Multi- Inter- and Trans-disciplinary research promoted by the European Cooperation in Science and Technology (COST): Lessons and experiments

Ioanna Stavridou, Afonso Ferreira

Multi- Inter- and Trans-disciplinary research promoted by the European Cooperation in Science and Technology (COST): Lessons and experiments

Ioanna Stavridou[1] and Afonso Ferreira[2]
COST Office
Av. Louise 149
1050 Brussels
Belgium

Multi-, inter-, trans- disciplinary research has gained a lot of interest and investment during the past two decades as a result of the realization that many of today's challenges are resistant to traditional research approaches and require cross-fertilization between different disciplines and integrated knowledge from heterogeneous sources (Kueffer et al, 2007). Despite these needs, evaluation of multi- / inter- / trans-disciplinary research remains one of the least defined aspects. For the purpose of this paper multi-, inter- and trans-disciplinarity will be indicated with the acronym MIT.

A number of publications exist, offering conceptual and/or pragmatic frameworks for inter- /trans-disciplinary evaluation, e.g. Klein 2005, Stokols et al, 2003, Defila and DiGiulio, 1999. According to Klein, 2008 and references cited therein, there are seven generic principles of evaluation: 1) variability of goals, 2) variability of criteria and indicators, 3) leveraging of integration, 4) interaction of social and cognitive factors in

[1] Ioanna Stavridou, PhD, is Science Officer for the Life Sciences Cluster, in charge of the Trans-Domains track at the COST Office. istavridou@cost.eu.

[2] Afonso Ferreira, PhD, is Director of Research with the French CNRS. Part of this work was done when on leave as Head of Science Operations at the COST Office, in Brussels, Belgium. afonso.ds.ferreira@gmail.com.

collaboration, 5) management, leadership and coaching, 6) interaction in a comprehensive and transparent system and 7) effectiveness and impact.

In Europe, transdisciplinary and interdisciplinary research complement the core of the European Research Area (ERA), where defragmentation of research and knowledge are major objectives in view of the achievement of a competitive knowledge-based European economy. COST (European Cooperation in Science and Technology), an intergovernmental organization of 36 countries and one of the longest-running European instruments supporting cooperation among scientists and researchers across Europe, is also working towards this aim. COST does not fund research itself, but the formation of European science networks having a global perspective.

In this context, our goal is to design and develop evaluation procedures that foster and promote high quality MIT research in the ERA. The resulting scientific networks should be flexible enough to promote multiple pathways of collaboration and integration, to lead to defragmentation of knowledge and to unveil new challenges and interconnections between disciplines. On the other hand, it should be noted here that such procedures must not only be sound and effective, but also operable at large scales.

As a large scale test-bed for the exploration of these concepts, COST launched in 2008 a new track for the submission and evaluation of proposals that specialises in MIT proposals, called Trans-Domain track. In the four collection dates recorded until the end of 2009, 18% of all submissions were assessed through this new avenue.

The objective of this paper is to share with research managers the experience garnered with this evaluation process of MIT proposals for the formation of research networks at COST. The discussion also includes, the advantages and disadvantages of this process and how it compares to other evaluation procedures implemented by several European research funding agencies.

This paper is organized as follows. In the next section we specify the kind of MIT research considered in the scope of COST. Then, we describe both the aims of COST when launching the specific track for the submission and evaluation of MIT proposals and the characteristics of COST Open Call and this new Trans-Domain track. The experiences and lessons learned are discussed in the following section, where several possible improvements are examined. Even though COST's Trans-Domain track is innovative at the European level, several countries also implement specific manners to

deal with MIT proposals and some of such attempts are addressed thereafter. We then close the paper with some concluding remarks.

On Multi – Inter – Trans – Disciplinary research

"In a world characterized by a rapid change, uncertainty and increasing interconnectedness, there is a growing need for science to contribute to the solution of persistent, complex systems" (Hardon et al, 2008).

A complex, life-world persistent problem requires at least the application of transdisciplinary research; a relatively new but well established field of research in the 'knowledge society'. Transdisciplinary research, in simple words, produces, integrates and manages knowledge of the interested parties of public agencies, civil society and the private sector to promote what is perceived to be the common good with regard to a specific problem.

Transdisciplinary and interdisciplinary research do not oppose but rather complement the disciplinary approach to knowledge production. Transdisciplinary research can be considered as an extension of interdisciplinary research (Cronin, 2008, Unesco, 1998). Actually according to Tress et al, 2006, transdisicplinarity combines interdisciplinarity with a participatory approach, i.e. academic researchers working together with non-academic participants to research a common goal and create new knowledge.

