FET_TRACES

Tracing impacts of the FET programme

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Cross-cutting analysis: Success factors derived from the cases

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Author: Petra Schaper-Rinkel (AIT)
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About FET_TRACES

FET_TRACES is a research project for the European Commission which analyses and measures the impacts of the research funding scheme “Future and Emerging Technologies Open” (FET Open and FET Proactive). Within the European research funding landscape, the FET scheme acts as a pathfinder for new ideas and themes for long-term research in the area of information and communication technologies and beyond. Its mission is to promote high risk research, offset by potential breakthrough with high technological or societal impact (see http://cordis.europa.eu/fp7/ict/fet-open/home_en.html).

In the FET_TRACES project we will investigate and measure direct and indirect impacts of these two schemes on the science and technology landscape and its perception by individual researchers who are potential proposers for FET Open and FET Proactive projects. Results from innovation research will be used to develop a targeted indicator set covering central aspects of the FET mission (novelty, trans-disciplinarity, innovation-ecosystem). For the data collection we use sophisticated impact assessment methods like bibliometrics, patent analysis and online surveys. In addition to the impact assessment we will analyze selected breakthrough-projects to find out about necessary components for “breakthrough”-research. The study will also include insights from FET-like funders on national levels in Europe.

Terms of use

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Document history

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Content

1 Cross-cutting analysis of breakthrough-projects

To identify success factors and to get a detailed picture of motivations, processes and practices in FET projects, we conducted case studies for which we collected publicly available information and carried out interviews with project coordinators. The case studies highlight the variety of FET projects and are structured along the different phases of the projects (initial idea, forming of the consortium, carrying out research, etc.) as well as impacts of successful FET projects on knowledge, people, economy, and the society.

In this report, we briefly summarize the success factors derived from the cases based on a cross-cutting analysis of the cases. The first part summarizes success and impact related to the program level, and the second part summarizes success factors at the project level.

2 Impact generated at the program level

2.1 Impacts on knowledge

- A cross-cutting issue is that FET projects make an important *contribution to the changing knowledge system itself by developing 'common languages' between disciplines*.
- FET projects are interdisciplinary in varying degrees and in different forms. The often high level of interdisciplinarity requires large efforts in the respective projects. Project partners *establish a creative collaboration culture* to develop a common language and to integrate their inputs into one common framework in order to realize their research goals.
- The case studies show that the *collaborative and interdisciplinary mode of research is a strong driver for novel research approaches*.
- The collaborative and interdisciplinary approaches originally tried out in FET projects provide considerable support to the emergence and implementation of new '*interdisciplinary disciplines*', such as quantum chemistry, neuro computing, biophysics or computational social science.

2.2 Impacts on people

- A new generation of interdisciplinary scientists is trained through FET projects. They start their career in an interdisciplinary way from the beginning and they are not just physicists or just chemists."

- For PhD-students, FET projects are characterised by the chance to work together with internationally renowned scientists from different disciplines. The positive experience of collaboration has the effect that young researchers are motivated to do their own future research in an international, interdisciplinary, FET research manner.

2.3 Impacts on the economy

- Researchers involved in successful FET projects acquire a certain attitude towards broader scientific impacts as well as future economic impact. The collaborative and interdisciplinary mode of research broadens their perspective and sharpens their focus on issues concerning future products and process innovations that become possible through their research. Researchers state that FET projects have different aims – even those focussing on basic research have a long-term indirect economic impact because of their specific technology orientation.

2.4 Impacts on society

- In the case studies, FET researchers emphasized that the FET programme is a unique programme because it allows for developing original ideas which need excellent use-inspired basic research to realize its potential applications. FET is in-between basic research and engineering and gives researchers the freedom and possibility to try out new things and to experiment. Other national and European research funding programmes are considered to be more formalized, whereas FET allows for more freedom to achieve unexpected things.

- A cross-cutting issues is that there is a time lag between the research and its societal impacts. Use-inspired basic research clearly broadens the options for future technologies with wide societal impacts. However, the specific societal impact is difficult to determine in an early phase because it usually takes more than ten years to reach the stage of application in industry or to address directly societal challenges.

3 Success factors at the project level

The case studies show that the FET program enables collaborative groups of researchers to expand their own strengths. In summary, it can be said that the essential strength of FET Open and FET Proactive is to enable use-inspired breakthrough research beyond individual disciplines and beyond the horizon of individual principal investigators. The establishment of these culture(s) of collaboration is a main factor to make projects successful.

Success factors have been identified with regard to generating breakthrough ideas, developing successful proposals and doing collaborative research successfully. We can distinguish different drivers and strategies to develop breakthrough ideas and doing breakthrough research that makes collaborative FET projects successful.

3.1 Taking advantage of the excitement and wide attention for highly regarded science awards

Breakthroughs that affect broad research fields and whole disciplines as well as highly regarded science awards attract broad attention in science and in the public. They also trigger discussions in the more specific research communities.

The excitement and these broad discussions can become crucial for new collaborative project ideas. A scientific breakthrough or a new idea in the broader field or the discipline (represented, for example, by the award of the Nobel Prize) can trigger a specific successful project idea. This is especially the case when collaborative researchers have an idea for an alternative approach that is related to ideas that have just become famous (new 2D materials after the Nobel Prize for physics was awarded for work towards graphene).

The strategy of using the wider attention for a topic is reflected in the fact that the success of the proposal is often linked to the right timing and the right audience. *We proposed the project at the right time to the right people*.

