School of Advanced Studies

HR EXCELLENCE IN RESEARCH

How to be an Open Scientist

University of Camerino

A collaborative work by the doctoral candidates of the International School of Advanced Studies of the University of Camerino

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1. What is Open Science?

Open Science is an academic movement to make scientific research projects, data, and results freely accessible to all levels of society, amateur or professional. It encourages practices such as publishing in open access journals, campaigning to create more open publications, pushing scientists to practice more transparent and accessible methods, and in general, making ~~it~~ easier to publish and communicate scientific knowledge to a wider audience.

Open Science is not a new concept. For centuries, scientists have collaborated, shared source material, and communicated results. The availability of the internet and new business models for the dissemination of scientific results have created new opportunities but also new challenges.

Under Carlos Moedas, European Commissioner for Science and Innovation, Open Science has become a policy priority in the organization and funding of scientific research. In particular, the **Amsterdam Call for Action on Open Science** has been a trigger to promote data sharing and open access to publications in the European Commission's policies[1].

Many researchers already practice certain aspects of Open Science; perhaps some already are Open Scientists without realizing it, and perhaps there are opportunities that many researchers have not yet considered.

This booklet is designed as a reference to provide suitable methods for making research more open, in a way that will benefit the researchers' work, colleagues, research field, and career.

[1] More information: https://www.government.nl/documents/reports/2016/04/04/amsterdam-call-for-action-on-open-science

2. Managing data as an Open Scientist

There are many advantages to managing your data as an Open Scientist, including:

- the benefits of real-time contribution of anyone potentially involved in research development based on the same data;

- the immediate availability of results and innovations to all science communities and not only to those that can pay for access;

- the sharing of knowledge beyond small groups of people;

- the promotion of collaborations stimulating different approaches to solve problems;

- the spare of time, avoiding the need of useless replications of work, the results of which are known and usable without restrictions.

How can you do this?

Research data that emerge from publicly funded research can become findable, accessible, interoperable and reusable (FAIR) for other researchers by means of several tools.

- Data management protocol(s):
    - data management plans that must be followed, according to the rules of sharing and/or receiving organizations.
- Data repositories:
    - a somewhat general term used to refer to a destination designated for data storage.
- Intelligent access & interoperability:
    - using existing applications and/or softwares for data handling; interoperability allows the interfaces of a system to work with other systems without any restricted access or implementation (in fact, interoperability is a major issue in the design of future intelligent information systems).

What tools can you use to do this effectively?

Guidelines on FAIR Data Management within the Framework Programme for European research "Horizon 2020" provide a Data Management Plan (DMP) template. The document defines Data Management Plans (DMPs) as "a key element of good data management. A DMP describes the data management life cycle for the data to be collected, processed and/or generated" and it "should include information on:

- the handling of research data during and after the end of the project
- what data will be collected, processed and/or generated
- which methodology and standards will be applied
- whether data will be shared/made open access and how data will be curated and preserved (including after the end of the project)."

The template is organized as a set of questions that helps researchers to understand and solve the open data issues. The different sections of the plan drive the researcher through these topics: data summary; making data: findable (including provision for metadata), openly accessible, interoperable, increase data re-use (through clarifying licenses), allocation of resources, data security, ethical aspects, giving further support links in developing the DMP, such as re3data.org, a global registry of research data repositories.

Managing data to keep them open requires the use of specific tools. One useful option will be the future EOSC (European Open Science Cloud), that will help researchers to have a common access in order to go through different disciplines. Moreover, this tool will assist in establishing a global standard for interoperability of scientific data.

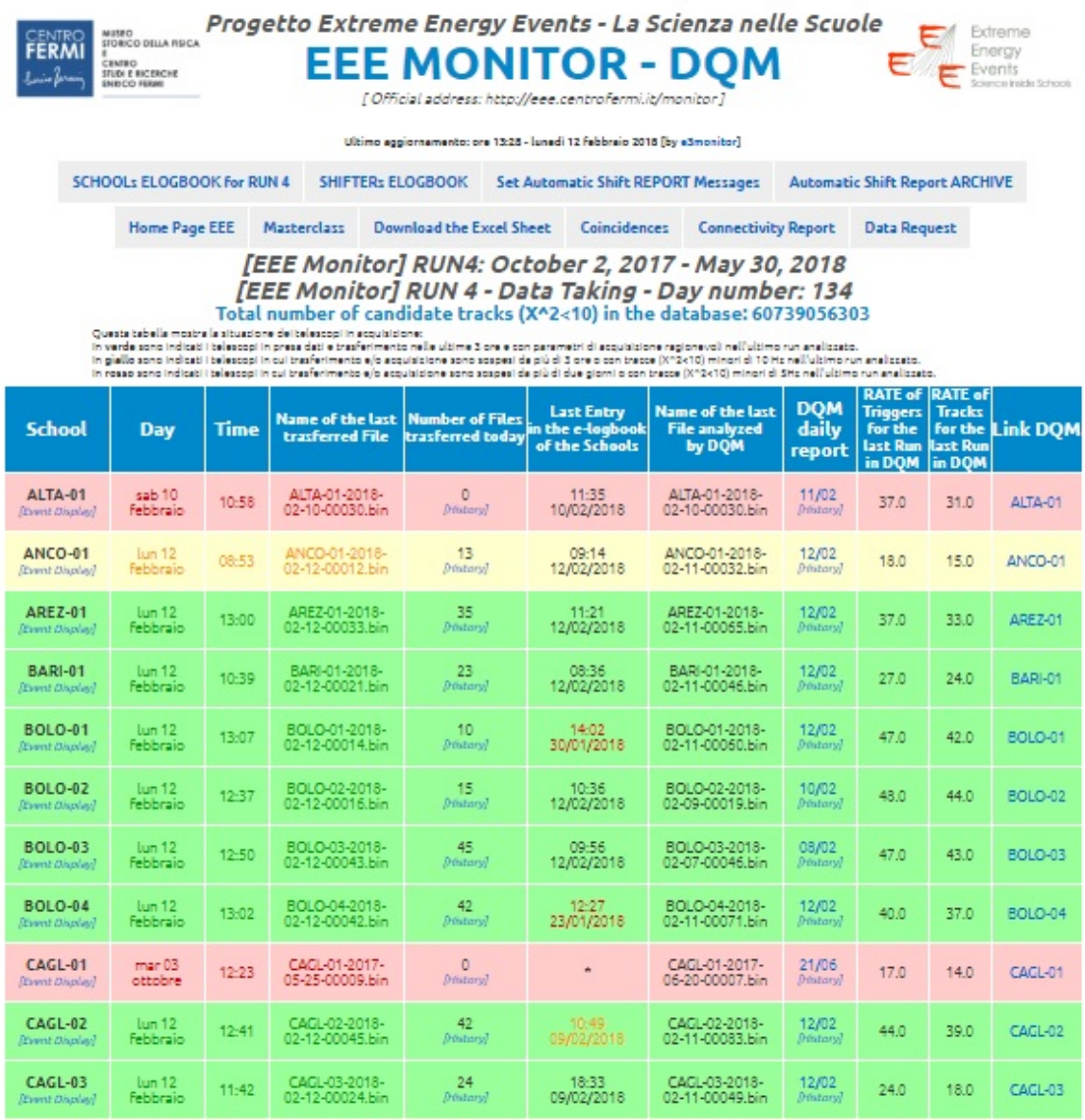
Other topic-specific databases exist, as, e.g., OpenTrials, which aims to share accessible data and documents on virtually all trials which have been conducted on drugs and other treatments, globally.

A different type of tool is Figshare, that allows to make your data more discoverable and open to all readers and in the meantime allows to upload files with no concerns about file size or format.

Some good practices to get inspired:

A very good example is the EEE Monitor-DQM of the EEE Project that is a special research activity carried out in collaboration with CERN, INFN, MIUR, on the origin of cosmic rays, with the fundamental contribution of students and teachers of high schools.

