Global BioImaging Project

D2.2 Common recommendations on Open User Access in Biological and Biomedical Imaging

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Task leader	John Eriksson
Contributors	Inga Pukonen

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Abstract

A key aim of the Global BioImaging (GBI) project is to enable exchange of best practice on operation of imaging infrastructures between Euro-BioImaging and other European imaging facility staff with their counterparts from Australia and India as well as Argentina, Canada, Japan, Singapore, South Africa and the USA. To facilitate this important work and to support potential harmonization of open access practices on the global scale, Work Package 2 (WP2) has a dedicated task to develop and publish an international recommendation on open user access to imaging infrastructures. An internationally harmonized access policy will pave the way to future reciprocal use of imaging infrastructure services at the international level.

The present report constitutes the deliverable D2.2 of the Global BioImaging project.

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Open access

Open access has become one of the key elements in research where research findings have been opened to public free of charge, enabling knowledge circulation and thus innovation. The European Commission (EC), which is the main research funding body in Europe, has expanded the *open access* concept to *open science*. Open science aims to make research more collaborative, global, creative and closer to society by opening science through digital tools, networks and media. Open access to research infrastructures refers to granting an open physical access to scientists from either academia or industry. Open physical access does not mean free-access to infrastructures equipment and expertise but is equal to all users and is based on scientific merit and technical feasibility.

In 2016 the EC published a *European Charter for Access to Research Infrastructures* in close cooperation with the European Strategy Forum on Research Infrastructures (ESFRI), the e-infrastructure Reflection Group (e-IRG), and the European Research Area stakeholder organisations. This charter sets out non-regulatory principles and guidelines as a reference document for research infrastructures (RIs) in defining their access policies (http://ec.europa.eu/research/infrastructures/pdf/2016_charterforaccessto-ris.pdf#view=fit&pagemode=none). This document has been used as one of the reference documents for establishing the open user access recommendations for the international imaging community in this deliverable.

Open access in imaging

Many imaging facilities globally provide external access to their facilities and technologies but access procedures vary substantially within imaging communities. In the report "*Evaluation of Existing Access Policies*" (Deliverable 12.1 http://www.eurobioimaging.eu/sites/default/files/D12.1-%20Report%20on%20existing%20access%20policies_0.pdf) produced by Euro-BioImaging Preparatory Phase I EC project in 2012, it was found that providing external access to imaging technologies in Europe was more common in biological than in medical imaging. It was also found that amongst imaging facilities that do offer external access, only a minority published defined access policies and procedural guidelines on their web sites.

In a global survey conducted by Global BioImaging project in 2017, results are not deviating much from pan-European. Also on the global scale a trend for easier access provision for biological imaging is clear where sample and instrumentation access are more feasible to implement. Based on the answers from all continents it was clear that access procedures vary significantly also globally from full open user access model to

really limited external access. More detailed outcomes of the conducted survey can be found below and in Annex 1.

One of the main aims of the GBI project and especially of Work Package 2 is to help imaging communities to establish a common open user access policy for operating imaging infrastructures. Opening access to the national facilities will further on help in opening provision of imaging and training services to biological and medical researchers and facility staff worldwide.

Exchanging expertise and knowledge with international Global BioImaging partners during the past two years at several meetings and workshops (i.a. *Exchange of Experience I*, Heidelberg, Germany 2016; *Exchange of Experience II* Bangalore, India 2017) has facilitated international collaboration and sharing best practices among imaging communities. This collaboration is expected to result in international recommendations on exemplary practices for imaging infrastructures.

Benchmarking international user access models in imaging communities

In order to better understand a global status of open user access policies in imaging infrastructures, WP2 launched between mid June and end of August 2017 a survey for benchmarking the current international user access models. Survey results represent six continents by 8 infrastructure representatives from Argentina, Australia, Canada, Europe (Euro-BioImaging), India, Japan, South Africa and the USA. Both biological (100% of the results) and medical communities (60% of the results) were represented.

