



Euro-BioImaging

Proof of Concept Studies

Principles and Outcomes

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1. Background

Advanced and innovative imaging technologies are becoming increasingly important for analysis of molecular dynamics in cells and organisms, delivering certain information easier than standard biochemical methods. Significant recent developments of imaging technologies caused the exponential growth of the number of publications based on imaging techniques. 40% of these publications come from European research groups, placing Europe on the second place (after the US) in the number of publications using imaging (www.gopubmed.com on November 2012).

European life scientists lack access to innovative imaging technologies. This became clear in a survey launched by Euro-BioImaging in 2011 which was filled in by 660 European biological and medical researchers. Euro-BioImaging believes that this gap could be reduced by creating a distributed imaging infrastructure offering open access to external users from other European institutions. Such open access model will not only bring scientific benefits. It could mitigate the high costs of innovative imaging technologies and the scarcity of expert staff, increase international cooperation and boost transfer of knowledge among European researchers. At present, less than 10% of imaging infrastructure in Europe is accessible to external users coming from other research institutions or countries. Increasing this percentage is the aim of Euro-BioImaging.

The Euro-BioImaging mission is to establish a distributed set of open access infrastructure Nodes, which will provide at least 50% of their capacity and expertise to European scientists, external to the provider's organisation.

2. Proof of feasibility of the Euro-BioImaging Concept and maturity of imaging technologies

In order to test this concept's strengths and weaknesses, refine standardized execution and access protocols and prove that distributed infrastructure offering open access could boost European life science research, Euro-BioImaging performed Proof-of-Concept studies (PCS) in 2012. From Oct 1st to Nov 30th 2011, Euro-BioImaging announced an open call for researchers, offering one-off free access to well established imaging facilities in European countries. This unique opportunity of free access to a broad portfolio of the most advanced imaging methods had been broadly advertised, and applicants from the PhD student level up to senior researchers were invited to submit their project proposals.

The studies turned to a fantastic success:

- 63 established facilities committed to contribute free user access in kind to support this Euro-BioImaging initiative
- 41 Facilities from 14 European countries received users
- 228 researchers from 25 European countries and abroad (academic and industry) applied
- 110 user projects were accepted and conducted at the imaging facilities

Project proposals by users were evaluated for scientific merit by a panel of reviewers composed by the heads of the participating imaging facilities in each technology area, excluding the head of the facility the user applied to to provide independent evaluation. After positive evaluation, technical feasibility of the project was confirmed by the head of the facility, the user applied to.

The response rate, by both facilities and users, surpassed all expectations and demonstrated the strong need for open access to biological and medical imaging infrastructure in Europe. This represented an enormous success for Euro-BioImaging, which was just going into its second year of the Preparatory Phase. In just over a year, Euro-BioImaging managed to raise awareness of its mission and the imaging infrastructure needs among life sciences researchers and earned support from the majority of the European imaging community. Moreover, the high response rate showed that our mission - to provide open access to imaging infrastructure to every European researcher - has touched the sore point of the European scientific community addressing the lack of open access and a widespread unmet need for imaging technologies.

Both users and providers were asked to provide feedback on their experience. The outcome of this feedback is strongly supporting the importance of the open access model, pointing out a high success rate of the performed projects, strong satisfaction of users and providers and the importance of Euro-BioImaging as central access point and support mechanism. Below we summarise the major results of the PCS.

High success rate of the projects

During their visit to imaging facilities, over 70% of the PCS users got results that are valid for publication and of very high quality. This high success rate gets even more impressive knowing that users spent on average only 14 days at the facility. The essential factor that contributed to such fascinating outcome is in our opinion the teamwork of experts from different backgrounds, i.e. the staff of the imaging facilities and the users. Imaging facilities were involved already in the evaluation of the technical feasibility of users' proposals and in consultations for the preparation of their visit. Particularly, users acknowledged that through this consultation process they received helpful practical suggestions from the facilities and could adjust their project plan accordingly. Staff advised users on appropriate tests, controls, reagents and protocols for efficient imaging sessions. This consultation phase to prepare the visit was rated highly important by both users and technology providers.

We will therefore make sure that plans for future Euro-BioImaging Nodes include sufficient staff to support users regarding experimental design prior arrival on the site. Nodes should be involved in the evaluation of the technical feasibility of users' applications, as both users and providers appreciated and recognized the common benefit from such process. This teamwork of providers and users is of highest importance for the success of the research projects using innovative technologies. Hence, it is also necessary that the funding for the upgrade of future Euro-BioImaging Nodes allows for staff costs, providing the time for supervision and training of external users where necessary.