Below is the main interface of the online page on data management:



Progetto Extreme Energy Events - La Scienza nelle Scuole

EEE MONITOR - DQM

[Official address: http://eee.centrofermi.it/monitor]

Ultimo aggiornamento: ore 13:28 - lunedì 12 febbraio 2018 [by e3monitor]

SCHOOLs ELOGBOOK for RUN 4 | SHIFTERs ELOGBOOK | Set Automatic Shift REPORT Messages | Automatic Shift Report ARCHIVE

Home Page EEE | Masterclass | Download the Excel Sheet | Coincidences | Connectivity Report | Data Request

[EEE Monitor] RUN4: October 2, 2017 - May 30, 2018

[EEE Monitor] RUN 4 - Data Taking - Day number: 134

Total number of candidate tracks (X^2<10) in the database: 60739056303

Questa tabella mostra la situazione dei telescopi in acquisizione:
In verde sono indicati i telescopi in presa dati e trasferimento nelle ultime 3 ore e con parametri di acquisizione ragionevoli nell'ultimo run analizzato.
In giallo sono indicati i telescopi in cui trasferimento e/o acquisizione sono scaduti da più di 3 ore o con tracce (X^2<10) minori di 10 Hz nell'ultimo run analizzato.
In rosso sono indicati i telescopi in cui trasferimento e/o acquisizione sono scaduti da più di due giorni o con tracce (X^2<10) minori di 5Hz nell'ultimo run analizzato.

School	Day	Time	Name of the last trasferred File	Number of Files trasferred today	Last Entry in the e-logbook of the Schools	Name of the last File analyzed by DQM	DQM daily report	RATE of Triggers for the last Run in DQM	RATE of Tracks for the last Run in DQM	Link DQM
ALTA-01 [Event Display]	sab 10 febbraio	10:58	ALTA-01-2018-02-10-00030.bin	0 [history]	11:35 10/02/2018	ALTA-01-2018-02-10-00030.bin	11/02 [history]	37.0	31.0	ALTA-01
ANCO-01 [Event Display]	lun 12 febbraio	08:53	ANCO-01-2018-02-12-00012.bin	13 [history]	09:14 12/02/2018	ANCO-01-2018-02-11-00032.bin	12/02 [history]	18.0	15.0	ANCO-01
AREZ-01 [Event Display]	lun 12 febbraio	13:00	AREZ-01-2018-02-12-00033.bin	35 [history]	11:21 12/02/2018	AREZ-01-2018-02-11-00065.bin	12/02 [history]	37.0	33.0	AREZ-01
BARI-01 [Event Display]	lun 12 febbraio	10:39	BARI-01-2018-02-12-00021.bin	23 [history]	08:36 12/02/2018	BARI-01-2018-02-11-00046.bin	12/02 [history]	27.0	24.0	BARI-01
BOLO-01 [Event Display]	lun 12 febbraio	13:07	BOLO-01-2018-02-12-00014.bin	10 [history]	14:02 30/01/2018	BOLO-01-2018-02-11-00060.bin	12/02 [history]	47.0	42.0	BOLO-01
BOLO-02 [Event Display]	lun 12 febbraio	12:37	BOLO-02-2018-02-12-00016.bin	15 [history]	10:36 12/02/2018	BOLO-02-2018-02-09-00019.bin	10/02 [history]	48.0	44.0	BOLO-02
BOLO-03 [Event Display]	lun 12 febbraio	12:50	BOLO-03-2018-02-12-00043.bin	45 [history]	09:56 12/02/2018	BOLO-03-2018-02-07-00046.bin	08/02 [history]	47.0	43.0	BOLO-03
BOLO-04 [Event Display]	lun 12 febbraio	13:02	BOLO-04-2018-02-12-00042.bin	42 [history]	12:27 23/01/2018	BOLO-04-2018-02-11-00071.bin	12/02 [history]	40.0	37.0	BOLO-04
CAGL-01 [Event Display]	mar 03 ottobre	12:23	CAGL-01-2017-05-25-00009.bin	0 [history]	*	CAGL-01-2017-06-20-00007.bin	21/06 [history]	17.0	14.0	CAGL-01
CAGL-02 [Event Display]	lun 12 febbraio	12:41	CAGL-02-2018-02-12-00045.bin	42 [history]	10:49 09/02/2018	CAGL-02-2018-02-11-00083.bin	12/02 [history]	44.0	39.0	CAGL-02
CAGL-03 [Event Display]	lun 12 febbraio	11:42	CAGL-03-2018-02-12-00024.bin	24 [history]	18:33 09/02/2018	CAGL-03-2018-02-11-00049.bin	12/02 [history]	24.0	18.0	CAGL-03

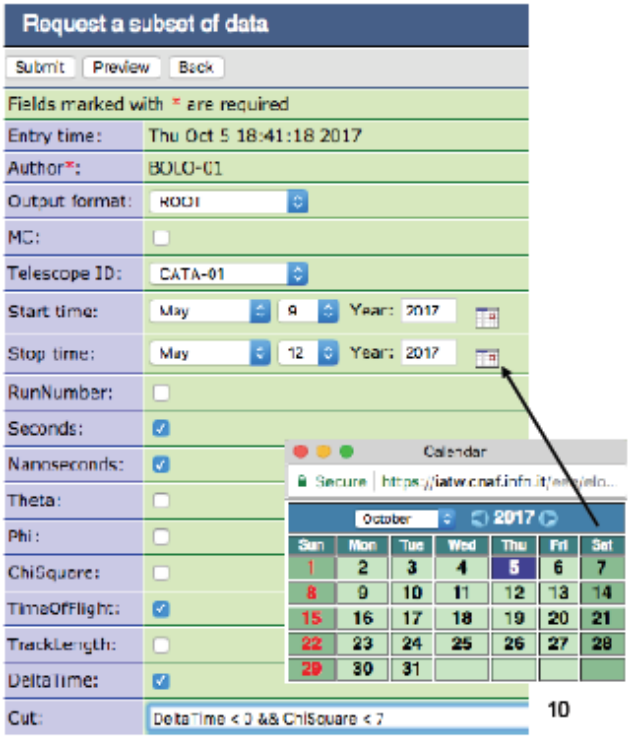
The online interface is easy and friendly for users, as shown in the next picture:

Data request

Request parameters
- **Output format**: could be either CSV or ROOT
- **MC**: it is a boolean parameter. If unchecked real data are provided, Monte Carlo data otherwise
- **Telescope ID**: the ID of the telescope (e.g. LAQU-01)
- **Start time**: initial date (day, e.g. 2017-03-15)
- **Stop time**: final date (day)
- **Cut**: a free-form string where the user can insert custom cuts (e.g. "ChiSquare < 9 && Theta < 10)

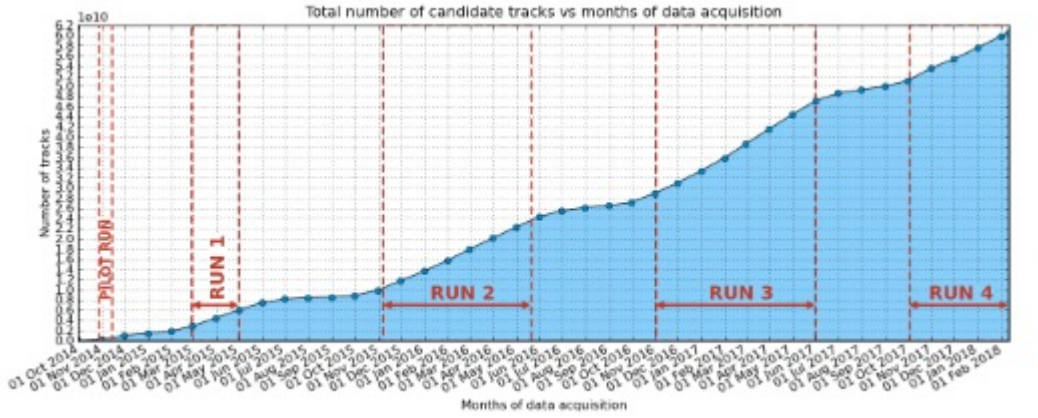
Observables to provide in output file (boolean parameters)
- RunNumber
- Seconds
- Nanoseconds
- Theta
- Phi
- ChiSquare
- TimeOfFlight
- TrackLength
- DeltaTime

All observables can be used in the "Cut" field!



