Future and Emerging Technologies

Information and Communication Technologies under FP7
Extract from Work Programme 2009-2010 for ICT

Future and Emerging Technologies (FET) fosters frontier research that will open up new avenues across the full breadth of future information technologies. FET acts as a pathfinder while having the agility to react to new ideas and opportunities, as they arise from within science or society. It promotes the exploration of radically new ideas and trends for future research and innovation and provides sustained support to emerging areas that require long-term fundamental research. It aims to go beyond the conventional boundaries of ICT and ventures into uncharted areas, often inspired by and in close collaboration with other scientific disciplines.

In this spirit, FET can be considered as the home for 'transformative research' that through its initiatives and actions can initiate and lead to a range of exceptional and unprecedented outcomes. For example, it can re-think or revolutionise entire disciplines, shape new ones or disrupt established technologies, practices or theories.

Excellence in collaborative purpose-driven research

FET fosters excellence in foundational and purpose-driven technology-oriented research that combines the best in science and engineering. FET research builds new bridges between science and technology and provides a basis for future research agendas and nurtures the new interdisciplinary research communities that will embrace them. FET improves long-term competitiveness in European ICT by exploring new and alternative technological paradigms that may lead to entirely new fields of economic activities, new industries or first-class high-tech SMEs.

SEVENTH FRAMEWORK PROGRAMME

A catalyst for change in interdisciplinary research

Radical breakthroughs in ICT increasingly rely on fresh synergies, cross-pollination and convergence with different scientific disciplines (for instance, biology, chemistry, nanoscience, neuro- and cognitive science, ethology, social science, economics) and with the arts and humanities.

This trans-disciplinary and high-risk research requires new attitudes and novel organisational models in research and education. FET promotes the exploration of such new research practices and methodologies. It encourages the involvement of young researchers and high-tech SME's in radical interdisciplinary collaborations, and the early take-up of results by decision makers in society and industry, as new ways of achieving impact.

FET Proactive Initiatives & FET-Open

FET operates two complementary schemes that together aim at the consolidation of new and emerging foundational trends future information technologies and their applications, while remaining open and responsive to fresh and unexpected ideas and developments. The bottom-up, light and deadline-free **FET Open** scheme can pick-up new ideas and opportunities whenever they arise. **FET Proactive** nurtures new ideas in selected promising domains, aligned with economic and social challenges and priorities.

FET OPEN

Objective ICT-2009.8.0 FET-Open: Challenging current thinking

Target outcome

FET-Open targets **foundational breakthroughs that open the way towards radically new forms and uses of information and information technologies**. It flexibly accommodates the exploration of new and alternative ideas, concepts or paradigms that, because of their radical, fragile or high-risk nature, may not be supported elsewhere in the ICT Workprogramme. Research under FET-Open is aimed at achieving a first proof-of-concept and at developing its supporting scientific foundation. The novelty of this research comes from new ideas rather than from the refinement of current ICT approaches.

In addition, FET-Open targets **support and coordination activities for high-risk and high-impact visionary research**. These activities can be either thematically oriented (for example, stimulating the emergence of a new research community), or they may focus on horizontal issues in FET-type of research (for example, catalysing new visions and ideas, promoting new research modalities, attitudes and practices; or exploring new ways for achieving visibility and impact of the research). They aim at a broad and open participation from within Europe and, where relevant, beyond.

Expected impact

- For STREP projects: contribution to the scientific foundations of future information and communication technologies that may be radically different from present day ICT. It may, for example, open new avenues for science and technology, or lead to a paradigm shift in the way technologies are conceived or applied. FET-Open research is not required to have direct short-term technological or societal impact but it will take concrete steps towards achieving its long-term vision, supported by a critical exploration of the potential implications for the environment and for society.
- For CSA actions: contribution to catalyse a lasting and transformative effect on the communities and practices for high-risk and high-impact research. These activities will lead to new and more dynamic, engaged and risk-taking research communities that can develop the new and non-conventional approaches that will be key to address the technological, societal and environmental challenges that Europe and the world are facing.
- All FET-Open activities should contribute to securing and strengthening the future potential for high-risk / high-impact visionary research. To achieve this, FET-Open is expected to generate new collaborations involving a broad range of disciplines, the established scientists as well as the talented young ones, and a diversity of actors in research, including small and independent research organisations and high-tech SMEs, whenever relevant in terms of the activities proposed. International collaboration should exploit synergies in the global science and technology scene, to increase impact and to raise the level of excellence world-wide.