According to the US National Academy of Sciences, interdisciplinarity is 'a mode of research that integrates information, data, techniques, tools, perspectives, concepts and/or theories from two or more disciplines or bodies of specialized knowledge to advance fundamental understanding or to solve problems whose solutions are beyond the scope of a single discipline area or area of research practice (US National Academy of Sciences, 2004). The differences of interdisciplinary and transdisciplinary research is that the latter can lead to the evolution of disciplines and outcomes that are greater than the sum of the parts, i.e. it is a transcend process of knowledge production (Petts et al, 2008, and Cronin, 2008). In addition, transdisciplinary research involves approaches that could break down the boundaries of disciplines, involve knowledge generated by the combination of different elements from various disciplines, i.e. knowledge of non-disciplinary character, from relevant stakeholders and create new comprehensive knowledge and an overarching synthesis (Klein 2008; van den Besselaar and Heimeriks,

2001, OECD, 1972). As McDonell suggested 'transdisciplinarity can give birth to a 'meta-language', a transcendent language, in which the terms of all participants disciplines are, or can be, expressed' (Unesco, 1998). In this way complex issues can be properly addressed in a new 'intellectual space' enabling defragmentation of knowledge and promotion of innovation and cross-fertilization.

Multidisciplinary research occurs when the research subject is approached from different angles using different disciplinary perspectives. The different disciplines co-exist in the specific context while retaining their boundaries and methods; multi-disciplinarity does not involve any integration of new knowledge, and here lies its difference with inter- and trans-disciplinary research.

The evaluation of MIT proposals should then aim at identifying those that carry objectives that can only be achieved through multi-, inter- or trans-disciplinary undertakings.

How COST deals with MIT proposals

COST evaluation process of new proposals takes into account a number of the principles described above. It should be reminded though that COST only funds network formation and co-ordination and has characteristics that differentiate itself from other funding mechanisms, e.g. *à la carte* participation (no pre-defined consortium), no thematic priorities, funding is limited and for 4 years, depending on the number of European countries involved in the network (average funding per year is 100.000 euros). As a result of COST's unique nature, comparisons with the criteria set for funding research projects can be made only to a certain extent.

To explain further this differentiation between the research supporting funding institutes and COST it can be mentioned that COST criteria do not evaluate the excellence of the consortium as in the case of proposals to the Framework Programme, for instance, because the COST Actions are open to participation during their four years of lifetime. This means that the conventional metrics like number of patents, publications and citations can be used only to a certain extent since the Action can start with a network of a 'low-score' on quality indicators but end with a network of a 'high-score'. The 'a la carte participation' results in great flexibility, which can enable context-related

adaptations, deletions, and additions. Such flexibility can leverage integration, but is not frequently found in research supporting funding, whereas for COST, which supports only networking activities, it is an intrinsic characteristic.

The value of COST regarding MIT networks lies in the fact that within the four years of networking and collaboration, the researchers involved are enabled to develop a common language that will allow them to specify in greater clarity the issues that are central to the research problem and to develop methodologies that will enable implementable synergistic approaches, which through national or international research funding can eventually result in the resolution of the research problem of interest. COST networks can be considered as the incubators for bringing together scientists from different disciplines and other relevant stakeholders to set the foundations for the applications of MIT research proposals.

The recently adopted Trans-Domain (TD) proposal track in COST Open Call for Proposals is explained below.

COST Open Call

The Open Call for Proposals at COST is continuous with two collection dates per year. It has no thematic priorities, i.e. a bottom up approach, and with the a la carte participation mentioned previously. The evaluation of the proposals is a two-stage process which involves a first evaluation of Preliminary Proposals followed by the evaluation of invited Full Proposals.

Assessing preliminary proposals

The preliminary proposals are up to 10 000 characters long and need to follow a specific template. As a requirement a minimum of 5 COST countries are required to participate in the preliminary proposal. COST countries are 36 and include the 27 EU countries, the candidate countries (Bosnia and Herzegovina, Croatia, the Former Yugoslavian Republic of Macedonia, Turkey), EFTA member states (Iceland, Norway and Switzerland), the Republic of Serbia, and Israel, which has a cooperation status with COST. The Coordinator of this preliminary network is called the Proponent. The Proponent also needs to indicate to which Domain the proposal is submitted. COST has 9 Domains and respective Domain Committees (DC):

Biomedicine and Molecular Biosciences (BMBS), Chemistry and Molecular Sciences and Technologies (CMST), Earth System Science and Environmental Management (ESSEM), Food and Agriculture (FA), Forests, their Products and Services (FPS), Individuals, Societies, Cultures and Health (ISCH), Information and Communication Technologies (ICT), Materials, Physical and Nanosciences (MPNS), and Transport and Urban Development (TUD).