The software used to manage the data is provided by CERN: https://root.cern.ch/

It is interesting to notice how the data collection has grown over time in the last three years:



Any reasons why not?

This can depend on the type of data. Sharing experimental scientific data can be a risk, not to mention the economic constraints: the industry financing a research can forbid publication. Some data are **highly sensitive** and researchers must consider the possible consequences of making these available with or without restrictions, e.g. military data, data on religious or political preferences, on medical conditions, etc.

Obviously, researchers must respect the **privacy of individuals** and publish data in compliance with national and European privacy regulations. In many cases, this means that data must be anonymized.

3. Opening the source code when you develop software as an Open Scientist

In the current internet age, where the use of social media is widespread and where computer algorithms and codes are pervasive, there is a greater need to be connected with scientific collaborators to increase the development-time of utilities, applications, and programs. The aim of this increased connectivity is to provide easy collaboration in order to share research methods, data and results.

Why?

- Personal interests: e.g. self-development, doctoral thesis…
- Community contribution and research work: e.g. building source code knowledge base that can be reused, modified, or customized for other uses/requirements…
- Commercial reasons: e.g. code can be used by startup developments…
- Benefit for society, developing countries, NGOs: e.g. the code can be used by the less privileged, who do not have enough funding or resources…
- Sharing new approaches, paradigms, models with research communities and companies
- Evaluation of particular technologies, concepts, programs, behaviours, before trying/promoting them in real environments

- Agile development (quick software development using source code template): the open source code can be used by companies, academics and researchers to quickly build prototypes and concepts for their use
- Inspiration and Community support: the community helps each other for software development and provides inspiration
- Multi and interdisciplinary research: the community provides an environment for multidisciplinary research, for example IT and healthcare or IT architecture and finance…

How can you do this?

Due to recent advancements in ICT we can easily share codes in a safe, secure, fast, and cheap manner.

1) Community of practice and networks: use a network and a secure collaboration platform for sharing source code and documentation, tutorials, samples, development tools and API.

2) Process definition and rules: define the process, legalities, and regulations for sharing the source code with the community.

3) Define role and access: e.g. all students and researchers in UNICAM should be able to share code via the same platform.

4) Define the licenses for sharing the source code (https://choosealicense.com/)

5) Validation of source code: there should be some people responsible for reviewing and verifying the submitted source codes.

6) Define the right methodology for sharing code; this means that some features must be defined that support people to share their code without difficulty.

7) Provide data for testing source code.

What tools can you use to do this effectively?

Now there are a lot of tools and platforms for sharing codes, even if they are just basic repositories and not semantic repositories. Searching for a code is based on keywords and sometimes it is very hard to find the desired results.

The most widely used tool for sharing source codes is Github, because it has a wide community. It uses git technology that allows distributed copies of source code (github.com).

Another tool is Jupiter, which allows to share source codes using multiple programming language (http://jupyter.org/).

Some good practices to get inspired:

When you are sharing code, the license is a key point. The user needs are important for choosing the specific license. It is good to use an already defined open source license (https://opensource.org/licenses).

1. **Apache License 2.0**
2. **BSD 3-Clause "New" or "Revised" license**
3. **BSD 2-Clause "Simplified" or "FreeBSD" license**
4. **GNU General Public License (GPL)**
5. **GNU Library or "Lesser" General Public License (LGPL)**
6. **MIT license**
7. **Mozilla Public License 2.0**
8. **Common Development and Distribution License**
9. **Eclipse Public License**

Furthermore, guidelines are provided by the official web site (https://opensource.org/). It is important also to write documentation concerning the code using a standard one (e.g. http://www.stack.nl/~dimitri/doxygen/). A standard ontology (formal conceptualization of the concepts that must be used to annotating the code or the project) has to be defined.

Any reasons why not?

It is important to take into account the reliability of sharing code but it has some drawbacks.

1) Maintaining source code: answer the community questions and fix bugs.

2) Security and safety responsibility: critical applications like in healthcare, insurance, financial and transport domains. Who will ensure the safety and soundness of the open source code and process behaviours in such domains? Does the community or the individual take the responsibility? How virus attacks are dealt with?

3) Commercial issues: how to reconcile making the source code available for the community and commercially benefitting from this?

4) Problems concerning law and specific country regulations.

4. Involving the general public as an Open Scientist

Public engagement with science is based on interactions that provide opportunities for mutual learning between scientists and the public. This kind of learning refers not only to the **acquisition of knowledge**, but also to **increased familiarity** with wider perspectives.
Goals for public engagement with science may include civic engagement skills and empowerment, increased awareness of the cultural relevance of science, and recognition of the importance of multiple perspectives of knowledge to scientific endeavors[2].

How can you do this?

Opening up the scientific process and making its results accessible to a wider audience plays an important role in disseminating knowledge on a global scale. It provides not only scientists with an insight into the current state of knowledge production, but also interested individuals among the public.
There are many ways of involving the general public, for example:

- **Traditional media** (tv, radio, newspapers, magazines)
- **Science communication** (conferences, scientific "cafès", events in science centres, etc)
- **Science education** (for teachers and students of any age)
- **Social media** (including blogs, websites, web radio, etc)
- **Citizen Science** (involving the general public in collecting data, interpreting results, etc)
- **Stakeholder engagement** (involving key stakeholders such as patients and users throughout the research process)

Some tools and good practices to get inspired:

A good practice is to collaborate directly with colleagues with different level of experience in involving public institutions in order to facilitate open access to science.

[2] https://www.aaas.org/pes/what-public-engagement

It is useful to learn from examples of case studies in which universities establish partnerships with non-academic organizations and directly from citizen science examples in the world:

- The Cornell Lab of Ornithology, (http://www.birds.cornell.edu/Page.aspx?pid=1478)
- Open Air Laboratories (OPAL), (http://www.opalexplorenature.org/)
- Zooniverse, (https://www.zooniverse.org/ http://www.galaxyzoo.org/)
- Citizen Scientist Salford, (http://www.citizenscientist.org.uk)
- CSMON-LIFE (Citizen Science MONitoring), (http://www.csmon-life.eu/)
- STE (Scuba Tourism for the Environment), (http://www.steproject.org/)

Any reasons why not?

Information should be presented in a way that makes it useful for the general public in order to avoid misunderstanding. When more people report data, it will take more time for anyone to consider all of it. Some people think that involving the general public as Open Scientist could have some negative consequences, such as:

- Have more data of lower quality;
- Increasing the scale of science will make verification of any discovery more difficult.

Therefore, it is important to keep in mind that not all type of research projects benefit from public involvement in the research process. Researchers must decide on the best possible method to obtain quality results.

5. Collaborating with other researchers as an Open Scientist

"Two heads are better than one", the leading idea that pushes researchers to collaborate for their projects. This would not only minimize the required time to accomplish their targets but also to improve their outcomes in an innovative way. Enhancing collaboration also contributes to overcoming economic issues by facilitating researchers in terms of technology. In the past, a successful approach has occurred when scientists pooled their individual talents into larger group's collaborations. In this case, an effective strategy is to form technique-based collaborations, in which colleagues share technical expertise with each other, resulting in an enhanced impact of everybody's research.

Collaborating and sharing opinion could definitely enhance outlook of a research project because an external evaluator can assess research process and outcomes without any sort of influence by the involved research team in order to avoid biases. This will also help in putting new innovative insights thereby improving the quality of the work process. In the end, it can be stated that collaboration among scientists is a way to enrich scientific production because data of a study can represent a point of start for a new project or to have a significant output that is accessible and beneficial for the society . For instance, when a biochemist is collaborating with clinical researchers the benefits of a research can directly influence the concerned patients either for their diagnosis or for better treatment or even prevention.
https://www.huffingtonpost.com/dr-jennifer-lamberts/two-heads-are-better-than_1_b_3804769.html

How can you do this?