Funding schemes

STREP, CSA

Indicative budget

61 M€ (for batches 5 to 8; cut-off date in 2009-10)

Call

Continuously receivable from 1 January 2009 onwards, until 31 December 2010[1]. FET-Open applies a two-step submission scheme and FET-Open specific eligibility and evaluation criteria.

FET PROACTIVE

FET proactive will spearhead transformative research and support community building, and enhance Europe's innovation potential around a number of fundamental long-term challenges in ICT that will be key to the long-term sustainability of a technological future in Europe. In particular:

- **Computing Systems:** After 40 years of miniaturisation allowing combined gains in performance, cost, power efficiency and size, future computing systems are faced with increasingly conflicting ambitions for further performance improvements and reduced energy per operation, size and cost per

[1] It is planned that the call will be subsequently extended beyond 31/12/2010. Short STREP proposals submitted after 11/05/2010 and CA proposals submitted after 28/09/2010, when selected for funding, are not budgeted under this workprogamme.

function while maintaining data integrity. Research will investigate radically new approaches to computing based on inspiration from physics in *Quantum Information Foundations and Technologies* and in *Molecular-Scale Devices and Systems*. Research will pursue alternative directions for architectures in *Concurrent Tera-Device Computing*, for individual devices in *Molecular-Scale Devices and Systems*, and focus on power issues in *Towards Zero-Power ICT*.

- **Computing and Communication Paradigms:** New inspirations for architectures, communication and in particular the distributed nature of processing – locally or system wide – are explored to address new requirements on optimisation of resources and mastering system complexity. Awareness in networked ICT systems is addressed in *Self-Awareness in Autonomic Systems*, while management of local interconnections is a key issue in *Concurrent Tera-Device Computing*. Alternative paradigms for communications are investigated in *Quantum Information Foundations and Technologies*, with an emphasis on secure communications. Inspiration for radically new paradigms is taken from the functioning of the brain in *Brain-Inspired ICT* or from chemical networks in cells in *Bio-chemistry-based Information Technology*.
- **Living with ICT:** Unifying the experience of acting with or without ICT support will progress towards harnessing the combined advantages of information processing by humans and by machines in *Human Computer Confluence*. Radically new forms of sensing and interactions will be studied in *Brain-Inspired ICT*, while specific sensing modalities may emerge from work in *Molecular-Scale Devices and Systems* and in *Bio-chemistry-based Information Technology*.
- **Widening the Horizon of ICT:** Opportunities for deploying ICT in new areas will be explored together with technological developments. These will aim for new ways of reaching societal benefits and responding to industrial needs using ICT. Examples include improving human health in *Bio-chemistry-based Information Technology* and in *Brain-Inspired ICT*, new forms of therapy in *Human Computer Confluence*, environment monitoring in *Towards Zero-Power ICT*, high precision sensing in *Molecular-Scale Devices and Systems*, and new forms of cognitive work and entertainment in *Human-Computer Confluence*.