Satisfaction and mobility of users:

The PCS (and thereby the open access concept) was rated as highly successful - 99% of the users would use Euro-BioImaging Nodes in the future, and over 80% of them were highly satisfied with resources (instruments, assistance, setup, training, wet lab, etc.). Most of the users (over 90%) consider their travelling effort worthwhile, even if more than 50% of them travelled more than 500 km distance, had to arrange sample shipment and had to support their own travel expenses. The need of European scientist for advanced imaging technologies is so significant, that they travel long distances to access excellent imaging facilities. However, lack of adequate funding for travel and accommodation prevented some users from fully utilizing the open access opportunity provided by the PCS, especially when several visits or prolonged stay at the facility were necessary. These costs for user travel and accommodation can be a tight bottleneck in the future. Therefore, appropriate funding mechanisms for travel and accommodation are currently discussed by Euro-BioImaging with the national and European funding agencies.

Satisfaction of providers:

Visits by external users who accessed the facilities stimulated technology development at the providers' side. New applications that come to the facilities through the PCS projects helped drive the technology development at the facilities and in some cases provided additional valuable results for researchers working at the facility. The PCS also

increased interactions between facilities and industry, as well as rate of visits to the facilities by international external users.

97% of the providers taking part in the Euro-BioImaging PCS expressed the wish to offer open access in the future. Clearly, in order to host regular flow of external users in the future, facilities will need to be able to cover their running costs and where necessary upgrade the existing infrastructure and capacities. More than 80% of the providers would need additional support staff, and around 80% an equipment upgrade. Highly required by over 60% of the providers are funds for consumables used by external users, as well as upgrade of the IT capacities and data management support. Ca. 20-30% of the providers require an additional office or meeting room space. Considering that most of the facilities that took part in the PCS already have a facility manager, the funds for this position were requested by only 20% of the providers. Yet, the future Euro-BioImaging Nodes will likely include providers that are not yet functioning as a facility, but are providing a technology of European importance that is requested by the European researchers. Those Nodes might need a more substantial upgrade to reach the facility level and consequently a funding for the position of the facility manager and additional staff.

Role of Euro-BioImaging: Central access and support

Both providers and users requested a close and intense contact with the Euro-BioImaging coordination staff and recognized the importance of Euro-BioImaging as a central access point and support mechanism that coordinates user applications and manages the open access procedure in an efficient and transparent manner.

Input from PCS into the future operational model of Euro-BioImaging Nodes

Based on the results of the PCS and the feedback from the users and providers, Euro-BioImaging developed a set of criteria for future Euro-BioImaging Nodes. The PCS elaborately tested access and operational protocols and helped us to refine the actual requirements for training, data storage and other technology-specific services for future Euro-BioImaging Nodes. Using this best-practice knowledge, we have now defined the best infrastructure models for the different imaging technologies and set-up technology-specific standards for access and operational models, training, data management, and other services provided by the future Nodes.

The 10 technologies that were successfully accessed by external user during the PCS will be included in the first open call for Euro-BioImaging Nodes. These include Correlative Light-Electron Microscopy, Functional Imaging, High-Field MRI, High-Throughput Microscopy, Mesoscopic Imaging, Multi-Modal Advanced Light Microscopy, Multi-Modal Molecular Imaging, Phase Contrast Imaging, Probes-Molecular Imaging and Super Resolution Microscopy.

Euro-BioImaging will perform Proof-of-Concept Studies on annual basis, prior to including new technologies in the regular Open Calls for Euro-BioImaging Nodes.

3. Conclusion

The success of the PCS providing open access to distributed imaging infrastructure in Europe supports the Euro-BioImaging concept to open up the imaging infrastructure landscape and build a set of Euro-BioImaging Nodes offering at least 50% of their newly developed capacity to external users. As showed here by the PCS, this model will boost research of the European life scientists by increasing their publication rate and supporting technology development. It will also improve interactions between industry and academic institutions as well as contribute to the international mobility of researchers and improved transfer of knowledge throughout the EU. In addition to enabling excellent science, open access to distributed infrastructure promises to reach all these benefits in a more cost effective way than traditional funding models granted to individual institutions for internal use.

For implementation of these improved processes, it is of crucial importance that adequate funding is provided for upgrade and running of cutting-edge facilities (especially for staff, instrument costs and user fees), user travel and accommodation costs and operation of Euro-BioImaging as a pan-European research infrastructure.