

THE **FUTURE OF FET:**

A possible nucleus for
the European Innovation Council



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The Future and Emerging Technologies (FET) programme has the potential to become the leading research and technology visionary funding programme within and beyond H2020. Its complementary schemes allow different methodologies and scales to be addressed, starting with new ideas and moving up to long-term (grand) challenges. The combination of an open, bottom-up scheme that is able to identify emerging topics efficiently (FET-Open), with a scheme that covers already identified themes in a systematic way (FET-Proactive), and a scheme that addresses grand challenges (FET-Flagships), is unique among the portfolio of EU research programmes.

FET has demonstrated that it is a flexible, adaptive programme able to evolve in response to changing circumstances. It has also proven its ability to boost innovativeness in Europe through the creation of topical research and innovation communities and networks. To boost innovation further will require widening its community to include smaller groups and Europe's most innovative SMEs.

FET is a fully funded part of Horizon 2020. However, the observed dramatic oversubscription in FET-Open cannot be solved by just tightening the submission rules. The FET-Open and FET-Proactive budgets should also be further increased in proportion to the thematic widening that has been implemented in H2020.

A decision making FET Board consisting of acclaimed researchers, innovators and entrepreneurs, could be instrumental in rising prestige of the FET programme. This Board could evolve from the current FET Advisory Group.

Positioned as an evolving entity, FET is a natural model upon which to build the European Innovation Council because of its inherent focus on community building, its openness, its target driven outlook, its flexibility, and its responsiveness, all of which are fundamentally important characteristics in a rapidly changing world. FET also has significant potential to act as a seed for innovation.

FET – AN EVOLVING PROGRAMME: CHALLENGES AND SOLUTIONS

FET – Future and Emerging Technologies – is part of the Excellent Science Pillar of Horizon 2020, and the FET budget amounts to €2.7 billion. Originally FET focused on Information and Communication Technologies (ICT) related research. This restriction no longer holds.

FET's focus is on high risk, high impact research and cutting-edge engineering disciplines, ahead of the mainstream research agendas. The future for FET lies in bringing together research and innovation to create a highly responsive and adaptive system that is suited to a complex and increasingly uncertain and unpredictable world.

An important aspect of the FET programme is its powerful combination of bottom-up and top-down approaches to frontier research. The first is a natural way to finance ideas at their earliest stage, because no one really knows which ideas will bring the revolutionary new technologies of tomorrow, thus making top-down agenda setting at that stage impossible. However, when the problem to be solved becomes more mature and a large community of stakeholders has already crystallised, then a mix of top-down and bottom-up approaches should be considered, for the best use of scarce resources. When finally it becomes clear that the field or subject has reached a certain critical mass and it has become obvious that a concerted action of many stakeholders may produce a breakthrough result, or societal needs dictate so, or both, then a top-down larger scale funding, often with mixed funding sources becomes the best solution.

All these approaches are present in FET. Its foundation lies in the flexible and almost unrestricted **FET-Open** scheme. If a guided stimulus is needed and the community for a given issue becomes large enough, then the **FET-Proactive** scheme becomes a choice. The ultimate move is then to a **FET-Flagship** scheme, which is a highly targeted action aimed at speeding up the most timely and societally important subjects that require much larger funding and much larger consortia to achieve a breakthrough result.

The key strengths of fet are:

- **FET** research has already significantly contributed to Europe's leadership in areas such as quantum communications, nanoelectronics, neuro- and bio- inspired information science, advanced robotics and complex systems.
- **FET** has also led to new innovations in the marketplace, and its SME pilot scheme well illustrates the potential for taking advanced high-risk research to market in short timeframes.
- **FET** has the ability to create excellent communities by attracting top scientists whose outstanding work throughout their careers has earned them international recognition. Nine Nobel Prize laureates have been involved in FET projects.
- **FET** supports new ideas for radically different technologies, and it does this at an early stage when there are few researchers working on the topic. This can involve a wide range of new technological possibilities, inspired by cutting-edge science, unconventional collaborations, or new research and innovation practices.

- **FET** also nurtures emerging themes, seeking to establish a critical mass of European researchers in a number of promising exploratory research topics. It supports areas that are not yet ready for inclusion in industry research roadmaps, with the aim of building up and structuring new interdisciplinary research and innovation communities.

