An ERA-Net initiative for promoting infrastructure funding in the life sciences

Summary of the results of the first year of ERA-Instruments

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***ERA-Instruments* aims** at initiating coordination and a sustainable network of ministries, charities, funding agencies and research councils active in funding of life science research infrastructure (RI). This European platform of relevant stake-holders has begun developing comprehensive tools for adequate treatment of instrumentation related topics enabling conclusions for research policies on both a national and European level. ERA-INSTRUMENTS is focussing on bio-analytical instrumentation (incl. post-genomic high-throughput techniques) such as NMR, mass spectrometry, microscopy, micro-array platforms, next generation sequencing etc. With the broad experience with RI funding of its partners and the scientific input from the Scientific Advisory Board *ERA-Instruments* is working towards optimizing the accessibility of mid-size RI for scientists across Europe.

During the last years it has increasingly been accepted that concepts and strategies for research infrastructure (RI) funding should be harmonised and coordinated within the EU. ESFRI has determined requirements for European RI funding and has presented a roadmap. Growing attention is paid to life sciences that rely on RIs of a less centralised, but more networked dimension. There is a clear need for action in the interdisciplinary area between physics, chemistry, biology and medical sciences as cutting edge instrumentation becomes increasingly expensive and, yet, indispensable for world-class research. However, promotion of research policies, apart from the ESFRI projects, has been restricted so far to national efforts without managing these actions with a European view. Funding and research organisations cannot afford to remain at the national stage with world-wide competition for the best scientists and the most promising projects. Frontier research is international since long and funding organisations have to follow scientists to the European level.

In its first year (starting in April 2008) the *ERA-Instruments* project has laid the grounds for the coordinating activities that hopefully will initiate the step from national to European RI funding policies. Results so far include an assembly and analysis of national roadmaps for life science infrastructure, a collection and comparison of national RI funding schemes (in Europe) as well as a directory of Non-European funding organisations. A pilot user meeting on advanced confocal laser light microscopy methods and a comprehensive inventory of high-field magnetic resonance equipment in Europe (NMR spectroscopy and MR imaging) were successfully conducted. Conclusions could already been drawn regarding necessary improvements to RI funding schemes and conditions for transnational use of life science RI facilities. Best practice guidelines for efficient operation of RI were identified. A vital component was the continuous consultation of scientists including the Scientific Advisory Board of ERA-Instruments, but also many more scientists, e.g. via online questionnaires.

In the following some results will be detailed a bit more:

The analysis of national RI roadmaps in Europe showed that most countries have developed roadmaps or are currently doing so. The roadmaps were/are generated with different procedures and have different levels of detail and purpose. Nevertheless, RI policies for the life sciences show a number of similarities:

- a strong international orientation; the developments in international policy on RI (especially ESFRI) are closely followed;
- the importance of life sciences (LS) research is widely recognized, and the RIs in this area of research constitute generally a significant portion of the total RIs included in the roadmaps; often they also receive a considerable portion of the available funding;
- the same fields of relevance in the LS research are identified: among others translational research, medical and natural collections, bio-imaging, nuclear magnetic resonance (NMR) and MS, genomics and animal models;
- the acknowledgment of the interdisciplinary character of LS research;
- the need to consider in the budget scheme the operation and maintenance costs of facilities, and to invest in training and acquisition of specialized personnel.

The analysis confirmed that many countries are following the trend set by the ESFRI Roadmap, and develop - or are developing - an own roadmap for research infrastructures. Clearly, countries are looking for a system to allocate the limited funds for research infrastructure in a coordinated way at the national level, at the same time taking into account the developments at the international level.

The collection of RI funding strategies revealed a broad variety of funding schemes in European countries. However, some typical characteristics can be identified, such as ad hoc bottom up character of calls with broad coverage of scientific fields and subsequent peer review evaluation based usually on the scientific relevance, availability of similar equipment and potential users. Comparing national RI funding policies identified some common practices as well as potential steps that can be implemented in order to optimize and further develop the infrastructure funding schemes within the EU.

The **directory of Non-European funding organisations** is currently transformed into a public data base with continuous updating, potentially by the scientists themselves via a wiki approach.