The preliminary proposals are first examined for eligibility for COST support. All non-eligible proposals are discarded.

If a preliminary proposal cannot be readily allocated to a Domain because its topic is very broad and MIT then is considered as a Trans-Domain Proposal (TDP) and follows the TD track of evaluation. In this way, an MIT preliminary proposal will have a more accurate and fair evaluation by the pool of experts, since this involves a much greater range of expertise than the ones of the pool of experts of a single Domain.

Once the allocation of the preliminary proposals is agreed, the Preliminary proposals are assessed electronically by the Trans-Domain Standing Assessment Body (TDP-SAB). The TDP-SAB is composed of 3 representatives from each Domain, i.e. DC members, who have been nominated by their countries as experts in the relevant Domain. The Chair of each Domain is always one of the 3 experts. In the TDP-SAB, 27 experts from 9 Domains participate. In addition to the 27 members of the TDP-SAB, 53 additional experts who have been indicated by the 9 DCs constitute an additional pool of experts, who are also invited to evaluate the preliminary proposals.

The best preliminary proposals are the ones which fulfil the best with the evaluation criteria; i.e. they address real current problem or scientific issues, are innovative, are projected to have a high impact on society, technology or science and are clearly written.

Once the evaluation of the preliminary proposals is completed, these are ranked and the best ones are selected for the next stage. The number of preliminary proposals that pass to the next stage in each Domain / TD track is calculated in a per-equation based on the number of the submitted eligible preliminary proposals in relation to the total number of preliminary proposals submitted for that Collection Date. This filtering method enables the identification of the best preliminary proposals in a competitive and transparent way. The maximum number of preliminary proposals that can go through to

the next stage is 11. For the TD track the numbers of TD preliminary proposals were OC-2008-1: 65 out of 386, OC-2008-2: 81 out of 378 OC-2009-1: 97 out of 477, and OC-2009-2: 63 out of 468. In all four cases 11 preliminary proposals were invited to submit a full proposal.

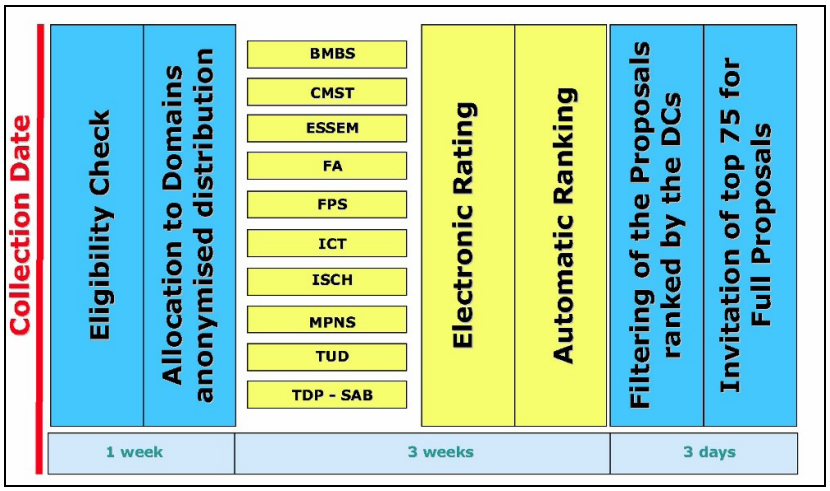

Figure 1: Selection Process of Preliminary Proposals

Peer-reviewing and selecting best full proposals

The next stage of the evaluation involves the submission of the Full Proposals, which are no more than 10 000 words in length and should follow the electronic COST template. For the evaluation of the submitted Full Proposals, COST consults both remote evaluators and evaluators participating in a 2-days meeting. Based on the keywords, content and Domain indication, evaluators are identified according to their expertise and publication track record. COST always attempt to find evaluators whose expertise encompasses all subject areas covered in the proposal. In addition, COST aims for a rather balanced European countries representation and also for a gender balance in the evaluation panel.