Survey results show that most of the imaging communities are organized in an established network but only a few of them have a supporting infrastructure subsidising the access. Even though many facilities do provide access to external users, less than **half operate in open access** manner. Main reason for that was raised to be lack of recognition and resources to establish the open access procedure. Common for the whole imaging community is absence of **dedicated funding mechanisms** for supporting the user access.

Facilities that report operating in open access manner usually/all? provide a common **virtual entry point** for internal and external user access. These networks have defined a common **user access policy** with established criteria for external access provision. These networks have also substantially **unified cost models** for service provision which is publicly available online.

Some of the participating facilities that currently do not operate in open access are in process to be organised as national network and are still defining their access policies. One of the main challenges for these networks is that their **coordination often is not recognized by their national funding bodies**. This significantly influences the community resources to develop the network operation and harmonise access policies and cost model.

More detailed survey analysis can be found in Annex 1.

Example of imaging communities operating without open access

a.) South Africa

Imaging in South Africa has slowly started to get organised and comprises currently two networks that are supporting the imaging community. The Microscopy Society of Southern Africa (MSSA) is a well-established and active society, mainly consisting of microscopy experts from academia from mineral and material sciences. The second network is a less formal imaging user group that has been established by Zeiss South Africa. This network consists of unit managers and microscopists from the light microscopy field.

The imaging community in South Africa is still a very heterogeneous cluster since imaging facilities are organized and run in very different ways. Due to that reason, there is no formal network of facility managers at all and no imaging infrastructure supporting and developing the policies. The open access to imaging facilities in South Africa is mainly nominal as only a few of the biggest universities provide some external access.

According to the survey's answers, limited access to imaging technologies blocks the knowledge flow to generate new imaging experts and innovative research. As only few people can access the technology, not enough resources are available to train the possible users, which then limits the access to expensive instrumentation. This way the user access that is provided, most often does not maximize the instrument capabilities. Small numbers in instrumentation usage most often also have an effect on the acquisition of funding for new technologies. Currently the funding in South Africa is entirely dependent on the researchers funding position. This is a major obstacle to produce competitive research data.

Example of imaging community operating with partly open access

b.) Japan

The imaging community in Japan has recently taken a major step by establishing the Advanced BioImaging Support (ABiS) platform (http://www.nibb.ac.jp/abis/?lang=en). This community-based network consists of representatives from almost 30 different imaging facilities and research groups, connecting facilities in one network through Japan. ABiS network has been established to provide access and technical support for Ministry of Education, Culture, Sport, Science and Technology (MEXT) grant holders.

Although the ABiS platform is a great support for the national research community, it is limiting external access to MEXT grant holders as it is fully funded by MEXT. Though biggest imaging facilities within the network do provide access to also other national users, no international open access is currently taking place. The main reasons for this are the structure of funding the access and cost model of services. Because of its nature, national MEXT funding mechanism is forming the barrier for support to external open access.

As currently access is only limited to defined population of national grant holders, the Japanese imaging community is facing challenges to reinforce the activities of the network. Main obstacles are obtaining continuous financial supports to maintain and renew advanced imaging equipment, hire experienced postdocs and technical staff as well as fund international exchange to support innovative research and training.

Imaging infrastructures successfully operating in open access

a.) Euro-BioImaging

Euro-BioImaging (EuBI) is a pan-European research infrastructure for imaging technologies in biological and medical sciences (www.eurobioimagin.eu). EuBI has been included in the ESFRI Roadmap since 2008. The Interim Board of Euro-BioImaging includes 16 member countries (Austria, Belgium, Bulgaria, Czech Republic, Finland, France, Hungary, Israel, Italy, The Netherlands, Norway, Poland, Portugal, Slovakia, Spain, UK) and the EMBL. The EuBI infrastructure consists of a set of complementary strongly interlinked and geographically distributed imaging facilities, Euro-BioImaging Nodes in different EuBI Member States. 28 out of the 29 1st generation EuBI Nodes offer open physical access to the 36 imaging technologies currently most requested in Europe. The infrastructure is empowered by a supporting and coordinating entity, the EuBI Hub, from which the users are directed to their desired imaging technology and served by the respective EuBI Node. EuBI has been successfully providing physical open user access during its Interim Operation since May 2016. Euro-BioImaging is currently in process to become the European Research Infrastructure Commission (ERIC) and will be known as the EuBI-ERIC by the 2nd half of 2018. Euro-BioImaging has driven the establishment of national imaging communities in 26 European countries and has established international partnerships with the Australian and Indian national imaging infrastructure organizations, globally promoting the concept of open access to imaging technology.