The first time, it is necessary to define the common field of the research. A group must discover what they have in common, which could be many things like: a shared problem addressed from different angles, a shared methodology applied to different topics, a shared subject divided up into different work packages, etc.

To reach this aim, each member has to show their competences about the topic and allow others to have access to skills. The same members should give their availability to ease the interdisciplinary analysis of the various aspects of work through a continuous dialogue among

them. The research team has to choose the language of the activities; to define the topic of work, the deadline of publication, the way of monitoring the phases of work through the suitable tools (like sharing software).

What tools can you use to do this effectively?

Sharing information and data with long distance colleagues are the main obstacles to collaboration among scientists. Fortunately, today we have access to a wide array of open software that can help in overcoming those obstacles. Due to the massive amount of software available, it is impossible to list it all, here are some of the most important and more used ones.

Google Docs, Google Sheets, Google Slides

The suite allows users to create and edit files online while collaborating with other users in real-time. Edits are tracked by user with a revision history presenting changes. An editor's position is highlighted with an editor-specific color and cursor. A permissions system regulates what users can do.

While Google Docs has been criticized for lacking the functionality of Microsoft Office, it has received praise for its simplicity, ease of collaboration and frequent product updates.

A simple chat room makes it also easy to exchange ideas and opinion in real time between collaborators.

https://docs.google.com/

Google Drive, Dropbox

File storage and synchronization services allow users to store files on their servers, synchronize files across devices, and share files.

In addition to their respective websites, Google Drive and Dropbox offer apps with offline capabilities for Windows and macOS computers, and Android and IOS smartphones and tablets.

Google Drive specifically encompasses Google Docs, sheets and slides.

https://www.google.com/drive/

https://www.dropbox.com

European Open Science Cloud (EOSC)

This cloud allows many European researchers a virtual environment with open and seamless services for storage, management, analysis and re-use of research data, across borders and scientific disciplines by federating existing scientific data infrastructures, today scattered across disciplines and Member States.

"Our goal is to create a European Open Science Cloud (EOSC) to make science more efficient and productive and let millions of researchers share and analyse research data in a trusted environment across technologies disciplines and borders." Carlos Moedas, Commissioner for Research, Science and Innovation

https://ec.europa.eu/research/openscience/index.cfm?pg=open-science-cloud

Collabtive

This web-based project management software provides an open source alternative to proprietary tools like Basecamp, Asana and Trello.
Collabtive enables virtual teams to work in close collaboration. The tool represents projects by tasks, milestones, related files and messages. Time worked can be tracked on a task-by-task basis.
Furthermore, the software is polyglot, supporting more than 35 languages.
Collabtive's main programming language is PHP5.

https://collabtive.o-dyn.de/

Loomio

Loomio is a decision making software to assist groups with collaborative decision-making processes. Users initiate discussions and put up proposals. As discussions progress the group receives feedback on a proposal through an up-datable pie chart.

The top-level organizational structure in Loomio is the *Group*. A group is made up of members, granted permission to that group. Groups can be both public and private, allowing for privacy or openness where required.

Within groups, members can create discussions on specific topics. During a discussion, members of the group can post comments and create proposals.

Proposals solicit feedback from members on a specific proposition. Members can either agree, disagree, abstain, or block. Blocking is essentially a strong form of disagreement.

https://www.loomio.org/

Interdisciplinarity: related aspects and problems

Interdisciplinarity summarizes, in a research project, contributions from different disciplines and cultural fields. Today it is not possible to concentrate on research topics, but instead the various problems related to different research project.

Interdisciplinary work consists in the contribution of different disciplines for the purposes of analysis and the possible solution of certain problems. Therefore it is necessary, within a collaborative relationship, to develop guidelines that can act as a catalyst for structuring the various contributions within a unitary discourse. In this context, different problems can arise:

- Failure to harmonize specific disciplinary languages;
- Possible lack of interaction between researchers from different fields who deal with the same problem;
- Possible competition for the acquisition of professional and economic advantages.

Within an interdisciplinary research effort, a well-managed harmonization of the contents is necessary with respect to the proposed purpose.

What might the solutions be?

We could work in two directions: the first linked to the drafting of an article written in clear language that is also accessible to researchers from a different scientific sector; the second is to create databases and online platforms that can allow everyone easy access.

What type of language should be used? Scientific articles must certainly maintain their scientific and technical language, otherwise it would lose its original scientific value, but at the same time it must be written in such a way as to guarantee comprehension even to those who are not experts.

Any reasons why not?

Pursuing a new idea is what makes the life of a scientist fascinating and challenging, but also demanding. We all know good ideas are hard to come by, making them an attractive target for poachers. Maybe other researchers will capitalize your ideas, while you work hard to collect the data. Certainly collaborating with other researchers is a great opportunity to the advance and innovation in research. However this cannot be possible in certain cases.

According to UNESCO, high-income countries are a choice for development countries in terms of collaboration. Surely because their projects are in this case a source of funding. We also notice in almost all the cases a neighbouring effect with scientific collaboration involving countries of the same regions.

Furthermore, all scientists are susceptible to similar experiences. We encourage everyone to share ideas freely. But in some cases, people are boldly stealing other people's ideas. If you choose to talk about your ideas to colleagues or collaborators be aware that, in general, involving more people may rapidly expand the risk and may have the potential to let the situation get out of hand.

Here is an example:

A researcher submitted a grant application to an international philanthropic agency that subsequently rejected it, but awarded the project (and money) to a local group connected to the funding agency.

In general, it is necessary to follow these ways to choose collaborators:

Find trusted people you can work with: it is very much about the person. If you cannot develop a strong working relationship with a collaborator, both sides will suffer. To share your ideas will be riskier.

It is going to take some time: developing good collaborations will usually take some time, even if you have found the right person.

Work with people who are getting things done: nothing is more frustrating than collaborating on a project with someone who is not that interested in bringing it to a close.
As a closing note, depending on how research is funded, there may be some publishers' restrictions and IPR restrictions in case of research funded by industries.

6. Sharing your research results with the general public as an Open Scientist

Sharing research results is critical to inform the general public of ongoing scientific research and to explain to them why it is important to fund general research with public money. In fact, the results of scientific research can improve society making life more comfortable, reduce human efforts and produce useful and innovative products and applications.

It is also important to engage with young people to generate greater interest towards science and to motivate them to participate in future science endeavors.

Communicating with the public is also useful for general scientific research, because sharing ideas and results between researchers and the public sphere creates a better opportunity to convince policy-makers and the general public to support research.

Finally, it is important that scientists share their knowledge in order to obtain public trust and to avoid misunderstandings, giving the correct idea of what science does so that people do not see it as a danger or as something mysterious.

Any reasons why not?

Everyone can freely access social media, however online utilities are not always used correctly. In fact, among non-specialized people it is often more important to share news for sensationalism and not for spreading accurate information. For this reason, it is important to

share information that has a specific source (http://www.uexpress.com/georgie-anne-geyer/2000/5/26/information-without-context-or-knowledge-is).

If something is explained vaguely, this could induce confusion.

Additionally, sometimes the company that is providing funding does not allow proprietary results to be shared so it is suggested to mediate an agreement with the manager in order to allow more transparency.

An additional important topic is related to bioethics issues: methods used in research cannot be communicated freely because they may produce a negative effect.

How can you do this?

In order to do this our method should fulfil the triple A rule: **A**vailability, **A**ttractiveness, and **A**pplication.

In fact, to involve as many people as possible we should use freely available communication tools and media.

It is also important to make the subject of the research attractive for a general public, far from the research field. To do that, explanations should be simple and intuitive.

The first step is to use an appropriate language, avoiding difficult scientific terms and keeping in mind that your target may be a novice.

Secondly, data should be presented in a way to leave space for applications with practical models to explain scientific phenomena.
In a public event, it is necessary to present concrete activities where people can get involved.

What tools can you use to do this effectively?