This stage of the evaluation of the Full Proposal is as follows. A first stage involves the remote evaluation of the Full Proposals by evaluators allocated to each proposal. The proposals are evaluated amongst others on the following: 1) if COST is the right funding mechanism to achieve their proposed goals and objectives, 2) Science (state-of-the-art, innovation, addresses a real current problem), 3) impact (societal, economic, technological, scientific), 4) structure and organization, 5) contribution to the

wider goals of COST (early stage researchers, gender balance, breadth of network). The evaluations of the remote evaluators are then made available to an External Expert Panel before their meeting convenes.

The External Expert Panel is requested to read all submitted proposals so as they can all contribute as generalists if not experts. During the meeting the experts give their evaluation taking into account the evaluation of the remote experts on the relevant proposal. This is followed by rounds of discussion where the strengths and weaknesses of all proposals are identified and discussed in relation to each other. The External Expert Panel evaluates and writes a consensus report for each proposal, where the evaluations of the remote experts and the External Expert Panel, as well the discussions, are taken into account. In the report by the External Expert Panel the strengths and weaknesses of the proposal are highlighted, suggestions for improvement are made, and leading experts or institutions in the relevant field for involvement in the network are suggested. In addition, the External Experts Panel recommends a subset of the proposals for further evaluation.

The next stage of evaluation involves a presentation of the proposal before the TDP-SAB, followed by a discussion. The TDP-SAB then ranks the Full Proposals based on the evaluations of the External Expert Panel, on the presentation and on the answers to their questions. In case the ranking of the TDP-SAB does not follow the rating of the External Expert Panel clear justification should be given.

Moreover, the TDP-SAB also in consultation with COST allocates the Proposals to one of the following three Clusters:

Cluster “Life Sciences” (Biomedicine and Molecular Biosciences; Food and Agriculture; Forests, their Products and Services)

Cluster “Natural Sciences” (Chemistry and Molecular Sciences and Technologies;

Earth System Science and Environmental Management; Materials, Physical and Nanosciences)

Cluster "Science in Society” (Information and Communication Technologies, Individuals, Societies, Cultures and Health; Transport and Urban Development)

At this stage all proposals per cluster are in competition with each other and the best proposals are recommended for funding to the JAF group (the executive group of the Committee of Senior Officials, CSO) and subsequently to the CSO.

In case a TDP is approved by the CSO, it is allocated to a single Domain within the allocated cluster for administrative purposes.

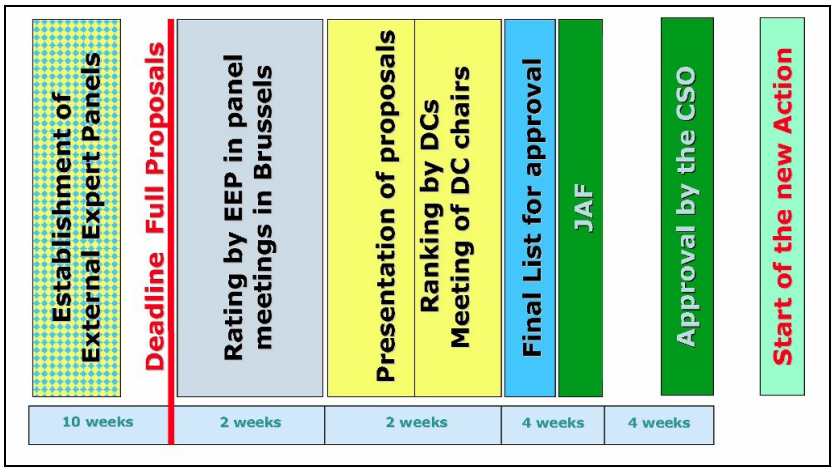

Figure 2: Selection Process of Full Proposals

Examples of successful MIT proposals

During the first four collection dates where this procedure has been applied, i.e. 2008 and 2009, six Full Proposals of the TD were recommended by External Experts Panel to the TDP-SAB Hearings in each case. At the end, four, three, and three Full Proposals were funded, respectively. Examples of TDs that have been funded by COST are:

- Detecting evolutionary hot spots of antibiotic resistances in Europe (DARE)

This Action aims at identifying the key evolutionary and ecological processes, which lead to the evolution of antibiotic resistances in the urban and natural environments. Mathematical modelling on the spread of antibiotics and antibiotic resistances will contribute to risk assessment allowing possibilities of interventions, and to guidelines for measures to reduce evolution of antibiotic resistances in the environment and to better

prediction of the effectiveness of newly developed antiobiotics. Its interdisciplinary character lies within four domains of COST - ESSEM, FA, BMBS and CMST (see page 5). This Action undoubtedly has a societal implication as well, since is well known that bacterial resistances to antibiotics are increasing and pose a serious threat to the public health.