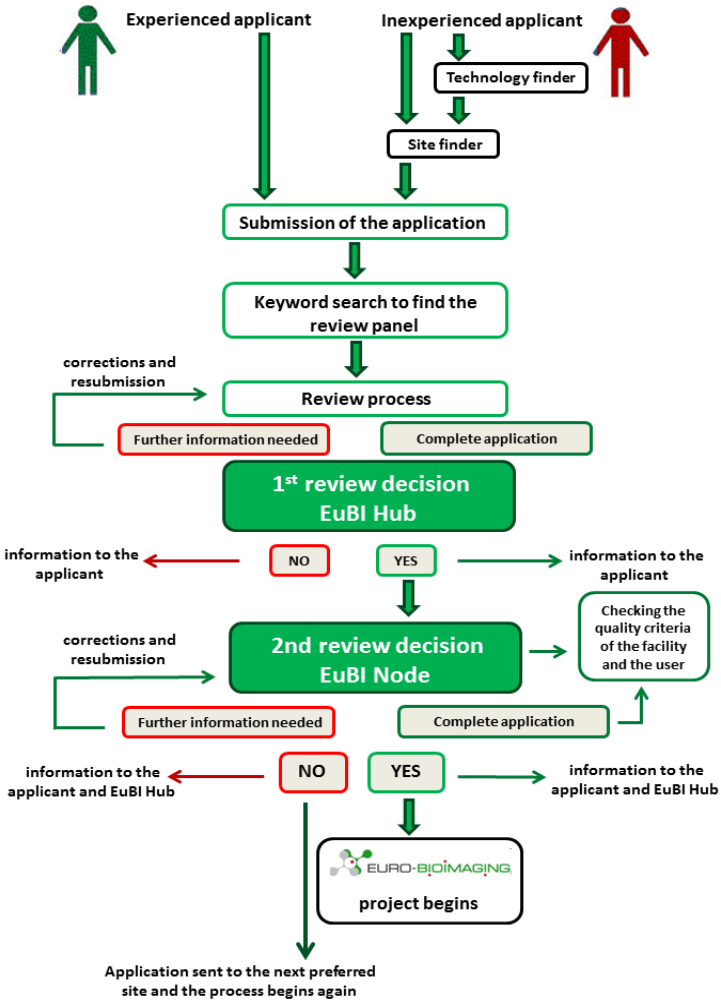

Figure 1. Euro-BioImaging user access model.

Open user access model of EuBI

Open user access for Euro-BioImaging is coordinated via a central Web Access Portal (WAP), which is a virtual, single entry point for EuBI users. An Interim version of the WAP (iWAP) has been in use since May 2016 for Interim user access to this infrastructure (https://www.eurobioimaging-interim.eu/). The final Web Access Portal, which is currently being finalised, will be providing a comprehensive overview of all offered imaging technologies and services provided by EuBI Hub and Nodes, including the presentation of each Node, detailed information on all served imaging technologies, online submission of applications for physical user access to Nodes, virtual access to the image data repository, image resource portal and general guidelines for user support. In particular, the WAP is aimed to help to provide additional support for those users who are not yet clear as to which imaging technology best fits their research, or those who need a combination of several imaging technologies.