A significant challenge for FET is the problem of dramatic oversubscription (in the recent FET-Open call the success rate was below 2%!). This clearly shows that FET-Open is in line with the needs of the community. The greatest challenge is thus not only to avoid the waste of scientific resources but also to still allow great ideas to be funded. In addition, there is a concern that the oversubscription problem will contribute to feelings of frustration among the scientific community, which stands in the way of making Europe the most attractive place for developing the technologies of the future.

The oversubscription issue cannot be just solved by tightening the submission rules. The FET budget (FET-Open and FET-Proactive) should thus be increased in proportion to its thematic widening.

Resolving the issues of oversubscription, ensuring that the very best proposals are selected and determining the topics for top-down instruments are difficult challenges for the future of FET, the resolution of which will impact the competitiveness of the EU. Dealing with these issues should be the responsibility of a high-level Board for the whole FET programme.

A FET Board is a crucial missing element in the FET granting scheme. It will reassure the research community that proposals are properly evaluated and by the right people. The same applies to the strategic choice of priority areas. The authority and prestige of such a Board would also be critical in harnessing further funding for future technologies in Europe. The FET Board should be established either from scratch or through the evolution of the FET Advisory Group, under new terms of reference (decision making power and not just an advisory input to the EC).

FET SCHEMES AND MECHANISMS

Effective innovation and entrepreneurship require a fertile ecosystem. FET should become its key component. Decisions about which innovations to bring to the market cannot be made in advance and require a great deal of adaptation during the course of a project.

The future FET should provide enough flexibility to allow serendipity to take place and to accommodate innovative outcomes. The FET schemes should support all phases of funding, thus leveraging national instruments and providing incentives to the EC stakeholders

For the funding of high-risk projects and the consolidation of proof-of-concept projects, multiple stages of funding are needed. FET-Open caters well for the very early stages (bottom-up and flexible). The private sector/market and other Horizon 2020 instruments cater

well for the later phases closest to the market. There is however a gap in between early stage funding and market exploitation. In this in-between space, research can no longer claim 'radical novelty', but development is premature. Missing is a bottom-up instrument to take a successful FET-Open project to the next stage to prevent the death of successful, unconventional projects that fall outside the 'road-map' of top-down instruments. To match the flexible nature of technological innovation, greater diversity is needed in terms of project duration. The distinction between consolidation research projects and projects near-to-application is crucial, as the latter falls within the remit of other Horizon 2020 schemes.

As regards the existing fet schemes:

- **FET-Open** should continue as a collaborative instrument, however serious consideration should be given to allow smaller groups of innovators to apply to the programme. FET-Open should therefore be expanded to include smaller grants for small consortia for 1 to 2 years. Such grants could support innovations and simpler proof of principle for excellent and radically new ideas without the management overhead of larger consortia. Funding them at European, rather than national level will be essential to ensure that the very best ideas will be brought to fruition independently of their nation of origin, and in order to create a strong sense of a true European Research Area in the domain of Future Technologies that can compete against heavyweight nations such as the USA and China.
- **FET-Proactive** should support a balanced mixture of prestigious both smaller scale (flexible and cost neutral 3 to 5 years, 3-5M€ of funding) and larger scale (5 years, 10-15M€ of funding) grants for paradigm-changing inter-disciplinary collaborative research on future technologies. Such projects should stimulate the ecosystem around them to establish the best conditions for take-up beyond FET as one of their objectives.
- **FET-Flagship** should be maintained as the ultimate FET programme scheme.

The success of FET lies not only in a diversification of the instruments, but also in assuring that its mechanisms encourage and provide incentives to researchers. Some desirable principles requiring fine tuning include: **reaction time, transparency and sustained support.**

COMMUNITY BUILDING AND INSTITUTIONAL MEMORY

One of the strengths of the current FET is community building. However, to bring the impact of FET to the next level, it is essential to analyse the characteristics of the most successful FET grants so as to tailor the FET programme to these winning features. The FET of the future should thus undertake follow-up evaluations of funded projects, and provide help to facilitate the use of the knowledge generated. There is a need for 'institutional memory', well beyond standard ex-post assessment.