- Soundscape of European Cities and Landscapes

The main aim of the Action is to provide the underpinning science for soundscape research. It will promote soundscape into current legislations, policies and practice, aiming at improving/preserving our sonic environment. It will promote health and sustainability, attract investment, convey cultural uniqueness/diversity and enhance quality of life. The TD character of the proposal lies within the Domains of TUD and ISCH.

- Understanding and manipulating enzymatic and proteomic processes in biomineralization: towards new biomimetic strategies, the creation of tailored nano-scale architectures and environmental monitoring

The main objective of the Action is to promote research on the biomineralisation processes of selected land, freshwater and marine species for both environmental biomonitoring and as a source of new biomimetic strategies and materials. New materials could be utilised particularly in osseo-integration as scaffolds for bone or cartilage repair/ replacement, or in dental applications though the creation of hydroxyapatite from the shells of mollusks. The TD character of the proposals lies between the domains of CMST, MPNS and ESSEM, with applications in BMBS.

- Submerged Prehistoric Archaeology and Landscapes of the Continental Shelf

The main objective of the Action is to promote research on the archaeology, climate and environment of the drowned landscapes of the continental shelf, created during periods of lower sea level, which form a major part of the European cultural heritage. It will create a structure for the development of new interdisciplinary and international research collaboration, and provide guidance to archaeologists, environmental and marine scientists, heritage professionals, government agencies, commercial organisations, policy makers and a wider public. The TD character of this Action encompasses the domains of ISCH and ESSEM.

COST and MIT Proposals – the way forward

Overall, the evaluation process of TD proposals at COST is a quick, transparent, fair and highly competitive process; the proposals are in competition first within the proposals submitted to the TD track and then with the best proposals of the relevant Cluster. For a successful proposal to be funded it takes around eight months from the day of submission of the preliminary proposal. The evaluation of the proposals throughout the process involves a satisfactory number of evaluators coming from different disciplines. The involvement of at least 60 experts from different areas, throughout the evaluation process is a requirement stemming from the inter- or trans-disciplinarity character of the proposals. COST pushes for the assessment of the TDPs based on the broader context of inter- or trans- disciplinarity and not just in the narrower context of the reviewer's own discipline or research interest. This is important especially in the case that the proposed network does not involve research at the cutting edge of any discipline.

For a MIT proposal the leadership of the proponent(s) should be evident and the strategy to deliver the outlined desired outcomes should be clearly stated (Gray, 2008). These two very important determinants of the success of the proposed network are recognized by COST and that is the reason Hearings is an indispensable part of the evaluation process. The proponent(s) are given the opportunity to address further the comments or problems pointed out by the External Experts Panel, to answer to questions raised by the TDP-SAB regarding impact, to clarify any other issue raised, and also to demonstrate that they have the necessary leadership style.

It should be noted that the evaluation process of the TD proposals is a relatively new process at COST, which although according to the gathered experience is successful, it can still be improved. As in the case of evaluation of MIT *research* proposals, limitations exist in the process. As Huutoniemi, 2007, stated 'the underlying dilemma in inter- and trans-disciplinary *research* evaluation is that quality assessment of knowledge production is rooted in disciplinary standards and practices, but the different perspectives involved in integrative activities may be epistemologically irreconcilable'.

In this respect, some hurdles that COST has encountered during the TD proposals evaluation along with possibilities to circumvent these are described below:

- A proposal is considered by COST as MIT when two or more Domains are indicated that need to work in an integrative way in a ratio of at least 40:60. This ratio is though subjective. The Science Officers of the relevant Domains are guided on this not only by the general content of the proposal but also by the methodologies and strategy that the different Working Groups propose to follow in order to develop a theory, answer a research question or develop guidelines or standards. Despite the fact that COST does not provide funding for research, it is important that the Working Groups tasks are described and elaborated so as to justify the need of the formation of the network. The fact that the evaluation of the ratio of the involvement of two Domains in a network is subjective suggests improvement of the system. A way to improve this is to transfer part of the responsibility to the proposers. For instance, in addition of indicating the Domains envisaged to be involved in this network, they should also clearly specify why an inter- or trans-disciplinary approach is needed and which type of approach is envisaged.

