



REPORT : FET FLAGSHIP INFODAY

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Future & Emerging Technologies Unit
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1. Introduction

The FET scheme as part of the DG INFSO ICT programme is in the process of setting up the FET Flagship Initiatives, as laid down in the communication ['Moving the ICT frontiers'](#) and endorsed by the [conclusions of the COMP Council in December 2009](#). As one of the key actions, this communication envisages the launch of at least 2 of these initiatives by 2013.

FET Flagship Initiatives are proposed to be visionary, science- and goal-driven large-scale European ICT research initiatives nucleating from FET but cascading into various scientific and technological areas, from long-term to more technology-driven research. The scientific advance is at the center of the initiatives. Flagships should generate a wave of technological innovation and economic exploitation, ideally in a variety of areas and sectors, and would carry an important societal impact. For a more detailed description on the concept and some initial topic ideas of these initiatives, please refer to the [ISTAG report on FET Flagships](#).

In December 2009, an [online consultation](#) was set up to collect ideas from key stakeholders like the scientific community and the research programme leaders. For coherence and comparison purposes, the consultation specifically asked for input along 5 criteria: idea, ambition, impact, integration, and plausibility.

This consultation was closed 13th January 2010 to allow for the analysis of the input and the preparation of the ['Information Day and Workshop on FET Flagship Initiatives'](#), held on 22nd January 2010 at the Conference Centre Albert Borschette in Brussels. The main objectives of the event were:

- A broadcast to the scientific community and Member States the launch of the Flagships preparation phase;
- To promote the discussion of proposed candidate ideas, the exploration of their possible coordination at programme level, and mapping of support from different communities;
- To initiate the setup of the FET Flagships Science Forum.

2. FET Flagships: a new model for federated European research

Certain research goals are so ambitious that they are out of reach for any national or EU research initiative. Only by mobilising researchers Europe-wide towards a clearly defined common vision, and by giving them support to persist for several years, can such goals be reached.

FET Flagships could be seen in essence as public-public partnerships, where research activities of European and national programmes can be aligned and integrated around the gravity center of a unifying scientific challenge. Built on established strengths of European research, FET-Fs are envisioned as long term initiatives, each on a budget of typically around 100 M€Euros per year. The overarching nature and magnitude of these initiatives implies that they can only be realised through federated effort of the research community, national and regional funding agencies, the EU, and where appropriate, with the participation of global partners and industry.

A Flagship Initiative should reach far beyond, for example, a topical research area described in a typical FP7 Cooperation call for proposals. It should embrace research challenges that can be addressed only by joining forces from FET-ICT and other European and national research programmes, e.g. from the Life sciences, Energy, Nanotechnology or Capacities programmes.

Currently the following criteria would characterise a FET Flagship Initiative:¹

- **Ambition:** the goal should be a breakthrough involving major challenges in science and technology, requiring a large federated effort, and justified via comparison with existing activities and state of the art
- **Impact:** a clear leverage effect, substantial progress and major innovation in science and technology; affecting European competitiveness, industry, society, governance and sustainability
- **Integration:** an operational framework describing why and how relevant disciplines, stakeholders and resources will be brought together at European or larger scale, and how they can be coordinated in an efficient way
- **Plausibility:** the different areas of research should be at appropriate level to be assembled into a well-defined roadmap with reasonable milestones

¹ Based on recommendations of the [ISTAG report on FET Flagships](#)

3. The opportunity offered

FET Flagships represent a new opportunity and a potential new instrument to shape and build the European Research Area. To implement a joint effort of such grand scale requires a great amount of preparation in terms of looking for ideas in the scientific community, defining operational mechanisms, devising and putting in place a legal framework, and most of all, establishing political and financial support of stakeholders.

While these are significant challenges, they also constitute clear opportunities for all stakeholders to:

- Avoid spreading S&T basic research funding too thinly at national and EU levels by coordinating efforts, and benefiting from what others do, directly or indirectly.
- Place different scientific theories, ideas and technological challenges under an exciting umbrella that stimulates many scientists to position their work in a bigger picture.
- Reach higher awareness, impact and return on investment of basic research in both S&T and towards society.
- Extend the time-horizon of research towards emerging technologies and their applicability in an integrated and coherent way.
- Create a framework in which scientists and technologists of different disciplines can initiate dialogue and collaborate actively, look for new inspirations from other domains, and benefit from the possibilities offered by tackling problems in a multidisciplinary approach.
- Give basic S&T research a stronger position in the funding systems via the creation of legal instruments which foster enforced connections with more established disciplines.
- Help to link scientific and technological research to innovation, and eventually towards commercialisation.