NEW OPPORTUNITIES

The emphasis on innovation in Horizon 2020 creates new opportunities for FET to contribute towards research-driven innovation, which could be taken up by a FET-originated European Innovation Council (EIC):

- The inclusion of a call for projects tackling **Extreme Challenges** to stimulate high-risk, high-reward projects based on disruptive ideas and novel approaches that could lead to radically new, innovative outputs and valuable unexpected products.
- **Second-stage Funding** for FET projects demonstrating a high innovation potential, provided via a call for follow-up projects involving industrial participation.
- Greater efforts to stimulate and facilitate the **Inclusion of SMEs** in FET projects, to add an innovation-oriented element while maintaining the dream-driven spirit of FET research.
- **A Proof of Concept** scheme providing funding aimed at bridging the gap between embryonic FET research results and demonstrations of proof of concept that would stimulate up-take by industry and be attractive to potential investors

Enhancing entrepreneurship and boosting innovativeness requires also dedicated community building and specific training. Therefore two supporting actions under the EIC umbrella are worth consideration:

- The establishment of **Innovation Labs or FET Schools of Innovation**, to offer a platform for educating FET researchers about the needs of the business community and vice versa, and to provide entrants with innovation and entrepreneurial related qualifications.
- **Innovation-oriented Coaching and Training**, delivered via a variety of routes and designed to make FET researchers more aware of their specific role in innovation-oriented activities and to broaden their innovation-related skills.

Finally FET should be open to the communities beyond the traditional stakeholders of the H2020. This could be one of the prime targets for the European Innovation Council.

A key element of the FET mission in the future should be to connect in new ways the creativity of European researchers and the rest of society (citizens, civil society, and other stakeholders). FET should also broaden the definition of innovation beyond technology, to include for example, social sciences, especially with respect to social sciences that result in new challenges and ideas for technology and create innovative collaborations.

FET AS THE SEED FOR A EUROPEAN INNOVATION COUNCIL

The FET programme has become a powerful tool in the hands of the EC to mobilise the talents of Europe in seeking the breakthrough technologies of the future. Having analysed its strengths and deficiencies, the FETAG concludes that an expansion of the current FET is of prime importance for boosting Europe's innovativeness via high level technological research. A powerful option is the creation of a new EU research funding body – the European Innovation Council (EIC) – based upon the FET programme model that would realise such a mission in a similar way as the ERC boosted fundamental research.

In the speech to the conference **“A New Start for Europe: Opening up an ERA of Innovation”**¹, by Commissioner Moedas stated:

“Horizon 2020 has made a huge step forward in supporting innovation. I am very proud of this. But I also see that Europe does not yet have a world class scheme to support the very best innovations in the way that the European Research Council is the global reference for supporting excellent science. So I would like us to take stock of the various schemes to support innovation and SMEs under Horizon 2020, to look at best practice internationally, and to design a new European Innovation Council. This is not for tomorrow, but I believe we should discuss it as a major element under the midterm review of Horizon 2020”

The idea of creating a European Innovation Council and using the FET as its nucleus has a history. In fact some discussion in this direction started while planning the ERC. The ERC focus was clearly on subject-agnostic frontier research. At the same time the EC emphasized the importance, for Europe, of becoming the world's best place to develop new technologies. Barroso fostered the idea of a European Institute of Technology as a kind of MIT. On the industrial front the six Key Enabling Technologies were defined as a guide to concerted actions towards a more competitive European industry. The idea of the EIC was thus a powerful next step, first presented at the FET 2011 Conference^{2,3}, based on the Academia Europaea response to the EC position paper on the concept of a Common Strategic Framework⁴:

“To stimulate entrepreneurship and creativity through innovation, a European High Risk Innovation Council should be created by the consolidation of most competitive elements of FP programmes that target individuals, small groups and high-risk innovative SMEs into one flagship programme. This would create a counterpart to the ERC, but in pre-normative and applied research targeted at products and technologies that could revolutionise future European industry. Establishment of an European High Risk Innovation Council could likely do the same for the European applied research scene, as the ERC has done for the more curiosity driven European rese-

¹ Open Innovation, Open Science, Open to the World, 22 June 2015, Speech by Carlos Moedas, Commissioner for Research, Science and Innovation, Brussels, 'A new start for Europe: Opening up to an ERA of Innovation' Conference. http://europa.eu/rapid/press-release_SPEECH-15-5243_en.htm

² J. M. Langer, the then Foreign Secretary of Academia Europaea, contribution on AE behalf^d during the plenary panel “Large vs small” at FET'11 the European Future Technologies Conference, Budapest, 4-6 May 2011 http://videotorium.hu/en/recordings/details/2952,Panel_discussion_on_the_topic_large_vs_small_

³ “Support European innovation”, J. M. Langer, Research Europe No 318, 21-04-2011

⁴ A response from the Academia Europaea, May 2011 http://www.ae-info.org/attach/Acad_Main/Publications/AE_response/AE_green_paper_response_International_Organisation_May%202011.pdf

arch community. The FET programme, run for quite a time by the DG INFSO, could be very good model for such an initiative. Any such development would need a comparable treatment as the ERC in order to have a similar effect."