The following themes will be addressed in pro-active initiatives:

Call 4: FP7-ICT-2009-4

ICT-2009.8.1 Concurrent Tera-Device Computing

ICT-2009.8.2 Quantum Information Foundations and Technologies

ICT-2009.8.3 Bio-chemistry-based Information Technology

Call 5: FP7-ICT-2009-5

ICT-2009.8.4 Human-Computer Confluence

ICT-2009.8.5 Self-Awareness in Autonomic Systems

ICT-2009.8.6 Towards Zero-Power ICT

Call 6: FP7-ICT-2009-6

ICT-2009.8.7 Molecular-Scale Devices and Systems

ICT-2009.8.8 Brain-Inspired ICT

Coordination Actions (CAs) will be called to support the coordination of research projects in each proactive initiative. Short duration coordination actions will also be called to help identify new trends and directions for the preparation of new proactive initiatives in 2011 and beyond.

Candidate topics for calls in 2011 and beyond include new breakthroughs arising from the initiatives launched in earlier calls of FP7, namely *Pervasive adaptation, Embodied Intelligence, ICT Forever Yours and Complex Systems Science for Socially Intelligent ICT*. Other topics include those presented in the series of consultations held in 2007 and 2008 and not covered by the present work programme, such as engineering social benevolence and creativity, designing socially-adaptive ICT, simplicity as a design principle in ICT, semantic and pragmatic technology for dynamic communities of practice, assembling information systems with bio-bricks and web science.

Use of Instruments and expected participation:

In the domain of FET Proactive, integrated projects will combine different aspects of multidisciplinary research, together with additional actions e.g. on wide dissemination, education, links with industry, international co-operation. They will assemble the set of multi-disciplinary research teams necessary to efficiently carry out the research and other activities. STREP projects will target a focused research topic with a limited set of teams. Involvement and participation of young researchers, high-tech SMEs and industry, as well as international partners from developed and/or emerging economies in any of the FET proactive initiatives is welcomed and encouraged. This will lead to increased European excellence in science and research, and foster collaboration with leading international organisations.

FET Proactive applies specific eligibility and evaluation criteria which can be found in Appendix 5 of the Work Programme 2009 – 2010.

Objective ICT-2009.8.1 : FET proactive 1 :

Concurrent Tera-device Computing

Integrated circuits and tightly-coupled systems will integrate up to 1000 billion devices by the year 2020. These will provide orders of magnitude improvement in performance and cost only with much higher concurrency and heterogeneous architectures tuned to specific application kernels. In parallel, device variability and failure rates will reach critical levels and power saving methods will be required at all system levels from transistors to architecture and software.

Target outcome

Radically new methods and tools for architecture design and programming of chips and systems beyond 2020, including compilers and run-time systems :

a. **Complexity of design and run-time of many-core heterogeneous systems :** Radically new concepts, design paradigms, methods and proofs-of-concept to address design, compilation and run-time complexity of computing engines with 100+ heterogeneous cores. Solutions should cover hardware, software and possibly reconfigurable hardware.

b. **Design of dependable systems with faulty components :** Methodologies and approaches for the design and construction of dependable systems in the face of critical levels of hardware or software faults and in the face of component variability.

c. **Breakthrough programming paradigms :** Radically new design and programming paradigms to enable effective programming of Tera-scale ICT Systems with 100+ cores, in terms of scalability, portability and dependability. They would enable high data throughput applications and new algorithms for the management of massive data sets.

The developments should be motivated by the requirements of wide classes of relevant applications in a time scale of 10-15 years. Proof of concept demonstrations should be developed in parallel with foundational advances.

Integrated projects should address at least two of the above topics, STREPs at least one.

Expected impact

- Reinforced ability to design, program and manage competitive concurrent computing systems beyond the year 2020, thereby supporting the European systems industry in extending its strengths to diverse future application domains while supporting scalability and portability of applications.

Funding schemes

IP and STREP

Indicative budget

IP/STREP: 15M€, of which a minimum of 50% to IPs and a minimum of 30% to STREPs

Call :

ICT Call 4

Objective ICT-2007.8.2 : FET proactive 2 :

Quantum Information Foundations and Technologies

New perspectives in ICT that exploit the quantum nature of information offer modes of computing and communicating that are not mere down-scaling of silicon CMOS based architectures, thus providing a "beyond Moore" route to circumvent the bottlenecks associated with the extrapolation of present-day information processing and technologies.