The tools you use depend on the objective that you have. For example, if you plan to use social media, you can be very effective at reaching a large number of people; however, on the internet there are so many different websites to explore that the risk is that your product goes unnoticed. Therefore, you need to spend some time and energy in advertising and creating contacts. For

instance, if you want to start a Facebook page on science, you need to follow other pages and be active online, which takes a lot of time and practice before you can actually reach many people.

On the other hand, local events like exhibitions, visits to museums or informal scientific social events will attract fewer people but they are easier to promote, especially if they take place in public venues like cafès, squares and other places where ordinary everyday activities and social meetings take place.

So, depending on what you choose to do, you can select the best platform or option.

As regards social media, the advantage of platforms like Facebook and Twitter is that the user visualizes your posts on their homepage when they enter their account without needing to go looking for them; on the other end, a YouTube channel sends notifications to subscribers. Also Instagram is very popular but it is especially fit for images.

Blogs and websites allow posting of longer texts and divide them according to the subtopic.

On the other hand, scientific events (science nights, science cafés, science fairs and so on) need to be hosted in an adequate place and be well organized and funded. In some cities, scientific events are included within larger and more general cultural manifestations, so to involve more people, also when they are not particularly interested in the science field. This kind of event is not only educational but also entertaining, so it is important to include food and drinks or music and create a comfortable, colloquial atmosphere.

A particular kind of events are those designed for high school students' orientation. In these occasions, the presence of young researchers can make students feel at ease and make it easier for them to identify themselves and feel involved in a less intimidating environment. It is also important to make the participants active by proposing simple experiments and activities, also in the form of games or challenges.

Finally, if you want to reach a more general public composed also of older people who might be less familiar with the internet and modern technologies, you can propose to collaborate with expert people from the traditional media, like tv presenters and journalists that are more familiar to this kind of audience, to allow your topics to reach a wider population in a way that they feel comfortable with.

7. Sharing your research results with scientific colleagues as an Open Scientist

Why?

"Open Science is changing certain aspects of scientific publication practices to become more open, inclusive and interdisciplinary. Ensuring Europe is at the forefront of Open Science means promoting open access to scientific data and publications alongside the highest standards of research integrity" (https://ec.europa.eu/research/openscience/pdf/report.pdf).

Open science supports the wide spread of Knowledge and the exploitation of intellectual outputs coming from the research. It supports young and future researchers in achieving their goal and create their own network all over the word, involving the scientific communities and the society without boundaries and limits. Improving your management skills in your scientific career with the open science approach include:

- Visibility, Credits, Funding, Knowledge Transfer and Networking

How can you do this?

If knowledge stays within the academic walls, it will not propagate out into the general public. In order to share knowledge and better understand innovative research, we can follow a few steps to share the knowledge through posters, presentations, preprints and circulating teaching material for better understanding.

The traditional journal publishing model is very powerful. However, things are changing in the world of scientific peer-reviewed articles; so, we need to follow digital methods like:

- **GREEN ROAD** TO OPEN ACCESS = "self archiving": Scientists publish in a traditional journal but archives (opens) a publication in an openly available repository.
- **GOLD ROAD** TO OPEN ACCESS = Scientists publish in an Open Access Journal, a freely available electronic journal. Sometimes there is a publishing fee.
- **HYBRID ROAD**: pay the APC (Article Processing Charge) to open an article in a subscription journal.

What tools can you use to do this effectively?

The tools that can be used, like diagrams, explanatory images and tables capable of communicating research analyses and results in a concise and effective manner, are fundamental to support the research topic. Authors will have to pay attention to the images due to good rewriting. The use of a series of keywords is important for finding the focus of the research topic immediately. Of course, if possible, it is always better to confer directly with colleagues that are experts in this area.

Open science members could help others by bringing their findings to other peoples and providing a flexible environment. This will reinforce their trust in open science and promote participation. However, according to the European commission report, some good practices should be implemented to attract and recruit scientists (http://europa.eu).

These includes

- Creating awareness
- Promoting the advantages of open science
- Rewarding and exposing to incentivize
- Designing institutional policies allowing the researcher to participate
- Exercising the reasonable choice over when and how they share

One can also use these internet links for tools:

1. **arXiv.org (Cornell University Library):** you can create your own account. Once you become a member of this library, you have full access to new research/ articles from all over the world (Reference: Cornell University Library)
2. **DATABANK** is an analyzing and visualization tool that contains collections of time series data on different topics. We can use this to make our own DATABANK for sharing among colleagues [**http://databank.worldbank.org/data/home.aspx**]
3. **Dataverse Network:** Open source data repository tool that originates at Harvard University. It can be helpful for open scientist members.
4. **Figshare:** Another way to store your data, share with others and also discover research.

Some good practices to get inspired:

Knowledge sharing refers to the provision of task information and know-how to help others and to collaborate with others to solve problems, developing new ideas, or implementing policies or procedures. Knowledge sharing can occur via written correspondence or face-to-face communications through networking with other experts, or documenting, organizing and capturing knowledge for others. Although the term knowledge sharing is generally used more often than information sharing, researchers tend to use the term "information sharing" to refer to sharing with others what occurs in experimental studies in which participants are given lists of information, manuals, or programs. Therefore, if managed properly, knowledge sharing can greatly improve work-quality and decision- making skills, problem-solving efficiency as well as competence that will benefit the organization at large.

The intensity and effectiveness of knowledge sharing through the open-network largely depends on the usability of the IT system created, the incentive system as well as the organizational culture of the institution. Successful results sharing contribute to communication and improvement among different institutions, which are focused on similar fields. On the other hand, result sharing is more important once the research objectives are met. Sharing can show the main difficulties and drawbacks to experts which could enhance the efficiency and time - saving. Sharing results is also an efficient way to save scientific research funding and to accelerate global technological development. It can contribute to scientific building in developing countries.

During the sharing procedure, a common language and common vocabulary is needed in order to guarantee the same knowledge to each participant. For instance, scientists become familiar with a specific language and terminology; this strengthens thanks to the interaction with colleagues with whom he/she works closely (e.g. in the same laboratory). A specific sector of study defines a real "forma mentis". This leads to taking for granted its own approach as universal. However, while operating in the same macro-area (e.g. biology or computational science) scientists often use different languages.

In conclusion, the main effort to face for sharing knowledge consists in translating results into a more understandable language that do not omit important key points.

The benefits of research can only be realized if results of investigations are published in the literature for others to replicate and expand upon. But in order to preserve the authenticity, originality, and quality of the investigation scientific research must respect appropriate ethics principles. There are many issues related to scientific writing and all researchers should be aware of them.

Plagiarism can occur in many different forms: copying totally or partially papers or publications without declaration of the sources information origin; appropriating colleagues' results, graphics, figures or tables; "paraphrasing" sentences or parts of other works without acknowledgement. Even though not related to the sharing of scientific knowledge, self-plagiarism – i.e. using as new previous works - can be considered unethical as well.

Falsification of data cannot be justified because the researcher must always be unbiased and true with data.

Three of the main mistakes are the following: copying a part of the text from other authors; adding incorrect citation the most frequent difficulty are the grammatical errors, e.g. forgetting to use the parentheses which report the authors' citation, or not using italics.

Falsification could be strictly punished, including academic penalties resulting in dismissal from the university.

How to cite journal articles

It is usual among young researchers to follow some implicit rules, which have been defined by common practice in academic and scientific writing context. In order to have their works published in a given journal, with eventually a high impact factor, they feel forced to reference to previous contributions of the same journal. The main risk consists of citing certain sources that are irrelevant to the topic, affecting the objectivity that should characterize a scientific paper, especially in the case of an author being a supporter of Open Science. There is no easy solution to this issue. However, before starting to write an article, each researcher should perform a deep investigation about the topic and look for available works while being aware of the final purpose, including the journal the paper is designated to belong to.

Some activities to get inspired to collaborate are:

Demanio Marittimo: http://www.mappelab.it/demanio-marittimo-km-278/

A 12-hour marathon - from sunset to dawn - devoted to contemporary architecture and art on Marzocca beach (Senigallia) open to everyone. A night of talks, debates and performances by prominent architects and artists.