Just as important however, is the understanding that **in FET, Europe already has the nucleus of an EIC of world-class standing, representing a twin to the ERC.** Fundamentally, therefore the EIC needs to build on FET, and merge the best of FET with the winning design features of the ERC. FET could provide leadership about how to construct the EIC, and FET has a natural role in providing advice how to do it.

In more detail, the EIC could be modelled on existing FET initiatives, but would be ideally placed to extend these instruments to become the coherent cradle of the technological innovation that is needed to boost Europe's future taking into account societal aspects

The task of the EIC would be to support high-risk high-gain applied research in the most rapidly developing areas, where there is high likelihood of rapid commercialisation of research results and where the time factor is crucial (rapidity and flexibility are at premium) and where grants of between 1 and 10 million euro can enable chances for a breakthrough. The EIC should be a pan-European endeavour providing not only rapid and competitive source of financing high risk applied (technological) research, but also an equalizer across Europe and benchmark provider. There should also be a benchmarking input to choose and then attack Grand Challenges (flagship initiatives). The scheme could be a mixture of a USA type business angel venture capital action and a state-supported flexible and responsible policy action.

As regards finances, the overall scheme should primarily be financed by the EU budget. This will assure independence and faster implementation of the policy, similar to ERC. The scale ultimately is in the €1 billion/year range if only FET-Open and the FET-Proactive of today would be included. Budgets for the Flagship-type initiatives should be defined separately.

The risk of failure is very low, because the scheme would consist of very many (300+ cases/year – each about 3 years with a closure option) and today's experience with both FET-Open and the US experience of venture capital is that, although individual high-risk projects might bring few tangible technological solutions, funding enough of them ensures that the success of some more than compensates for the seed funding spent on the many less successful ones.

The efficiency and transparency of the EIC would be provided through the construction of the scheme based on relatively small grants and a simple two stage procedure, whenever justified.

The focal role that the EIC should play requires a high-level Board composed of top researchers with proven track record of entrepreneurial success and experienced industrialists especially from rapidly developing areas. It is thus expected, that such industries will become not only a supporter of the scheme, but also the end user and the guardian of its stability by providing the critical wisdom of practitioners

The EIC, as an EC-based funding body would then be based on a respected and efficient and tested operating scheme – FET – with, in addition, implementation of best practices from other Horizon 2020 programmes.

Of course the EIC may have a much broader role than just a new funding body for EU resources. Its relation to the policy activities, and the more industrially-oriented strands of the Framework Programme, as well as the EIT, should be a subject of a very careful consideration, as there is nothing more dangerous as a seemingly universal tool, especially as its creation requests a consensus among Member States and possible stakeholders.

CONCLUSIONS

This report summarises more than a year-long extensive analysis conducted by the FET Advisory Group. The FET programme has proven to be one of the most responsive and welcome programmes addressing emerging technologies. It could become the driver for the future economic well-being and competitiveness of Europe. To make it even more successful certain measures are needed and these have been briefly enumerated above.

From the earliest stage of our deliberations it became clear that the FET programme is an ideal tool to become a nucleus of much broader EU instrument. It will be a challenge for the proposed EIC to retain a balance between on the one hand supporting scientific excellence and on the other hand supporting implementation of the technologies of tomorrow. However, bridging this gap is a grand challenge for Europe, which needs to be addressed, and with a careful implementation we believe this is doable. To ensure a proper balance EIC should be a funding agency in the EC funding ecosystem, steered by a high level Board with members from a broad spectrum - high level scientists and scientists with a track record of innovation, entrepreneurs with a sense for cutting edge research, but also investors, and members with intimate knowledge about the FET, EIT, ERC, Societal Challenges and Industrial Leadership programmes.

The FET Advisory Group thus concludes that the FET programme should be recommended as the nucleus for the establishment of a European Innovation Council.

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