- Referees are selected taking also into account whether they are involved or are familiar with inter- or trans-disciplinarity research. In some cases the network is focused on a very innovative research topic and can involve all major European laboratories working on this topic, which leaves empty the pool of European reviewers. A solution is involvement of referees outside the European arena. This has an inherent risk of the referees not being fully aware of the relevant inter- or trans-disciplinary research in Europe, hence of the impact that such a network could have.

- The evaluators have to differentiate in some cases whether a proposal will address economic/ societal needs or scientific/ technological needs or both. It is therefore important that the applicant(s) need to make it clear how inter- or trans- disciplinarity will be reflected in the outputs. These will enable the reviewers to evaluate the extent to which the project will address issues of social, technical or policy relevance and also whether the project will aim to have an impact in different fields or, through the development and utilization together of technologies and methodologies from different fields, to impact one discipline or field.

- Structure and Organisation is another very important point that needs to be well elaborated in the TD proposals. For the success of a network of a TD character the organization structure should be well defined in such a way that fosters communication and networking among the different Working Groups. In the case of TD proposals it is important that the network finds ways to understand how each discipline approaches a research issue and develops a language understandable to all experts involved before addressing the issue, since this can affect the value and extent of integration. For this reason, an organizational chart and task distribution along with a timeline are highly requested. It is important also to note that in the TD proposals the goals should be clear, but the milestones or routes to achieve those could be subject to revision with time (Lyall et al, 2007).

- The TD proposals are in direct competition with the proposals of disciplinary character at the last phase of the evaluation process; this can be problematic in some cases when the integrative and context-specific achievements of TD proposals are not attributed the deserved credit and hence TD proposals are disadvantaged. The TD track should be treated separately, like any other Domain in COST. This would level the field for competition and minimize the '*mono-disciplinary syndrome'*.

Funding MIT projects based on established mono-disciplinary funding systems has intrinsic difficulties that need to be dealt with, for the reasons explained above. MIT is a new era of research and adaptations or changes to the current evaluation systems are required. In order to overcome those, a number of other obstacles should be resolved. For instance the number of truly MIT researchers is relatively small; this is due to the weakness of multidisciplinary career structures, the lack of established interdisciplinary scientific journals, and current education systems hardly promote multidisciplinary graduates and postgraduates. This lack of truly MIT researchers, and hence of potential evaluators, can lead to the marginalisation of novel MIT projects submitted where no recognised set of referees are individually qualified to evaluate it.

Despite that MIT proposals have great potential to lead to significant innovations the possible intellectual conservatism of research funding institutions can hinder MIT research projects to secure funding. Moreover MIT proposals often involve a high initial

effort (both in terms of funds and of personal commitment). This stems from the disparity of scientific languages between people with different educational backgrounds. In order to overcome this kind of obstacles more personal investment to learn from the other disciplines and to accept new concepts/ ideas and methodologies are necessary. In order to achieve this, more time and more proximity are required so as to exchange knowledge and overcome constraints between disciplines. Such needs can lead to higher budget requirements than expected, as well to heavy time constraints.

COST characteristics can truly benefit MIT research projects by being a light platform providing the necessary tools for the establishment of MIT networks, for the exchange of knowledge and for overcoming possible constraints between disciplines, leading to an acquired momentum necessary for the fulfillment of the research goals.

Related strategies to assess MIT proposals

Several COST member countries implement specific manners to deal with the assessment of MIT. In this section we discuss some of them as well as how the European Research Council (ERC) with this issue.

In the UK, Research Councils do not have specific guidelines to assess MIT research project proposals. Usually several reviewers will be necessary to complete the assessment, some Councils tailor their peer review body accordingly, whereas other Councils bring in additional reviewers (each reviewer assessing the section of application that they have expertise in). The Research Councils have make amendments to their collaboration on the peer review and funding of MIT projects as described in the Cross-Council Funding Agreement (http://www.rcuk.ac.uk/research/prrcremits.hmtl). According to this, all responsive-mode research grant applications that extend beyond a single Research Council's remit will be assessed by peer reviewers from across the relevant domains. Beyond this stage, decisions will be made through a single Council's peer review process but any significant element residing within another Council's remit will be funded by the Council(s) concerned.

