lu/ist/fet/comms.htm>