In the EuBI open access model (Figure 1), users are guided by the WAP to the appropriate imaging technology for their scientific questions and provided by the overview of the Nodes where the needed technology is available, before they submit their project proposals. Evaluation of proposals occurs in a two-step procedure: first, an independent scientific evaluation is performed by a panel of external leading experts in the field, organized and administratively supported by the Hub. Second, a technical feasibility review and final approval for the user access is done by the selected hosting Node. EuBI Nodes provide consultation and expertise by highly trained experts during all stages of the user project. Overall evaluation criteria for user project proposals comprise scientific and technical quality, soundness of concept and progress beyond state-of-the-art, associated work plan and technical feasibility.

b.) Australia

The Australian Microscopy and Microanalysis Research Facility (AMMRF) and National Imaging Facility (NIF) are collaborative research infrastructure facilities forming a national, open access grid of leading edge imaging expertise across Australia. AMMRF (http://ammrf.org.au/) is a user-focussed facility comprising 14 university and government laboratories across Australia that supports more than 3,000 researchers annually. AMMRF links Australian microscopy facilities and offers access to optical, electron, X-ray, scanning and ion-beam techniques. NIF (http://anif.org.au/) provides access to molecular imaging instrumentation and state-of-the-art imaging capability of animals, plants, and materials for the Australian research community. Both imaging infrastructures belong to National Collaborative Research Infrastructure Strategy (NCRIS) and are funded by Australian Government Initiative.

Open user access of AMMRF

The AMMRF offers a complete, modern suite of instruments accessible to all Australian publicly funded researches on a merit basis in accordance with their access principles and policy. In addition to a common access policy, all AMMRF laboratories support researchers through a common User Experience (Figure 2) comprising key stages including critical evaluation of experimental proposals, advice for grant funding applications, selection of the most appropriate techniques, integrated online and onsite training, state-of-the-art data storage, transfer and analysis tools. At all stages of the User Experience AMMRF have been active in the development and operation of a range of e-Infrastructure and online tools to support researchers. In addition to application submission, AMMRF offers additional online tools such as imaging technology finder tool TechFi™ (http://ammrf.org.au/access/techniquefinder/) and virtual user training tool MyScope™ (http://ammrf.org.au/myscope/).

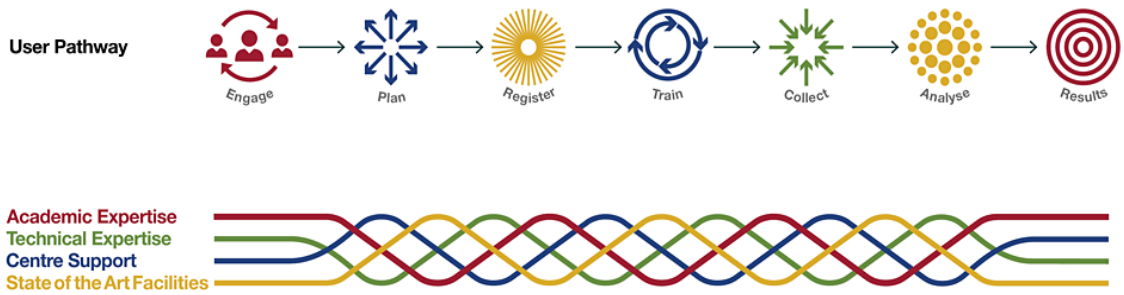

Figure 2. User Experience scheme of AMMRF.

Common features of open user access in thriving imaging infrastructures

When analysing the imaging infrastructures that currently operate in open user access manner, many overlapping features clearly stand out in their operation. The core of infrastructure proficient operation is being distinctly organised. This can be facilitated only if **coordination of the infrastructure is recognised by the national funding body**. When coordination is enabled on the national level, the imaging community is able to develop key structures and functions for open access operation.

In order for infrastructures to be able to operate in an open access manner and provide services that are publicly available, established imaging infrastructures have **single virtual entry point** for their services. This entry point can be a basic website collecting all infrastructure related and relevant information or an advanced web access portal that functions as a tool for users in finding all services needed for access. Most advanced web based access portals provide services such as technology and service finders, application submission, training possibilities and many post physical access tools such as image data processing and analysis. These advanced online tools form e-Infrastructure and provide additional imaging services for infrastructure users.