Target outcome

a. **Quantum information theory, algorithms and paradigms:** new quantum algorithms, computation paradigms and communication protocols, quantum optimal control and quantum feedback methods.

b. **Entanglement-enabled quantum technologies** exploiting several qubits for performing ICT tasks with unprecedented characteristics (e.g., quantum random numbers generators, improved atomic clocks, entanglement enhanced metrology, sensors and imaging) and engineering of entangled systems.

c. **Scalability of quantum processing systems :** devices realizing quantum algorithms with up to ten qubits, demonstrating fault tolerant computing and error correction on small scale systems, and demonstrating quantum simulation of systems that cannot be simulated classically.

d. **Long distance quantum communication :** technologies able to overcome the current distance limitation of quantum communication, e.g., by developing quantum repeaters realizing reversible interconversion of different types of qubits.

The research work should advance the state-of-the-art of QIPC and contribute to the transition of the field from upstream research to application-oriented research, e.g., through the increased reliability, scalability and interconnection of components. Interplay between theory and experiment should achieve complete and realistic schemes for coherent manipulation and high-precision performance.

Projects should address at least two of the above topics.

Expected impact

- Enable the scalability of quantum information technologies in the presence of environmental decoherence, hence facilitating their real-world deployment.
- Develop reliable technologies for the different components of quantum architectures.
- Identify new opportunities fostered through the transfer of entanglement technologies from laboratories to industries.

Funding scheme

IP

Indicative budget

15M€

Call

ICT Call 4

Objective ICT-2009 8.3: FET Proactive 3:

Bio-chemistry-based Information Technology (CHEM-IT)

The research will aim at realising programmable information chemistry by revolutionising the means to very precisely direct, control and analyse the chemical processes in sophisticated bio-inspired chemical systems in order to exploit the information processing capabilities of such systems. In addition, the research should aim at implementing evolution and self-organisation into these systems. This could imply the need to control, synthesise, analyse, adapt and/or proliferate chemical (sub-)systems.

Target outcome

Foundations for a radically new kind of information processing technology inspired by chemical processes in living systems. This technology will exploit the information handling capabilities of such systems, as well as their ability to rapidly adapt/evolve and flexibly reconfigure in response to changing conditions by avoiding the constraints separating information handling from processes that create or reconfigure the physical system. Projects are expected to experimentally demonstrate in a physical implementation major steps towards the realisation of such advanced information processing systems. In addition, proposals should express a clear vision on the potential implementation and impact of the proposed concept in the field of information processing.

Expected impact

- Enable the development of ICT systems and devices that utilize interactions between components to assemble complex functional information processing materials.
- Enable a new generation of systems capable of interfacing with conventional IT systems that are self-replicating, self-repairing and/or capable of rapid adaptation/evolution as well as flexible reconfiguration in response to changing conditions.

Funding scheme

STREP

Indicative budget

7 M€

Call

ICT Call 4

Objective ICT-2009.8.4: FET proactive 4:

Human-Computer Confluence

The initiative aims to investigate and demonstrate new possibilities emerging at the confluence between the human and technological realms. It will examine new modalities for individual and group perception, actions and experience in augmented, virtual spaces. Such virtual spaces would span the virtual reality continuum, also extending to purely synthetic but believable representation of massive, complex and dynamic data. Human-Computer confluence fosters inter-disciplinary research (such as Presence, neuroscience, machine learning and computer science) towards delivering unified experiences and inventing radically new forms of perception/action.