In Turkey, the Academic Research Funding Directorate, which oversees all Committees (Basic Sciences; Environmental, Atmospheric, Earth and Marine Sciences; Electrical, Electronics, Informatics; Engineering; Health Sciences; Social Sciences and

Humanities; Agriculture, Forestry and Veterinary Sciences) has considered carrying out the evaluation of these proposals itself instead of allocating them to Committees. The evaluation process would start with the proposals being sent to evaluators suggested by the relevant Committees and would end with a consensus meeting with the Committee Chairs, based on evaluators' reports. Accepted proposals would then be allocated to one of the related Committees for award processing and monitoring. Rapporteurs from all relevant Committees would be used for post-evaluation monitoring.

The Cyprus Research Promotion Foundation (RPF) deals with multidisciplinary proposals by establishing panels of external evaluators of various expertises to cover each proposal's thematic spectrum. Such a panel would consist of anything between two to seven evaluators, depending on the needs of the proposals submitted. In case needed RPF can request presentation of the proposal to the external evaluators panel. After the completion of the evaluations the applicants negotiate with RPF the budget of the proposal. The process is the same as with mono-disciplinary proposal.

The Swiss National Fund (SNF) has a separate process for inter- or transdisciplinary research proposals involving a special committee of experts, named as Specialized Committee Interdisciplinary Research. This Committee is composed of at least eight members of the National Research Council, and each of the four SNSF divisions is represented.

At the SNF, an application is considered as inter- or transdisciplinary if the following three requirements are cumulatively complied: 1) The research topic includes two or more scientific disciplines, 2) the research requires the reciprocal interaction between two or more disciplines, 3) within the scientific approach, the reference to common theoretical concepts and methods as well as to their common evolution is needed for all involved disciplines. The proponents, based on the above three questions, are asked to describe the inter- or trans-disciplinary nature of their project, in an attempt to convince the Committee of the inter- or trans-disciplinary nature of the proposal. If the applicant does not succeed in convincing the Committee, the project does not go to the next stage of evaluation.

The ERC evaluation is a two-step process that involves a single submission of a full proposal. ERC, for operational reasons, has three main research domains, namely

Physical Sciences and Engineering, Life Sciences, and Social Sciences and Humanities, with a total of 25 individual ERC panels.

In the case of interdisciplinary proposals, including cross-panel and/or cross-domain research projects and research with the potential to open new fields, the Principal Investigator (PI) may indicate except from a 'primary evaluation panel', a 'secondary evaluation panel'. It should be noted though that the primary panel will determine whether the proposal is indeed interdisciplinary. If this is confirmed, then it can request additional reviews by appropriate members of other panel(s) or additional referees. If though the primary panel decides that the proposal falls within the panel's scope then it will only be evaluated by this panel. The PI should also indicate one or more panel descriptors, i.e. research fields involved.

The first step of the evaluation involves evaluation of Section 1 of each proposal, which among others includes a concise presentation of the scientific proposal. Each proposal is evaluated by at least three reviewers and then a meeting is convened where the panels meet to discuss and establish a ranking list of those proposals that meet the quality threshold. Proposals which pass the quality threshold and lie above the budgetary cut-off level will pass to the step 2 of evaluation. The interdisciplinary domain has an indicative budget of 13% of 2010 budget.

During step 2 of the evaluation panel may request additional reviews by appropriate members of other panel(s) or additional referees for the evaluation of the complete version of the interdisciplinary proposals. Once the evaluations are completed, the panel chairs of each research group will rank the proposals of their domain. In order to establish the ranked list of the Interdisciplinary Research domain, the proposals of interdisciplinary nature will be brought forward from all three research domains and all evaluation panel chairs will evaluate from an interdisciplinary perspective, the scientific added value of the proposal based on the second evaluation criterion (Research project).

Conclusions and recommendations

In this paper we reported on the COST experience with the assessment of MIT proposals. We described in detail how such a process is implemented in the COST

framework. Although the majority of stakeholders are satisfied with the current procedures, we highlighted some specific parts where there is room for improvement and provided possible solutions to current difficulties.

Among such suggestions we highlight the importance of 1) having panels of different expertise with evaluators acting as experts and generalists, as well as remote evaluators for a more accurate and fair evaluation, 2) setting criteria which help evaluators to capture the knowledge composition as a whole and understand the possible impact of the weaved perspectives could have in a socioeconomic or scientific and technological way and 3) having Hearings where the applicant's leading abilities are demonstrated and clarifications are provided on the proposal. In addition, more institutional support and encouragement should be given to MIT research. Finally, funding agencies should adapt their criteria to support novel research communities minimising the '*mono-disciplinary syndrome'* of the evaluation of TDs.