4. The online consultation

An [online consultation](#) was set up to collect FET Flagship ideas from key stakeholders and to catalyse coordination of plans. Leading scientists have been encouraged to elaborate further their objectives as outlined in the ideas presented, and to seek ample collaboration and alliances with the others to build up initiatives of common interest and wide support.

The contributions have been grouped into three thematic clusters: i) socio-economic simulation, ii) new paradigms for computing/engineering, and iii) Bio-ICT confluence. A summary of all contributions received for the online consultation is listed in '*Annex I: Response to the online consultation*', while the full contents of the contributions is available in '[Contributions to the Consultation](#)' document on the [consultation website](#).

Overall, elaboration of submissions was predominantly very good, with some variation owing to the short deadline. It is clear that understanding of the FET-F concept needs to be improved, one common problem was ideas not being sufficiently goal-oriented, or targeting too narrow a field. A number of ideas could very well complement each other, and participants were encouraged to explore the possibilities of coordinating their efforts. To allow further possibility for refining and matching ideas, networking of stakeholders and nucleating possible FET Flagship Pilots, the online consultation was opened again from 15th February to 31st March 2010.

5. Conclusions of the FET Flagships Workshop

- The COM (2009) 184 'Moving the ICT frontiers' Commission Communication and its recent endorsement by the Council underlines the **political need for common action** as envisaged in the FET-F scheme and laid down in the **Digital Agenda**: in particular concerning the joint effort, and shared ownership of initiative between different EC services, Member States and scientific communities.
- **Experiences from relevant existing instruments will be valuable** in the setup of FET Flagships. ERA-NETs for example have also aimed to set up a common framework for joint multidisciplinary research activities, coordinated by synergistic networking of national research activities/agendas, to establish lasting cooperation.
- The EC is counting on the feedback of the scientific community in the **ongoing efforts to refine the concept and criteria** of FET Flagships. To support this process, a **study on the FET Flagships** concept is being funded by the EC, establishing a comparative analysis of similar actions, identifying success factors, validating refined concept and criteria with the scientific community, assessing the possible legal and operational frameworks, and providing policy recommendations to support the implementation of FET Flagships. These results will be publically available over the course of 2010.
- **The scientific community particularly welcomes the *focused and multidisciplinary* characteristics** of the envisaged FET Flagship scheme. These qualities are also expected to infuse additional organising power within the envisaged framework. **Identification of a unifying scientific goal** is essential in leveraging joint effort from all stakeholders.
- Social desirability, ethical considerations, legal and regulatory implications, sustainable funding, manageability, and visibility of interim results are recommended to be reflected with more emphasis in the criteria for FET Flagships.
- **Each FET Flagship could differ significantly** from the others in size, organisation, approach or impact on science, technology and society. Comparison of the 'plausibility' and 'leverage' criteria can be difficult between targets of socioeconomic nature and those with easily identifiable technological output.
- **Main future milestones** are expected to be the launch of **FET Flagship Pilots** via a call for proposals in second half of 2010, the setup of the **FET Flagships Science Forum (FFSF)** and the setup of the **National ICT Directors' Working Group**. The role of the FFSF will be to encourage emerging initiatives, and to support the coordination of constituencies within and among FET Flagship candidates, involving mainly visionary scientists with ample experience in research management and funding. The National ICT Directors' WG is to involve representatives of national research programmes to discuss potential leveraging effects of the emerging FET Flagship Pilots, their match with already established research agendas, and to investigate the tools and mechanisms available for their implementation.

- The scientific community represented in the FFSP, together with the National Research Programmes represented in the National ICT Directors' WG, will be invited to examine the possible coordination of efforts, and to identify truly ambitious goals of common long-term interest in order to justify the focused combination of resources. **The FET Flagship Pilots will have to convincingly demonstrate how they are to fulfill the criteria of Ambition, Impact, Integration and Plausibility.**

Annex I: Response to the online consultation

This summary is based on ideas for FET Flagships submitted in written form and/or presented at the event. The contributions have been grouped into three thematic clusters. These are Biology-Material ICT Confluence, New Paradigms for Computing and Engineering, and Complex Socio-Techno Systems.

1. Biology-Material-ICT Confluence

Living Technology: Exploiting Life's Principles for ICT:

(Steen Rasmussen – U. Southern Denmark – DK)

ICT lead catalysis of our ability to engineer systems whose power is based on the core features of life. To make possible the convergence of nanotechnology, biotechnology, information technology and artificial intelligence such that we can engineer robust, self-repairing, evolving, smart - and thus sustainable and inexpensive - living technology.