Target outcome

a. **On-line perception of and interaction with massive volumes of data:** new methods to stimulate and use human sensory perception and cognition to interpret massive volumes of data in real time to enable assimilation, understanding and interaction with informational spaces. Research should find new ways to exploit human factors (sensory, perceptual and cognitive aspects),

including the selection of the most effective sensory modalities, for data exploration.

b. **Unified experience**, emerging from the unnoticeable transition from physical to augmented/virtual reality: new methods and concepts towards unobtrusive mixed or virtual reality environment (multi-modal displays, tracking systems, virtual representations…), and scenarios to support entirely unobtrusive interaction. Unobtrusiveness also applies to virtual representations, their dynamics, and the feedback received. Research could also explore how to extend unified experience to synthetic representations of massive volumes of data.

c. **New forms of perception and action:** invent and demonstrate new forms of interaction with the real world, virtual models or abstract information by provoking a mapping from an artificial medium to appropriate sensory modalities or brain regions. This research should reinforce data perception and unified experience by augmenting the human interaction capabilities and awareness in virtual spaces.

Proposals should address at least two of the above topics.

Expected impact

- New methods and tools to act across real and virtual spaces
- New means to present the massive amounts of data which future ICT systems will generate and collect to individuals and groups to allow them to explore and more fully understand the causes and consequences of phenomena
- Improved ability to truly deliver presence experiences contributing both to progress in Presence research and enhancing the foundations for future applications of societal value

Funding scheme

IP

Indicative budget

15M€

Call

ICT Call 5

Objective ICT-2007.8.5: FET proactive 5: **Self-Awareness in Autonomic Systems**

The challenge is to create computing and communication systems that are able to optimise overall performance and resource usage in response to changing conditions, adapting to both context (such as user behaviour) and internal changes (such as topology). To achieve this, autonomic systems should enable nodes to build up an awareness relating to higher and even global levels, e.g. of patterns of use, system performance, network conditions and available resources. This requires breaking through the tradition of fixing abstraction layers at design time, which hide issues at lower layers (e.g., by hiding mobility, heterogeneity, or drops in performance), but inevitably limit the scope for optimising resource usage and responding to changing conditions.

Target outcome

New concepts, architectures, foundations and technologies for:

a. **Creating awareness** at the level of autonomic nodes, by allowing them to interactively and selectively collect information about the system, and use it effectively. A central question is how to link awareness of performance, conditions, available resources, etc., to the nature of information that is exchanged.

b. **Dynamic self-expression**, namely the ability to autonomically use awareness to adapt the trade-off between abstraction and optimisation. There is a need for understanding the consequences of this principle on system behaviour and performance, and designing/experimenting with related features.

Projects should investigate how such systems can be embedded in a larger (technical or non-technical) context, and within this context support society and economy. They should take into consideration malicious behaviour and the system's ability to respond to arising needs.

Demonstration of new approaches should lead to a better understanding of their feasibility.

STREPs should address at least one and Integrated Projects should address in an integrated manner both topics.

Expected impact

- Lower management costs of large networked systems through the ability to adapt to changing environments and patterns of use, and through a greater degree of, flexibility and reliability
- More efficient use of resources such as processing power, energy and bandwidth through autonomic decisions based on awareness

Funding schemes

IP and STREP

Indicative budget

IP/STREP: 15M€, of which a minimum of 50% to IPs and a minimum of 30% to STREPs

Call

ICT Call 5

Objective ICT-2009.8.6: FET Proactive 6:

Towards Zero-Power ICT

New disruptive directions are needed for energy-harvesting technologies at the nanometre and molecular scale, and their integration with low-power ICT into autonomous nano-scale devices for sensing, processing, actuating and communication.

Target outcome

a. **Foundations of Energy Harvesting at the nano-scale:** Demonstration of radically new strategies for energy harvesting and local storage below the micrometer scale. Exploration and harnessing of potential energy sources at that scale including kinetic energy present in the form of random fluctuations, ambient electromagnetic radiation, chemical energy and others. Research may also address bio-mimicked energy collection and storage systems.

b. **Self-powered autonomous nano-scale electronic devices:** Autonomous nano scale electronic devices that harvest energy from the environment, possibly combining multiple sources, and store it locally. These systems would co-ordinate low-power sensing, processing, actuation, communication and energy provision into autonomous wireless nano-systems.