One of the fundamental keys in open access service provision is established **user access policy**. This policy at the minimum covers criteria for granting external access and policy on intellectual property (IP) rights. In established open user access infrastructures **criteria for granting the external access** is public and is usually based on both *technical feasibility* of the project as well as on the *scientific excellence*. In addition to *scientific quality* of the project, *academic collaboration* has been mentioned as one of the main elements on granting the access. In technical feasibility, *training* is a very important aspect of the access. Main reasons for applying external or even transnational access often are lack of innovative technologies and expertise. For these reasons coordinated technology platform training for coming users as well as experienced operators for access have to be in place. *Funding of the project* also stands as one the evaluation criteria for many facilities. Intellectual property rights are usually agreed between user and service providers. In most of the cases IP right belong to user and to his/her home institution.

Cost model of external user access is a heterogeneous item across all imaging communities. Based on the international survey conducted by Global BioImaging project (see Annex 1) as well as two surveys collected by Euro-BioImaging research infrastructure in 2012 (Preparatory Phase I Deliverable 12.2 http://www.eurobioimaging.eu/sites/default/files/D12.2%20Report%20on%20surveys%20performed%20to%20obtain%20needs,%20expectations,%20concerns,%20and%20existing%20policies.pdf) and in 2017 (Preparatory Phase II Deliverable 4.4, soon available online at www.eurobioimaging.eu website) it is shown that access costs vary depending on multiple aspects of facility, technology and personnel costs and institution funding models. Cost models are mostly divided among *full cost*, *running cost* or *subsidised model*s. Free access is also sometimes available but it is a rare model and usually a possibility mainly for privately funded organisations. Most of the institutions charge full cost to users representing industry. Depending on what cost model best suits the individual infrastructure, user access costs need to be unified within the infrastructure and the user needs to be clearly informed prior to access.

In order to sustain, optimize and further develop open user access services for their imaging communities, established imaging infrastructures collect **user feedback** in different forms and stages of user access. This helps infrastructures to better understand how their services can be developed further, evaluate the open user access process (quality assurance) and also collect post-project information to see, how research conducted at the imaging facility has evolved. Collecting user feedback provides also valuable information of open access operation for infrastructure's funding bodies.

Added value of open user access

By opening access to cutting-edge technologies, imaging facilities **increase their scientific excellence and expertise** in imaging. Open access mediates new scientific collaboration and knowhow making facilities stronger operators internationally. By harmonizing existing and future imaging infrastructure within a country, the open access allows all scientists to take advantage of the ground-breaking innovations in imaging technologies. In this way, the open access will generate new knowledge and have a major impact on innovation in research products.

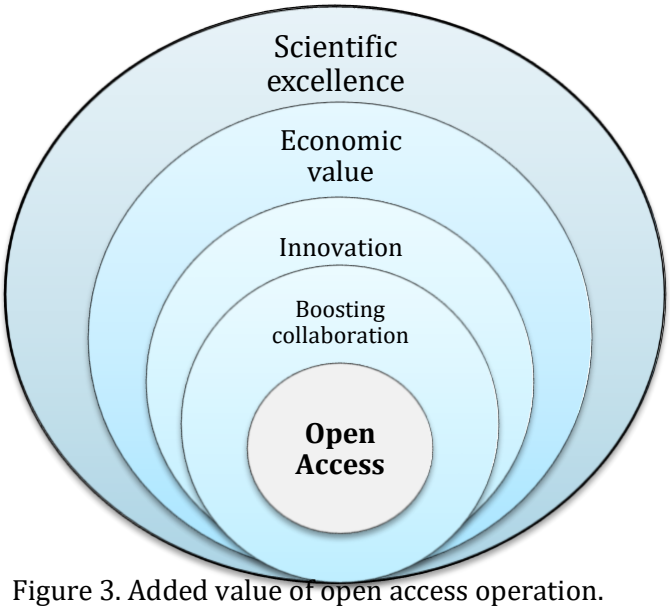

Figure 3. Added value of open access operation.