3.2 Finding complementary interdisciplinarity

Successful FET projects can start with the need to involve a discipline that is far away from the own discipline to bridge the gap between theoretical models in one discipline and experimental approaches in another discipline. This is the case, for example, when

theoretical physicists seek collaboration with groups of experimental chemists to explore and invent new materials or in the case when a brain-inspired hardware research groups collaborate with experimental neuroscientists.

3.3 Finding contrasting interdisciplinarity

Successful FET projects start also with project ideas that need to involve a discipline that is far away from the own discipline to compare and align concepts and models. Example: Computer scientists collaborating for the first time with psychologists and anthropologists to define, identify and compare closeness of relationships. Established disciplines and research fields follow internal logics of established theories, methods, networks, power structures, and cultures. Successful FET projects can go beyond these disciplinary rivalries and build a deeper focus on specific problems by collaborating with disciplines that use totally different concepts and address the same problems form a different perspective.

3.4 Insufficient national funding initiates the development of collaborative project ideas

The FET program initiates the development of successful collaborative ideas, because sometimes it is not the idea at the beginning, but the need for researchers to find funding for their own research. Researchers who have already conducted research projects in their country of origin often broaden their approach to apply for collaborative FET funding. Transcending narrow disciplinary agendas is often directly linked to the existence of the FET program. In these cases, the researchers follow the idea of the funding program to develop their own ideas in just that spirit: in a collaborative and interdisciplinary form that would not have been developed without the funding program.

3.5 Finding the best groups in the field

A recurrent reason for the success from the project perspective is the quality of the groups involved in the project. Find the best research groups in the field is therefore the

strategy. These groups are identified differently: either through literature, or through references from researchers from their own institution or even through personal relationships. This is especially the case for coordinators that are connected to prestigious institutions.

3.6 Expanding interdisciplinarity step by step - based on the previous positive experiences

Positive experiences with interdisciplinary research are strong drivers for increasing interdisciplinarity. A strategy of successful FET projects is the gradual expansion of interdisciplinarity. This applies in particular to experienced coordinators, who expand the radius of interdisciplinarity based on previous positive experiences with interdisciplinary projects. This kind of 'bounded' interdisciplinarity is looking for very concrete approaches in other disciplines to develop approaches for breakthrough research.

3.7 Developing a vision and specifying goals

The goals and visions of successful FET projects are diverse, including toolboxes of new devices and discovering and inventing radically new materials. Many coordinators find collaboration to be time consuming. To compensate for this effect, the strategy is, from the very beginning to develop clarity of purpose and articulate what the consortium can reach together that they could not reach alone. This means thinking beyond individual approaches to whole research fields and big ideas. For example, 2D nanolattices, a FET Open project, which started in 2011 and ended in 2014, has brought together five partners to discover and develop materials in a similar way as graphene but with totally unexplored physical properties. Focusing on the vision to make a 2D – one layer – material out of silicon, the effort aims to accomplish what none of the groups could achieve on their own — to make silicene/germanene that needed cross disciplinary collaboration with regard to theory and with regard to solving the engineering problem.

3.8 Transcending insularity and silo-research

Individual research groups often assign their participation and resources to activities that perfectly align with their own research or they tend to use the collaboration with other

groups as a way to get other research groups to support their own priorities. Two dynamics in FET projects, which are often difficult to achieve, can be effective antidotes to this problem.

Successful and experienced coordinators who are committed to collaborative research projects start the project with a clear vision and with the ability and authority to build up an interactive setting, where the tasks are more dependent on each other. They focus internally on the core issue and act externally as a kind of 'Secretary of State', understanding the needs of the consortium and the demands of the 'outer world' (broader research field, European Commission, reviewers). *I have to make a good story out of the work in front of the European Commission and the reviewers.* Internally, they focus on scientific leadership and not on management issues. *Try to solve problems instead of posing certain behaviours and rules.*

Coordinators who are not that advanced in their career (*My CV was not advanced enough to apply to ERC*) use the success strategy of proposing an idea that meets the interests of the other groups. The FET program gives them a unique opportunity for an ambitious project because the idea and the consortia are crucial for the funding success. not their individual CV. Not all of the coordinators might be that highly committed to interdisciplinary research but the collaborative approach of the FET program gives them strong incentives to think in that way in order to receive funding. *FET promotes researchers very strongly to collaborate.*

3.9 Leading in a creative way through synthesizing, orchestrating, translating

The complex, cross-disciplinary research questions and innovation goals that characterize collaborative research projects require continuous learning and interaction to overcome the challenges that have not been foreseen and that cannot be foreseen. Coordinators of successful FET projects describe their work and efforts in a language that connects their approach with leadership and creative processes – not with management or a managerial language. They are of course by the way successful research managers (complaining about the bureaucracy) but their focus in describing their role is the work of synthesizing, orchestrating, and translating problems and results within the consortium and in the broader context. A crucial task is to stimulate the interaction within the groups. *My role was to promote the exchange of the group – to find the right loop in interaction.*

3.10 Connecting the specific research field with the broader context

Sharing what they have learned is an important issue for researchers from successful projects — both the results (as starting points for new project ideas) and the methods for achieving them. Scientists coordinating FET projects consider it highly valuable that the cooperating research groups achieve something *together* through interdisciplinary cooperation. They also express that — despite the technologies for virtual collaboration — the real joint meetings, the direct discussion, and the time-consuming work of developing a common language is essential for success in interdisciplinary and collaborative research.