Expected impact

- Possibility of building autonomous nano-scale devices (from sensor to actuators), extending the miniaturisation of autonomous devices beyond the level of the 'smart dust'
- New applications in a vast number of ICT fields such as intelligent distributed sensing, for health, safety-critical systems or environment monitoring

Funding scheme

STREP

Indicative budget

7M€

Call

ICT Call 5

Objective ICT-2009.8.7: FET proactive 7:

Molecular Scale Devices and Systems

The research addresses devices to represent, store, process and exchange information at the atomic and molecular scale, as a basis for fully functional ICT devices and systems. These devices and systems should rely on new scalable concepts and architectures enabled by atomic precision and control, exploit intrinsic properties of atoms and molecules, realize their interconnection, interface them to the mesoscopic world and ultimately have an impact on future information processing systems.

Target outcome

a. Investigation, development and demonstration of **physical implementations**, both at the single-molecule level and with small assemblies of concatenated, interconnected molecules, with the aim of achieving proofs of concept and demonstrating working devices or systems such as molecular computation, single molecular memories, molecule-based sensors, and scalable, functional arrays of molecules.

b. Exploration, design and development of **supporting technologies for molecular-scale information devices and systems** such as: a) **Measurement and control systems**, including atomic and molecular references and precision sensors and procedures to preserve data and operation integrity at design and system level , and b) **Simulation and modelling tools**, including hierarchical modelling (from ab initio and single device to system level).

c. Exploration and demonstration of **radically new characteristics and functionality** of molecular-scale systems by investigating new non-charge based information processing techniques, devices, architectures, self-assembly, programming, supported by experimental implementations.

Integrated Projects should cover at least two of the above topics and present a long-term vision towards future applied RTD.

Expected impact

- Opening of new avenues and exploration of new possibilities in ICT devices and technologies at the molecular scale
- Experimental demonstration of principle and feasibility of such devices
- New perspectives on potential applications with concrete advantages (e.g. energy consumption, data and operation integrity, speed…)

Funding schemes

IP and STREP

Indicative budget

IP/STREP: 15M€, of which a minimum of 50% to IPs and a minimum of 30% to STREPs

Call

ICT Call 6

Objective ICT-2009.8.8: FET proactive 8:

Brain Inspired ICT

Recent advances in ICT and neuroscience enable a significant part of the human brain to be studied and modelled "in silico". This objective seeks to exploit such advances in order to better understand how the brain processes information and/or how it communicates with the peripheral nervous system (PNS), and to explore potential applications of this.

Target outcome

a. **Development of multi-scale models of information processing and communication in the brain and/or PNS.** Systemic study of the brain, combining recordings/imaging of brain activity on several spatial and/or temporal scales simultaneously. This research may also address higher-level cognitive processes. This multi-disciplinary research should foster joint progress and synergy in ICT and the bio- and neuro-sciences.

b. **Synthetic Hardware Implementations of Neural Circuits** that mimic information processing in the brain or PNS. These implementations should demonstrate either the emulation of significant functionality of a neural system (including a comparison with the biological counterpart) or the performance of other specified processing tasks.

STREP Proposals should address at least one and Integrated Projects a combination of the above topics.

Expected impact

- Improved design principles for bio-hybrid artefacts involving engineered components that directly communicate with the nervous system, relying less than current implants on brain plasticity or training in order to function.
- Computational systems that emulate human skills (e.g. by using the directed fusion of diverse sensory information) or exploit underlying principles for new forms of general purpose computing. These should demonstrate significant improvements in, for example, performance, fault tolerance, resilience or energy consumption over traditional ICT approaches.
- Improved diagnosis/treatment of neurological disorders through the use of a comprehensive model of neural and brain functioning.
- Experimental data archived with sufficient appropriate meta-data to facilitate re-use in another research contexts.