Because COST only funds the networking of research, which is funded from other sources, dealing with MIT proposals is perhaps easier, at least budget-wise. As a consequence, the potential of COST in the European Research Area, especially in regards to MIT research, should be fully utilised, for instance for the preparation of next generation MIT research project proposals, and for the establishment of a strong MIT community in Europe. We note that COST not only recognizes the importance of trans-, inter- multi-disciplinarity, but also promotes those in a multi-dimensional way; namely it organizes strategic and exploratory workshops of trans- and inter-disciplinary character, e.g. July 2009 strategic workshop on ICT in Food Security in 2030, as well as training schools between networks of different disciplines.

We hope that the interested reader will find in this paper grounds for promoting MIT research in a sound and broad manner.

References:

1. Committee on Facilitating Interdisciplinary Research, National Academy of Sciences, National Academy of Engineering, Institute of Medicine, 2004. *Facilitating Interdisciplinary Research.* The National Academies Press. Washington, D. C.
2. Cronin K, 2008. Transdiciplinary research (TDR) and sustainability. *Overview report prepared for the Ministry of Research, Science and Technology* (MoRST).
3. Defila R, DiGiulio A, 1999. Evaluating transdisciplinary research. In *PANORAMA* [Newsletter of the Swiss Priority Program Environment, Swiss National Science Foundation] 1/99. *Facilitating interdisciplinary research,* 2004. National Academy of Sciences. Washington, DC: National Academies Press.
4. Gray B., 2008. Enhancing transdisciplinary research through collaborative leadership. Am J Prev Med, 35 (2S): S124-132
5. Hadorn, G.H., Hoffman-Riem H., Biber-Klemm S., Grossenbacher-Mansuy W., Joye D., Pohl C., Wiesmann U., and Zemp E. (Eds) 2008. *Handbook of Transdisciplinary Research*. Springer.
6. Huutoniemi K, 2007. Evaluation of Interdisciplinary Research. *Oxford Handbook of Interdisciplinarity*
7. Klein J T, 2005. Guiding questions for integration. *Integration Symposium 2004 - Proceedings.* Canberra: Land and Water. Australia.
8. Klein J.T., 2008. Evaluation of Interdisciplinary and Transdisciplinary Research – A literature Review. Am J Prev Med, 35 (2S): S116-123.
9. Kueffer C., Hadorn G.H., Bammer G., van Kerkhoff L., Pohl C., 2007. Towards a Publication Culture in Transdisciplinary Research. *GAIA* 16/1:22-26
10. Lyall C., Bruce A., Tait J., Meagher L. 2007. Short guide to Reviewing Interdisciplinary Research Proposals, *ISTTI Briefing Note* (Number 2).
11. Organisation for Economic Cooperation and Development, 1972. Interdisciplinarity: Problems of teaching and research in universities.
12. Petts, J, Owens, S. and Bulkeley, H. 2008, Crossing boundaries: Interdisciplinarity in the context of urban environment, *Geoforum*, 39:593-601.
13. Stokols D, Fuqua J, Gress J, Harvey R, Phillips K, Baezconde-Garbanati L, et al, 2003. Evaluating transdisciplinary science. *Nicotine & Tobacco Research* 5, Supplement 1: S21-39.
14. Tress, B; Gunther, R. and Fry, G., 2006. Defining concepts and the process of knowledge production in integrative research. Chapter 2 in Tress, B. et al *From Landscape Research to Landscape Planning – aspects of integration, education and application.* Wageningen UR Frontis Series 12, pp 13-26.
15. Unesco, 1998. Transdisciplinarity 'Stimulating Synergies, Integrating Knowledge'.
16. Van den Basselaar P., Heimeriks G. 2001. Disciplinary, Multidisciplinary, Interdisciplinary – Concepts and Indicators. *Conference on Scientometrics and Informetrics- ISSI2001*. Sydney, Australia.

Websites

1. http://www.transdisciplinarity.ch/d/index.php
2. http://www.rcuk.ac.uk/research/prrcremits.hmtl
3. http://www.research.org.cy/EL/index.html
4. http://www.tubitak.gov.tr/home.do?ot=10&lang=en
5. http://erc.europa.eu/pdf/ERC-AdG-2010.pdf
6. http://www.snf.ch/E/Pages/default.aspx