PhDCup: http://www.phdcup.be/publieksprijs

A competition among PhD candidates aimed at sharing their research with the general public. After a 4-day workshop with media experts, candidates create a short video (3 minutes long) on the core of their three-year research.

TED talks: https://www.ted.com/

Influential videos from expert speakers on education, business, science, tech and creativity, with subtitles in 100+ languages. Ideas free to stream and download (retrieved from https://www.ted.com/)

OMT travelling exposition: www.omt-etn.net

Travelling exposition: build a device (videogame for example), that everybody can use.

Serpentine Pavilion: http://www.serpentinegalleries.org/explore/pavilion

Every year the Serpentine Gallery in Kensington Gardens (London) commissions a temporary pavilion by a leading architect. Open three months during summer, the Pavilion allows the general public to experience contemporary architecture.

Any reasons why not?

One of the most significant obstacles of open science lies in the incentive structures of academic research, which can often fail to recognise, value, and reward efforts to open up the scientific process. As a result, the career advancement of researchers may be hampered if they embrace new ways of working and publishing, rather than fitting within existing systems. If faster and deeper change is to occur, we need robust data and empirical evidence (https://ec.europa.eu/research/openscience/pdf/report.pdf).

8. Finding help and inspiration as an Open Scientist

When you are part of a new movement, it can be difficult. Sometimes you feel as though you are swimming against the stream. Few people recognize the value of what you are doing, or you might want to take a particular approach and don't quite know how to do it. There are many people, documents and websites that can help you - inside and outside the University of Camerino!

Any reasons why not?

Changing a system is always difficult. Some researchers feel they do not get much credit (yet) within their department or institution for being an Open Scientist, and therefore they feel little encouragement to operate like one. For example, they might feel under pressure to publish in high-impact journals, but cannot afford to pay the Article Processing Charge and are unaware of the Green Road alternatives. However, the context in which we work is changing quite rapidly.

Meanwhile, being inspired by others who practice Open Science, simply because it adds quality to your scientific work, generates greater impact and enriches your experience as a researcher!

APPENDIX

Open access @Unicam: how to promote and disseminate research output, by Clementina Fraticelli, Chief Librarian

Agenda

- Open Access @Unicam
- Overview of Open Access: Gold OA Vs Green OA
- Why deposit: benefits of being open access as a researcher
- Misconceptions about open access publishing
- CamPuS - *UniCam Pubblicazioni Scientifiche* for young researchers
- What you can deposit in CamPuS
- How you can deposit your paper in CamPuS
- How to make papers openly available
- Worry-free deposit: does your publisher allow self-archiving?
- Published version vs accepted version
- Unicam open access policy

Open Access @Unicam

- 2004: the University of Camerino signs the Messina Declaration, "Italian Universities for Open Access: towards open access to research literature", a manifesto that promotes Open Access to scientific literature in Italy, inspired by the Berlin Declaration of 22 October 2003
- 2008: Unicam joins the *Magazzini Digitali Project* concerning harvesting, self-archiving and legal deposit of doctoral theses in Florence National Library Archive
- 2012: Unicam Statute, art. 35, University Library System mission: "spread the principles of full and open access to scientific literature and promote the free dissemination of research output produced by the university“
- 2014: On the occasion of the Decennial Declaration of Messina, Unicam signs the Messina Open Access Road Map 2014-2018, to confirm its adherence to the principles of the Berlin Declaration and commits itself to "support the implementation of institutional policies aimed at consolidating the development of open access and to foster opportunities for internationalization of research, with a view to ensuring broad visibility for Italian scholarly publications“
- 2018: Drafting of a «University of Camerino open access policy».

Open Access benefits

- More exposure for your work
- Higher citation rates
- Access for the public
- Practitioners can apply your findings
- Compliant with grant rules

- Taxpayers get value for money

Misconceptions about open access publishing

- Open access journals are not peer reviewed
- All or most open access journals charge publication fees
- Most fees are paid by the authors themselves
- Publishing in a conventional journal closes the door on making the same work open access
- You must choose between prestige and going open, because open access journals are low in quality
- Post-print archiving violates copyright
- Open access mandates infringe academic freedom.

How to make your papers openly available

Most publishers allow your peer-reviewed final manuscript to be made openly available via your institutional repository. Your librarian will check publishers' policy and ensure that your submission is copyright compliant. Enter the name of the journal in the Directory of Open Access Journals (DOAJ). If there is a hit, then it is fairly certain that the journal is legitimate. The Quality Open Access Market (QOAM) ranks journals based on services provided and user experience. If a journal is circumspect, QOAM marks it with a red label ('threat to authors'). If you are uncertain about a journal, visit The American Journal Experts for guidelines on how to determine whether it is of questionable quality.

UniCam Pubblicazioni Scientifiche for young researchers

Unicam has adopted IRIS an Institutional Research Information System:

- 68 Italian Universities use it
- Public register of Italian University research
- It contains personal data of the academic staff and their publications, both full texts and bibliographic metadata
- The aim is to collect and preserve the scientific output of the University, make it visible and promote its impact on a national and international level.

CamPuS is an open public system, interoperable with other public and private systems
For output data it interfaces with:

- Loginmiur - Only entry point for the structured and unstructured researchers of Italian universities and public research institutions accredited for the use of ministerial services
- OpenAIRE - Global directory of academic open access repositories, collection system for publications funded by the European Commission.
- DART Europe - Portal for open access research theses in Europe
- BASE - One of the world's biggest search engines, especially for academic web resources
- Pleiadi - National platform for centralized access to scientific literature held in Italian open access archives and journals
- CORE - Connecting Repositories, that is aggregating open access content from repositories and journals worldwide
- ResearchGATE
- WorldwideScience global science gateway comprised of national and international scientific databases and portals.

For incoming data it interfaces with:

- Scopus, Web of Science (for Universities that have signed specific APIs), Pubmed, Crossref.

Access to bibliographic records

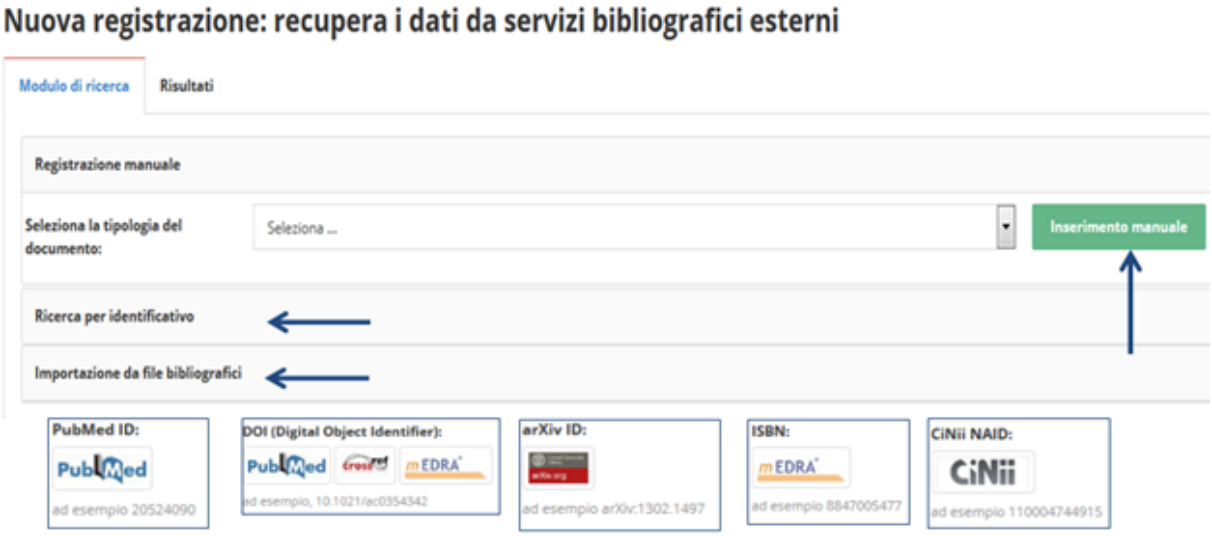
1. Free web access for non-profit purposes
2. Free access to full-texts with authors' consent and in accordance with publishers' policies
3. Publications can be:
   reproduced, exhibited, performed, used for teaching, study, research and non-profit purposes, provided that all the bibliographic information relevant to their identification is indicated and the permalink (handle) to the resource provided
4. Publications cannot be:
   used for commercial purposes, unless authorized by the authors