Economic impact of open access

Nationwide open access services with harmonized and visible user policies can **stimulate innovation** through providing open access to infrastructure key assets**,** such as resources**,** technologies**,** data and knowledge. This can also boost **collaboration and partnering with industry** and enable technology transfer. By opening access to the imaging platforms and by utilizing the most of expensive instrumentation, open access will help in sharing the costs of deployment and can allow a **much better return on investment** of imaging platforms. Open access to imaging facilities will reduce the need to equip individual labs and departments and will provide **significant cost savings** by evading duplication on infrastructure investments.

Scientific excellence

Operation in open access will facilitate new **international scientific collaboration** that will enable more discoveries in inter-disciplinary research areas. This will produce more **high-impact publications**, innovations and **technology developments**. Open access will provide worldwide level visibility for imaging community attracting professional staff and experienced senior scientist that will train next generation of imaging experts and make national centers **stronger operators**.

International recommendations for open user access policy in imaging facilities

Based on all the information addressed above, general recommendations and guidelines can be set for how to establish and operate open user access in imaging facilities. Main recommendations of open user access provision in alphabetical order are described below.

1. Accessibility to information online
In order to be able to provide service and operate in an open access manner, imaging infrastructures should have a public website providing clear information on the general description of the infrastructure, service and technologies provided, intellectual property (IP) rights, terms and conditions of the access as well as contact information. Where applicable, information on fees of service and costs of access should be provided. All relevant information should be available online both in national and English languages.

2. Acknowledgement
Users should be invited to acknowledge the imaging infrastructure for the contribution to their research outcome. This outcome can be a publication, patent or any other published data produced with the help of granted open access.

3. Coordination of the infrastructure
In order to be able to establish, develop and sustain the infrastructure, a dedicated coordinating entity needs to be identified and chosen. This entity will be representing the whole community and be the driving force for the infrastructure. The coordinating entity is also key for funding acquisition to support the open user access.

4. Data management
The imaging infrastructure should be transparent to the user on how experimental data produced during the access is owned, stored, accessed and managed. The imaging infrastructure and the user should commonly agree on data management as well as on ownership and rights of the data obtained from the access. These details can be agreed together with data confidentiality in written procedure upon service agreement.

5. Defined cost model
Costs of operation, instrumentation and service provision should be defined before providing user access. These defined fees on service and instrumentation should be made available to the user before the access. A cost model should be defined and unified among the infrastructure if possible.

6. Supporting measures of open access operation

In order to facilitate successful user access, imaging infrastructures are encouraged to offer supporting measures for external users. These supporting actions can be technical support and user training; providing access to user manuals and other tools needed; guidance on local rules and safety issues; provision of access to possible electronic material and platforms; and provision of accommodation and logistical support if needed.

7. Single entry point to access

In addition to providing all relevant information online, open user access should be unified in a form that infrastructure provides a clear single entry point for all its users. Access can be granted either through direct communication with service provider or via advanced, online user access tool that can cover all aspects of user access procedure.

8. Training

On-site training and technical support for coming users is essential to facilitate successful open access to an imaging facility. As imaging technologies and methodologies are rapidly evolving, it is also very important to train the technology platform operators and technical staff of the facility.

9. Transparent user access procedure

Defined user access process may consist of the application procedure and criteria, which includes evaluation of the application (scientific excellence and technical feasibility evaluations), feedback and negotiation, and decision. After granting the access, physical visit(s), technical settings, collection and analysis of data will follow. If user access is a selection procedure, it should be transparent.

10. User access policy

The access policy of the imaging infrastructure and imaging facility needs to be defined and the general user access policy publicly available. The access policy should include criteria for granting the access, conditions of access (including any law or regulations relevant to access), describing the access processes and possible support measures facilitating the access. Any restrictions should be clearly stated and communicated openly.

11. User feedback

For constant evaluation and development of infrastructure services, imaging facilities are encouraged to create mechanisms to collect user feedback. This information will help infrastructures to measure many aspects of user satisfaction and service provision and by utilizing this information, develop the user access. Collected feedback also provides a valuable data for infrastructure future funding acquisition.