A **first user meeting** on optical microscopy – not contained in the original work programme and one year earlier than originally scheduled – was very successful with the identification of weaknesses of funding procedures (from the perspective of the scientists), of specific as well as general problems with the manufacturers (some of them were also participating) and with a most lively debate on the requirements for software for the acquisition and post-processing part that is almost as important as the microscopy hardware itself. In summary, the user meeting met the expectations in full and a report on the discussions and the outcome will be made available to the public soon.

In a case study ERA-Instruments tried to establish a **European RI inventory** of leading edge equipment in European life sciences on the example of nuclear magnetic resonance (NMR) and magnetic resonance imaging (MRI). The purpose of the case study was the identification of the involved communities and establishing a profile of RI centres that might be of interest both to funding bodies and to scientists. An online questionnaire was distributed by the *ERA-Instruments* partners and the task leader to address all relevant laboratories throughout Europe including also countries that do not actively participate in *ERA-Instruments*. Obtaining comprehensive information and a full coverage of sites of interest proved to be a considerable challenge, but an incomplete inventory was out of the question at all times as it would be of very limited value.
Addendum: The data has been published in an online data base (http://www.gacr.cz/era-instruments-database.html) and the contents have been summarized and analysed in an accompanying report.

Recommendations about **access to RI facilities** were elaborated on the basis of information gathered from a series of case studies of user facilities around Europe as well as discussions with the Scientific Advisory Board. It was seen important that facilities should include some cutting edge research so that the competitive edge of the facility can be maintained. This can be achieved by placing cutting edge technology development within the facility, in conjunction with instrument manufacturers, which will have advantages for both facility managers and developers. It was noted that facilities can experience difficulties with recruiting well-qualified researchers as there does not appear to be clear career progression when researchers are providing services rather than conducting their own research. A series of service models were considered, which involved the provision of sample preparation, training in instrument use and data analysis. Access models, including whether to include a peer review step were considered. A project feasibility check was commonly included ensuring that projects can be run, even when no formal peer review was performed. Different charging models were considered, ranging from full cost recovery to free access.
The benefits of access to cutting edge facilities for the user community are obvious. The remaining problems can be solved by preparation. Contact should be made as early as possible with facility managers to clarify in what form samples should arrive, and find out how much help and training should be expected for sample preparation, instrument use and data analysis. The treatment of intellectual property and the mode of publication of results should also be clarified at an early stage.

The aspects of **efficient operation of cutting edge instrumentation** overlapped to some degree with the considerations about access arrangements as described above. The discussion at a specific experts workshop focused on the operation of instrumentation within the key areas structural biology, proteomics, genomics and bioinformatics. Different organisational and, especially, financial requirements for delivering the instrumentation necessary for structural biology, genomics, proteomics and systems biology were identified and these differences would also apply to an analysis of instrumentation in other areas such as flow cytometry, microscopy and imaging. Best practice for running equipment in Europe is therefore necessarily based on a pragmatic approach that is flexible enough to accommodate many different funding and operational models. Funding models might range from free access to full cost calculation with the major financial requirements originating from investment in equipment, upgrading of the same or from running costs including service contracts that can contribute quite significantly to the overall bill. Personnel might not be the main financial problem. But recruiting and keeping the highly qualified staff, that is a precondition for any successful operation was generally seen as major challenge given the limited career options and the partially insufficient acknowledgement of their contribution. Training should always be part of the RI facilities responsibilities. Adequate ways need to be defined for RI centres to demonstrate their performance. Co-authorships of publications of users of the respective facilities must not be the only way of acknowledging the contribution of RI centres.
Adequate software for data analysis is very important for all kinds of equipment, but the current status is satisfactory only in a few fields such as x-ray-crystallography and cryo-electron microscopy, whereas others fields, e.g. NMR or genomics, depend currently on individual solutions with all accompanying disadvantages.

Year one of the project provided ample results in terms of detailed analyses and investigations. Further steps of *ERA-Instruments* will make use of the output which builds a substantial basis for recommendations and future activities necessary to further improve the funding situation for life science RIs across Europe.