5. Bibliographic material types archived in CamPuS map and are aligned with LoginMIUR. For each record important elements are:
    - full-texts
        - pre-print: manuscript submitted to the publisher, not yet refereed
        - post-print: version accepted by the publisher and refereed
        - published version
    - type of peer-review (single blind, double blind, open, transferable, collaborative, post publication review…)

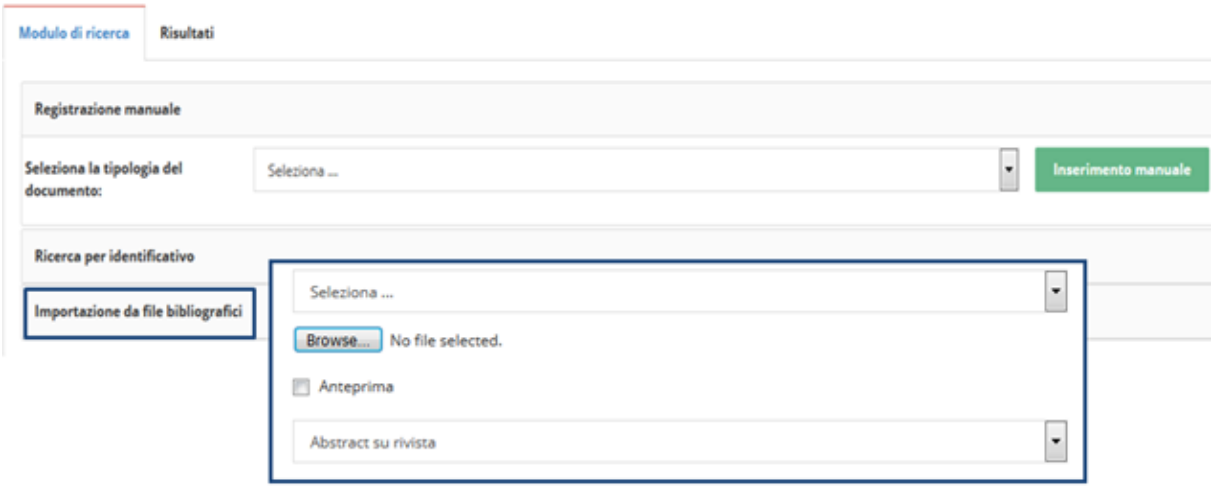
Doctoral Theses in CamPuS

- Migration of doctoral theses from the old repository CamEprints to CamPuS at the end of 2017
- Benefits:
    - DOI attribution
    - Larger research repository interoperable with national, international repositories and search engines
    - Compliance with the legal deposit mandate
    - No infringement of copyright laws and compliance with the author's rights.

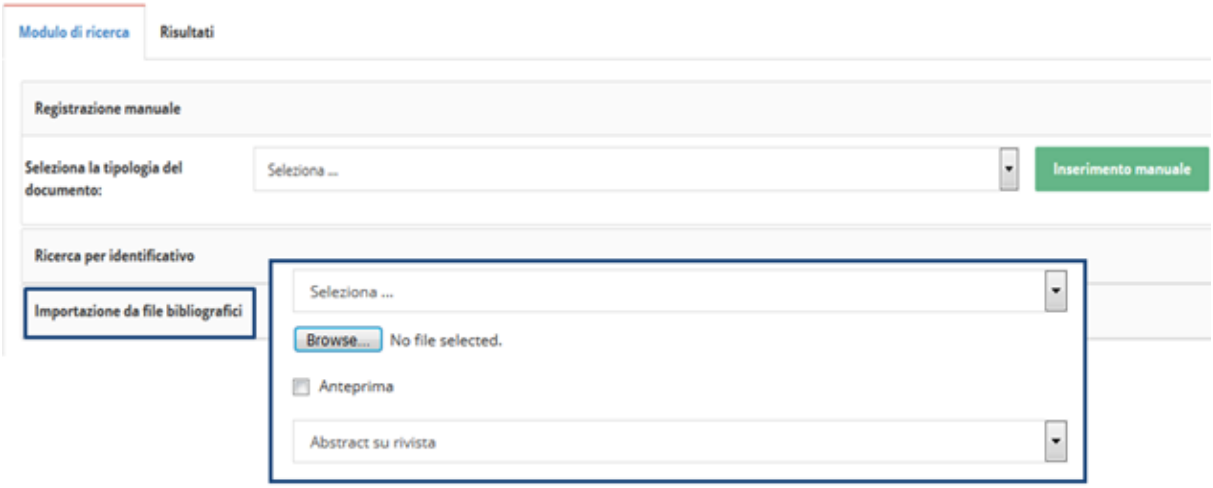
How to deposit: practical guide

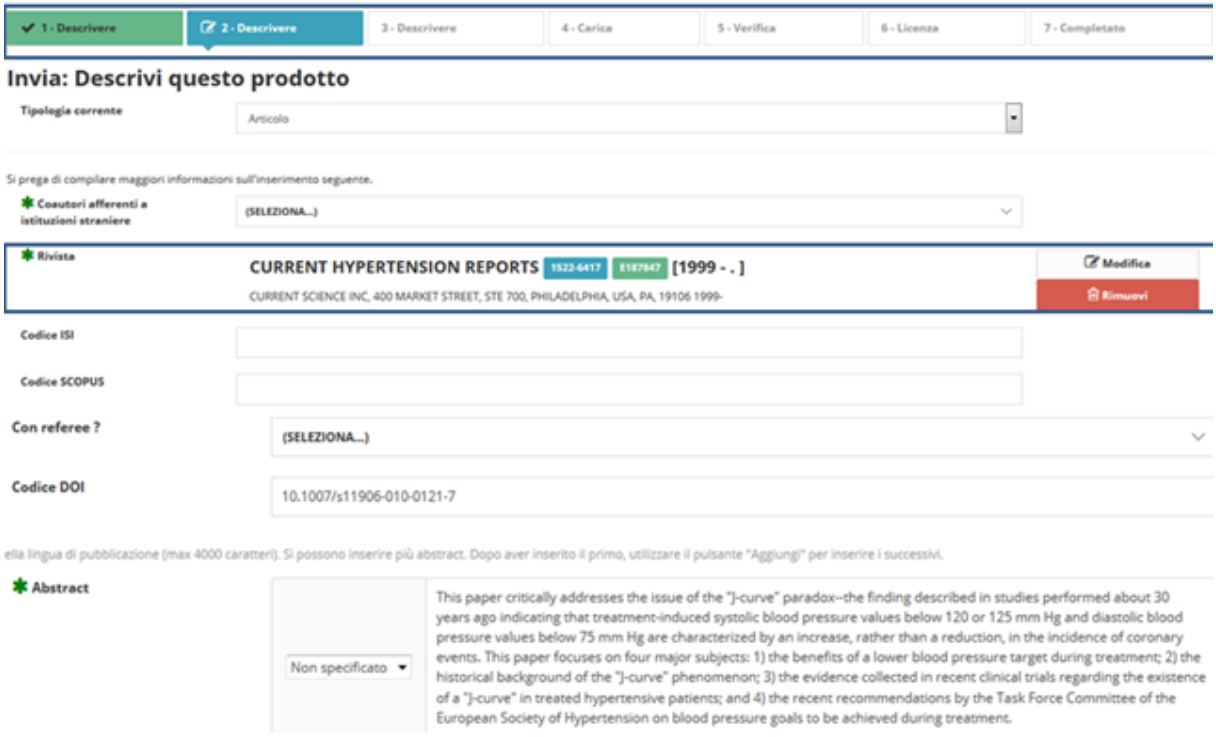


Nuova registrazione: recupera i dati da servizi bibliografici esterni



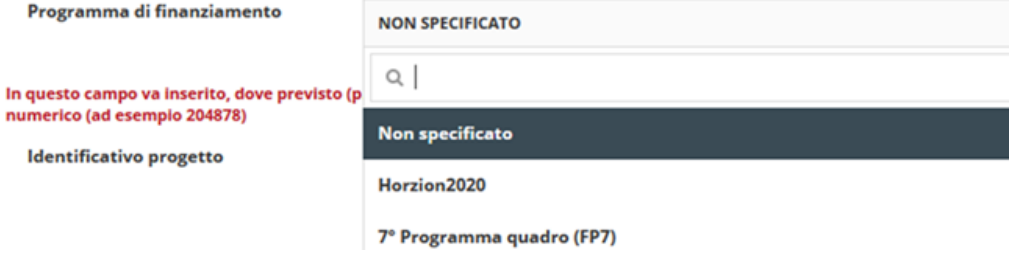
Nuova registrazione: recupera i dati da servizi bibliografici esterni