Funding schemes

IP and STREP

Indicative budget

IP/STREP: 15M€, of which a minimum of 50% to IPs and a minimum of 30% to STREPs

Call

ICT Call 6

Objective ICT-2009.8.9:

Coordinating Communities, Plans & Actions in FET Proactive Initiatives:

Target outcome

a. **Coordination or support actions** supporting the coordination and cooperation of the targeted research communities, assessing the impact and proposing measures to increase the visibility of the initiative to the scientific community, to targeted industries and to the public at large through dedicated events and/or media campaigns. These actions should also foster the consolidation of research agendas and the coordination of national, regional or international research programmes or activities. Each action should encourage the establishment and promotion of new educational curricula, also bridging and exploiting opportunities offered through Marie-Curie schemes and by the EIT. It should also promote international cooperation in foundational research on topics of the initiative.

b. **Coordination actions fostering the networking of research activities** conducted at national or regional level, facilitating the mutual opening of national and regional research programmes where appropriate, e.g. for *Quantum Information Foundations and Technologies*. These actions should involve in particular national or regional research programme owners and aim at the eventual launch of an ERA-NET plus action in a subsequent phase.

Expected impact

- Reinforced coordination of research projects in proactive initiatives in current or previous calls
- Readiness for ERA-NET or ERA-NET Plus schemes where appropriate

- Strengthened European research excellence, including preparation of co-operation and co-ordination with international partners from outside Europe

Funding scheme

CSA

Indicative budget

1.5 M€ at each call

Calls

ICT Call 4, ICT Call 5, ICT Call 6

Objective ICT-2009.8.10:

Identifying new research topics, Assessing emerging global S&T trends in ICT for future FET Proactive initiatives:

Target outcome

a. Short duration actions (typically 6-12 months) to organise consultations of multi-disciplinary communities to formulate novel and widely supported FET research topics, initiatives and modalities in support of foundational research that could open up radically new avenues for future ICT. Proposals should concentrate on new emerging areas of research complementing the ICT FET Proactive portfolio. They may consolidate, revisit, or widen topics elicited in earlier calls and previous consultations on the work programme, or bridge with emerging new communities established through FET Open projects. The main objective should be to identify and motivate one or more new research avenues from a global perspective, the associated fundamental challenges, and to analyse the expected impact on science, technology and society.

b. Actions that perform in-depth analyses of emerging global trends in multidisciplinary science and technology fields contributing to future ICT, in terms of assessment, measurement, risk analysis, critical mass and necessary resources.

Topics for FET Proactive Initiatives for 2011 and later calls will develop over the period and could be inspired by those highlighted in the introduction to FET Proactive under the heading *"Candidate topics for calls in 2011 and beyond"*.

Expected impact

- Novel widely supported and well motivated research topics to be considered as inputs for future work programmes in ICT, with an estimate of the effort required and a clear description of the expected impact.
- Increased motivation of research communities to embrace new directions of multidisciplinary exploration around ICT
- Early identification and increased awareness of new trends emerging on a global scale in support of future proactive initiatives

Funding scheme

CSA

Indicative budget

0.5 M€ at each call

Calls

ICT Call 4, ICT Call 5, ICT Call 6

Indicative Timetable

Call 4:

Open: November 2008

Deadline for submission: April 2009

Call 5:

Open: June / July 2009

Deadline for submission: September / October 2009

Call 6:

Open: November 2009

Deadline for submission: April 2010

Fet Open:

Continuously receivable from 1 January 2009 onwards, until 31 December 2010.

http://cordis.europa.eu/fp7/dc/index.cfm?fuseaction=UserSite.CooperationDetailsCallPage&call_id=12

Funding schemes

CA	Coordination Action
CSA	Coordination and Support Action
IP	Large-scale Integrating Project
SA	Specific Support Actions
STREP	Small or medium scale focused research action

FET Open and FET Proactive apply specific eligibility and evaluation criteria. Proposers should carefully read Appendix 5 of the Work Programme 2009 – 2010.