Neuromorphic Computation Facility

(Karlheinz Meier – Heidelberg U. – DE)

The goal is to design, build and operate a Neuromorphic Computation Facility (NCF) exploiting the computational principles found to be working in the human brain for research and as a generic computational machine. The NCF is a highly scalable device able to grow with the expected progress in IT technology. The NCF should be operated as a European user facility following the model of other research infrastructures.

Simulating the human brain

(Henry Markram – EPFL – CH)

Simulating the human brain is the ultimate challenge for mankind. This requires massive neuroinformatics, modelling, simulation, visualization and analyses. A facility that can build biologically accurate brain models will provide the ultimate approach to understanding the brain and its diseases, develop personalized medicine, revolutionize technology, and educate the public on how our brain works.

Disciplines involved: The flagship will involve many experimental, medical, theoretical, computer, robotics, and technology labs.

This idea is supported by the Swiss and Spanish Government.

Virtual Physiological Human Infostructure

(Marco Vicencoti – VPH-Institute – BE)

Future ICT for personalised, predictive and integrative understating of life; this proposal is in close resonance with the ISTAG priority, “Understanding Life through future ICT”. We propose to develop radically innovative ICT solutions for harvesting the huge amount of human physiological and pathological data at all scales from molecule to whole populations, and to transform them into knowledge using multiscale integrative modelling along the VPH approach.

International dimension: University of Auckland New Zealand, University of California S. Diego.

Support from EAMBES: the European Alliance on Medical and Biological Engineering and Sciences represents over 8000 European biomedical engineering.

Development of an industrial scale nanoparticle-based transducer for model-supported cellular analysis

(Prof. Booss-Bavnbek – Roskilde University – DK)

Dynamic marking of intracellular organelles by new types of nano-particles, in particular, magneto-fluorescent, non-toxic dyes/quantum dots, and inflammation sensors). Main goal: Systems analysis of pancreatic beta-cells.

International dimension: University of Shanghai, NIH, Bethesda, University of Illinois at Urbana-Champaign, University of Auckland, New Zealand, Harvard University and Joslin Diabetes Center (Boston).

Tuning Hybrid Carbon-Silicon Organisms

(Gusz Eiben – VU – NL)

Augmentation of humans with artificial devices (sensors as well as actuators) will be increasingly popular in the future. This initiative aims at technologies enabling optimal calibration of the extension device customized to any given user (recipient). At the next step the ambition is to facilitate design of adaptive controllers and interfaces for such hybrid organisms.

Integral Biomathics -A New Era of Biological Computation

(Plamen Simeonov – JSRC – DE)

It is not the question to invent yet another novel approach to computing, but one that integrates the multiple levels of organization and activity in a living system, and beyond that, one that evolves autonomously with extending and refining the model, thus mimicking the system itself.

Disciplines involved: Mathematics, Computer Science, Biology, Physics, Physiology, Visual Arts

International dimension: Ryukoku University (Japan), Binghamton University (USA), Duke University (USA)

From Artificial evolution to computational evolution

(François Kepes – CNRS – FR)

New insights from molecular and evolutionary biology for computing.

Self-constructing Intelligent Systems

(G. Indiveri – ETHZ – CH)

Convergent Science Network for Biomimetic and Biohybrid Systems

(Paul Verschure – ICREA – ES)

Biomimetic Artifacts for Space Exploration and A Biohybrid Continuum for Quality of Life.

2. New Paradigms for Computing and Engineering

Quantum Technologies

(Peter Zoller – IQOQI Innsbruck – AT)

The proposed Quantum Technologies Flagship will allow Europe to play a key role in the new market where the quantum limits will define the performance of industrial applications.

International dimension: National University of Singapore, Singapore.

Supercomputing

(Mateo Valero, Barcelona Supercomputing Centre – ES)

Supercomputing is a key technology for the future scientific and industrial competitiveness. The aim is to develop the supercomputing technology (system software and architectures) that will enable applications to execute at huge performances and power efficiency for the next 20 years.

Disciplines involved: computer science research institution, supercomputing centres.

Harnessing fluctuations: phononics and thermal energy management at the nanoscale for emerging ICT

(Clivia Sotomayor – Catalan Institute of Nanotechnology – ES)

The goal is to control thermal energy transport in the nano-scale (nanostructures, hybrid nano-materials and variations of nanostructure-bulk interfaces). To this end a large-scale concerted and targeted effort is required to meet the theoretical, experimental, material and modelling challenges, as well as applications to real cases in several key industrial sectors.

International dimension: IMRE Singapore.

From e-sciences to e-design

(Jean-Frederic Clerc – CEA – FR)

Robot Companions for Citizens: Create Robots for Human-Robot partnership.