Enabling OpenAIRE interoperability

Dove questo è previsto (p.e. progetti europei con pubblicazione in OpenAIRE - Open Access Infrastructure for Research Europe)



Some questions:

1. **Difference between proof or off-print and the post-print (accepted) version?**

Unlike post-prints, which are produced by the author, proofs / offprints are delivered to the author from the publisher.

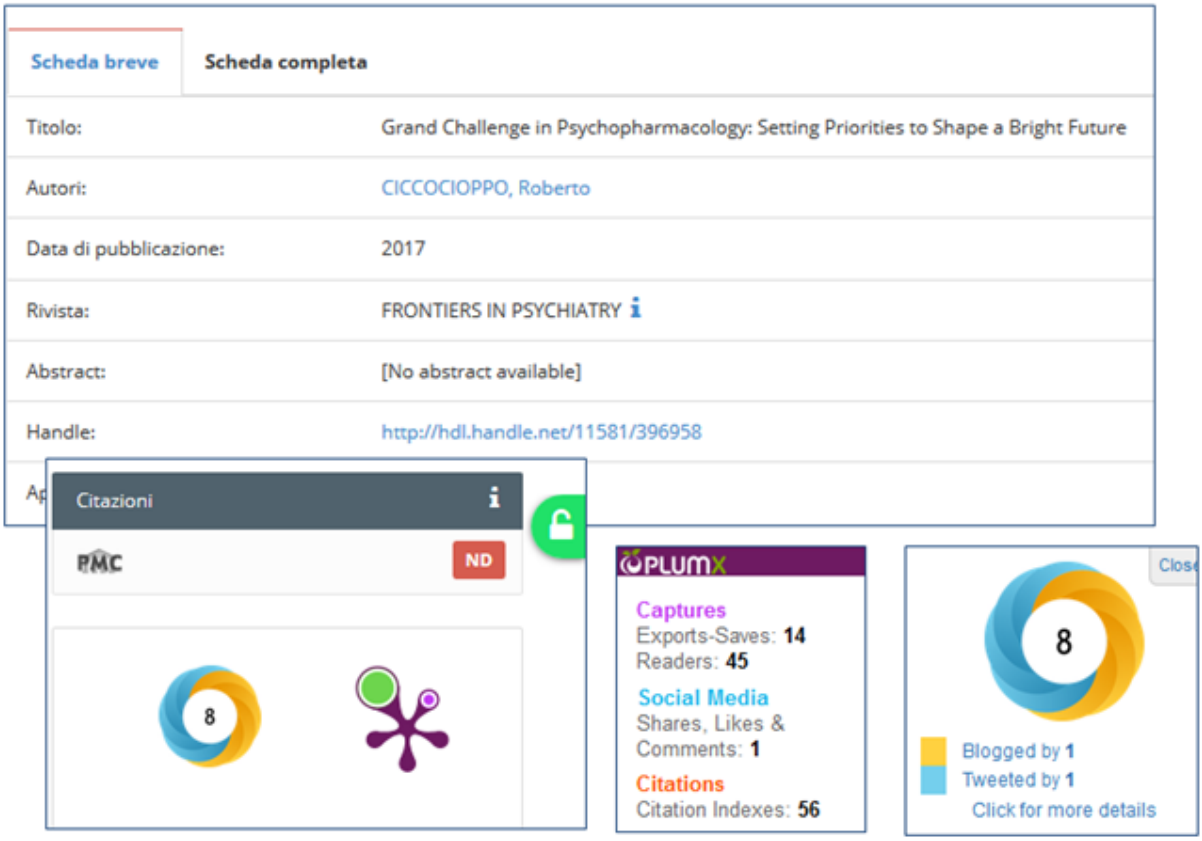
Proofs / offprints have been formatted and reflect any layout or copy-editing done by the publisher in preparation for publication.

Proofs / off-prints should not be deposited in your institutional repositories. (*NTU Library)

2. **Worry-free deposit: does your publisher allow self-archiving?**

- SHERPA RoMEO enables researchers and librarians to see publishers' conditions for open access archiving on a journal-by-journal basis.
- SHERPA Juliet enables researchers and librarians to see funders' conditions for open access publication.

3. **How popular is my research?**



4. **I do not have time to check the publisher's policy, can I still submit my papers in the institutional repository?**

- Yes, simply deposit your peer-reviewed manuscript. Your librarian will check the publisher's policy and ensure that the publisher permits the full text archival.

5. **May I know who is interested in my papers?**

- At the article level, you can view how many people view or download your paper and which country or city are they from by clicking on 'Show Statistical Information' link.

6. I share my papers in ResearchGate and Academia.edu, why do I need submit to CamPuS?

- Some publishers encourage sharing in institutional repositories, non-commercial subject repositories or personal websites, but specifically forbid sharing in for-profit commercial repositories and social networking sites such as ResearchGate and Academia.edu. So where such policies are in place, you may be in danger of violating these terms of service, if you post an article on a social networking site.

7. How fast does it take to process my papers?

- Once record and full text have been submitted, they will be available in CamPus front-end the following day. However, for papers that are under embargo, the link to the full-text will only be accessible after the appropriate embargo period has elapsed.

8. Can I still deposit papers that are under a publisher's "embargo"?

- Yes, you can still submit your accepted manuscript as soon as it is ready. The system allows us to lock the full-text access of a submission by setting an embargo period. Your librarian will also check and ensure that the full text of the manuscript will only be made openly available after the publishers' embargo period.

Unicam open access policy: references

1. CRUI Recommendation on Open Access and Assessment of Academic Research, 2009
2. EUROPEAN COMMISSION Recommendation (2012/417/EU), 17 July 2012 on Access to and Preservation of Scientific Information
3. Italian L. 112/2013, art. 4, para 2
4. CRUI Guidelines for University Policies and Regulations on Open Access to Publications and Research Data, June 2013
5. 2014 Messina Declaration "Italian Universities for Open Access: towards Open Access to Research Literature"
6. CRUI Guidelines on Open Access and Rights Management, 2017.

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1. Short story of the Open Access Movement (*Cold Spring Harbor Laboratory Library)
2. Introduzione sull'Accesso Aperto (by Peter Suber, translated into Italian by Susanna Mornati)
3. Wiki Open Access
4. Suber P., Open Access: Six Myths to Put at Rest, Guardian Professional, published Mon 21 Oct 2013
5. Wiley Types of Peer Review (last accessed Friday 9 Feb 2018)
6. Creative Commons Licenses (last accessed Friday 9 Feb 2018)
7. **To deepen the topic**
   - Open Access Directory (last updated October 2017)

   Compendium of factual lists on open access to scientific research, managed by the OA community

- Bibliography in Italian (last updated August 2017)
- Pleiadi - Portal of Italian Electronic Literature Archives and Institutional Deposits
- European Commission - Participant Portal H2020 Online Manual - Open Access & Data Management

8. **Tools**
   - Open Access Button
   - Unpaywall
   - SherpaRomeo
   - SherpaJuliet
   - Altmetrics
   - PlumX

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Great work everyone!


ASUS