Appendix 5: FET eligibility, evaluation, selection and award criteria

Eligible proposals under FET objectives will be evaluated according to three criteria - Scientific/Technological Quality, Implementation and Impact. A score will be awarded for each of these criteria, based on the considerations listed below.

In addition to the eligibility criteria set out in Annex 2 to the Cooperation work programme, FET-Open short proposals are also subject to the following eligibility criteria:

1. The length of Part B should not exceed 5 A4 pages, excluding a title page.
2. Part B should be fully anonymous, meaning that none of the partners or authors should be explicitly mentioned or be otherwise identifiable.

	1. S/T quality (in relation to the topics addressed by the call) **(Award)**	*2. Implementation* **(Selection)**	*3. Impact* **(Award)**
short STREP **(FET Open)**	• Clarity of targeted breakthrough and its relevance towards a long-term vision. • Novelty and foundational character. • Plausibility of the S/T approach, as outlined.	(not applicable to short STREP)	(not applicable to short STREP)
	Threshold: 3.5/5		
STREP	• Clarity of targeted breakthrough and its relevance towards a long-term vision. • Novelty and foundational character. • Specific contribution to progress in science and technology. • Quality and effectiveness of the S/T methodology.	• Quality of workplan and management. • Quality and relevant experience of the individual participants. • Quality of the consortium as a whole (including complementarity, balance). • Appropriate allocation and justification of the resources to be committed (personmonths, equipment, budget).	• Transformational impact of the results on science, technology and/or society. • Contribution at the European level towards the expected impacts listed in the work programme. • Appropriateness of measures envisaged for the dissemination and/or use of project results.
	Threshold: 3.5/5 **Weight:** ▪ FET Open - 50% ▪ FET Proactive - 40%	**Threshold: 3/5** **Weight: 20%**	**Threshold: 3.5/5** **Weight:** ▪ FET Open - 30% ▪ FET Proactive - 40%
IP **(FET Proactive)**	• Clarity of objectives and their relevance towards the long-term vision of the proactive initiative. • Integration of research activities of appropriate multi-disciplinary character.	• Quality of workplan and management. • Quality and relevant experience of the individual participants. • Quality of the consortium as a whole (including complementarity, balance).	• Contribution at the European level towards the expected impacts listed in the workprogramme under the objective. • Transformational impact of the results on science, technology and/or society.

	• Novelty and foundational character. • Specific contribution to progress in science and technology. • Quality and effectiveness of the S/T methodology.	• Appropriate allocation and justification of the resources to be committed (personmonths, equipment, budget).	• Appropriateness of measures envisaged for the dissemination and/or use of project results, and management of intellectual property.
	Threshold: 3.5/5 **Weight: 40%**	**Threshold: 3.5/5** **Weight: 20%**	**Threshold: 3.5/5** **Weight: 40%**
Coordination and Support Actions	• Clarity of objectives. • Contribution to the coordination and/or support of high-risk and high-impact research, for new or emerging areas or horizontally. • Quality and effectiveness of the coordination and/or support activities.	• Quality of workplan and management. • Quality and relevant experience of the individual participants. • Quality of the consortium. • Appropriate management of the resources to be committed (personmonths, equipment, budget).	• Transformational impact on the communities and/or practices for high-risk and high-impact research. • Appropriateness of measures for spreading excellence, use of results, and dissemination of knowledge, including engagement with stakeholders.
	Threshold: 3/5 **Weight: 40%**	**Threshold: 3/5** **Weight: 20%**	**Threshold: 3/5** **Weight: 40%**

Thresholds are set for each criterion, as indicated in the tables above. In addition, an overall threshold may also be set, as indicated in the table below. A proposal failing to achieve any of these threshold scores will be rejected.

	Overall Threshold
short STREP (FET Open)	None
STREP	10.5/15
IP	None
Coordination and Support Actions	10.5/15

Future and Emerging Technologies

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European Commission
Information Society and Media