(Martin Buss – T.U. Munich – DE)

YouCloud – is that a cloud in your pocket?

(Augustin Soule – Thompson – FR)

The data overflow: how to digest information.

3. Complex Socio-Techno Systems

Simplicity in IT

(Tiziana Margaria – U. Postdam – DE)

Simplification should be established as a driver of innovation. With two effects: 1) simpler products, platforms, tools are easier to adopt 2) it is easier to guarantee (prove, test) properties, therefore lower the risk of adoption for building on top.

Disciplines involved: Computer Science, Engineering, Economy, Healthcare and Healthcare Management, Societal and Cognitive aspects, as well as a selection of non-EU experts able to provide a global perspective.

Towards a theory of the evolution of the Web

(Wendy Hall, U. Southampton – UK)

Disciplines involved: The exact mix of disciplines is still moot, although it seems clear that it will involve computer science, mathematics, sociology, psychology, economics, law and the various disciplines that investigate complex systems.

International dimension: CSAIL, Massachusetts Institute of Technology, Northwestern University, Yale University, Rensselaer Polytechnic Institute, UC Irvine, University of Maryland, Shenzhen Web Science Laboratory, Tsinghua University, Seoul Nat. University.

Internet Science

(Georg Carle, T.U. Munich – DE)

Internet science is coordinated multi-disciplinary research that will lead to a thorough understanding of the complex technological and socioeconomic interrelations of the Internet, and will establish methods and tools to design components of future instantiations of the Internet, and future applications on top of it.

International dimension: University of Kansas - Lawrence, University of Kentucky.

FuturICT - Sensible ICT Systems that Make Humanity Fit for Future

(Dirk Helbing – ETHZ – CH)

Develop novel ICT systems (both infrastructures and applications) that support the understanding, integrative design, and management of complex systems. Apply these to model techno-social and economic, climate and other global systems. Develop instruments to support bottom-up processes for decision-making in politics, business, industry, and academia, with the aim to foster societal goals (e.g. robust techno-social systems or sustainable economics).

Disciplines involved: Economics, Geosciences, Ecology, Mathematics, non-linear dynamics, Physics, Computer science Psychology, Sociology, Anthropology, Engineering, Biology.

International dimension: Bloomington University (Indianapolis, USA), Brookings Institution (Washington DC, USA), Santa Fe Institute (Santa Fe, USA).

Socionome Metaloger

(John Sutcliffe-Braithwaite – U. Reading – UK)

Socionome Metaloger will establish the new science of Computational Socionomics based on the coupling of science and social systems within a new ICT paradigm. SOCIONOME researches the properties of social systems, their computability, structure, ontological basis, and real-world usage. The outcome will be a ubiquitous organisational real-time simulator that verifies social systems behaviour.

Disciplines involved: Social & behavioural science, Complexity science, mathematics, statistical physics, ecology, evolutionary theory, cognitive sciences.

Building up an appreciate system

(Sylvie Occelli – IRES Piamonte – IT)

Starting from IDEAAS (Innovation Development for Enhancing Administration Action & Services), we propose to address the issues of co-evolutive development of New Generation Network (broadband and ICT) and New Governance Network. The NGN² environment is expected to be rich in innovative technologies, reflexivability and cultural willingness to sustain the overall process.

Experience Learning: transforming and transformational medical education

(Seamus Mac Suibhne – Royal Academy of Medicine in Ireland – IE)

A multicentre, multidisciplinary, multiyear study following medical students from selection for medical school through their education and into practice - assessing every aspect of their acquisition and development of information related to knowledge, skills and attitudes.

Future of Institutions: models, practices, tools for understanding and anticipating the future of institutions

(Rosaria Conte – CNR – IT)

Annex II: Agenda

The meeting was held in Brussels on 22nd January 2010.

Presentations given at this info day are available at

http://cordis.europa.eu/fp7/ict/fet-proactive/flagship-ie-jan10_en.html

Morning: Plenary Session

09:00	Registration and Coffee
09:30	Welcome and opening keynote
09:45	The FET Flagship concept; roadmap and the way ahead
10:20	Support to concept refinement: study on FET Flagships
10:30	Pursuing joint priorities: the ERA-NET perspective
10:50	Q & A
11:00	Coffee Break
11:30	Presentation of 6 examples of responses to the Call for FET Flagship ideas:
12:45	Lunch

Afternoon: 3 Parallel Sessions

14:00 – 16:00	Suggested Clusters: <ul style="list-style-type: none">- Biological-Material-ICT Confluence- New Paradigms for Computing & Engineering- Complex Socio – Techno Systems
16:00	Reporting back from Clusters
16:30	Q & A
16:45	Conclusions and the way forward
