



Final Evaluation and Quality report

Deliverable 5.6



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 741527 and runs from May 2017 to September 2021.

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EXECUTIVE SUMMARY

The Final Evaluation and Quality Report is part of the ORION Open Science project (Open Responsible research and Innovation to further Outstanding kNowledge), funded under the European Science with and for Society (SwafS) work programme within Horizon 2020. The document is organized in three parts, including several infographics:

- A general **introduction to the project**, presenting ORION strategies and actions as well as overall statistics on the participating experts and citizens.

- The **Evaluation report**, presenting the main results arisen from the efforts devoted to the Work Package 5 focused on evaluating ORION training actions in Open Science and multiple co-creation experiments. Moreover, the report includes the main recommendations that the CRECIM (UAB) team has elaborated from its evaluation experience in the four-year lifetime of the project. In addition, the report offers an overview of the culture change happened in the institutions participating in ORION, according to the views of their Directors and

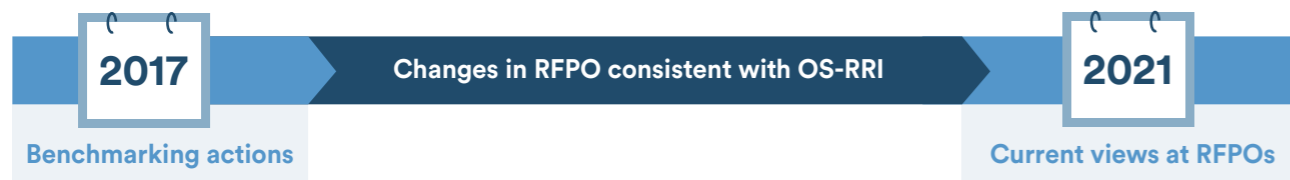
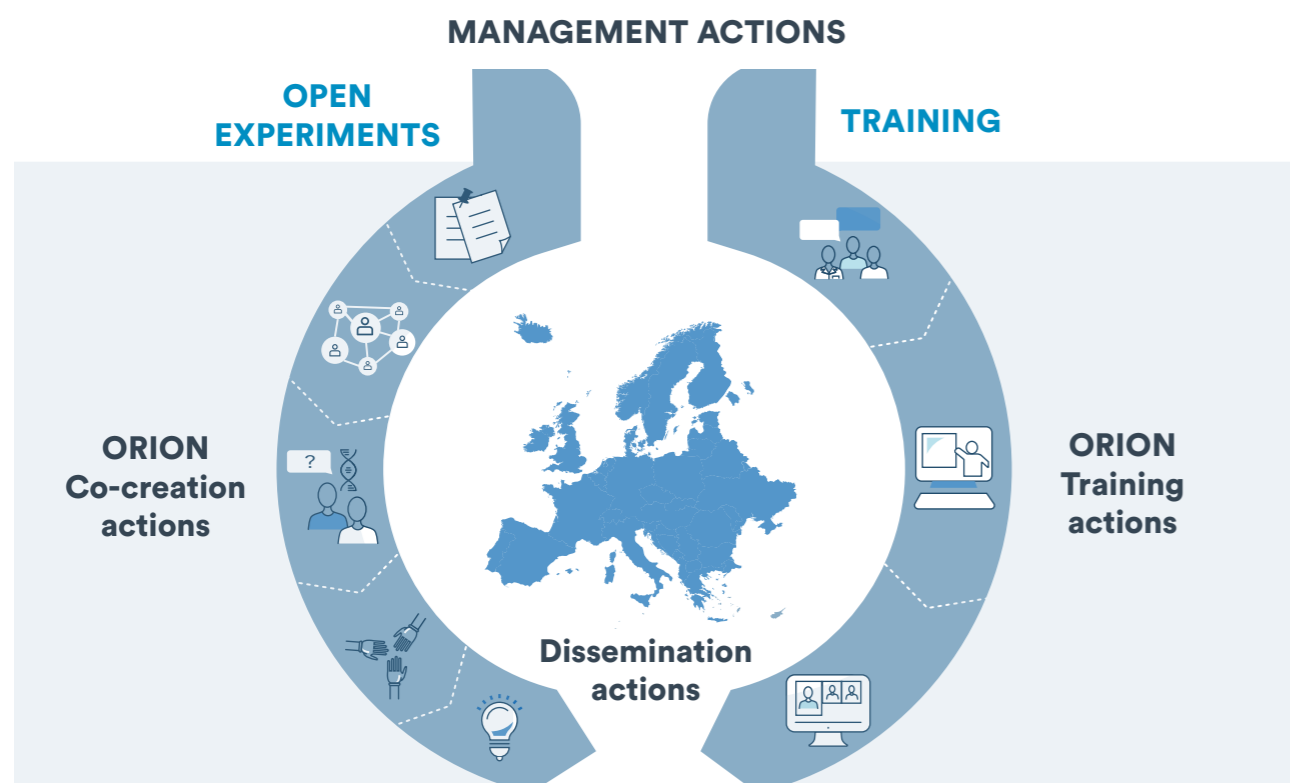
RRI experts. The evaluation report has been developed from data reported in the following ORION Deliverables:

- D5.1 “Evaluation and Quality Plan: Instruments, strategies and indicators” (confidential report)
- D5.2 “Interim evaluation report on co-experiences” (confidential report)
- D5.3 “Interim evaluation report on training workshops” (confidential report)
- D5.4 “Final evaluation report on co-creation experiences” (public report)
- D5.5 “Final evaluation report on trainings” (public report)

Through the document, links are provided to the ORION website where the public deliverables are accessible for the reader to find out further details on the evaluations that were carried out.

- The **Quality report**, showing the strategies, channels and results promoted by the ORION Management team to ensure the successful implementation of the project.

01 ORION STRATEGY AND ACTIONS



ORION PARTNERS

2 Research Funding Organisations (RFOs)

- ISCIII (Instituto de Salud Carlos III) – Spain
- JCMM – Czech Republic

2 Civil Society Organisations

- ANT Foundation – Italy
- VA (Public & Science) – Sweden

1 Social Sciences Group

- CRECIM / UAB – Spain

4 Research Performing Organisations (RPOs)

- The Centre for Genomic Regulation (CRG) – Spain
- The Central European Institute of Technology (CEITEC), Masaryk University – Czech Republic
- The Babraham Institute – United Kingdom
- Max Delbrück Center for Molecular Medicine in the Helmholtz Association (MDC) - Germany



WHAT HAS BEEN DONE IN ORION?

The ORION project aims to trigger evidence-based institutional, cultural and behavioural changes in Research Funding and Performing Organizations (RFPOs), targeting researchers, management staff and high-level leadership. Our long-term vision is to “embed” Open Science and Responsible Research and Innovation (RRI) principles (ethics, gender, governance, open access, public engagement, and science education) in RFPOs, in their policies, practices and processes to organise, do and communicate research. Throughout the project we have identified drivers and barriers, interests and values and have produced “prototypes” in the form of new citizen science projects, new research strategies, new funding frameworks and innovative training material.

Within the Trainings, a series of face-to-face workshops and online courses in Open Science and RRI were carried out which targeted primarily researchers (PhD students and postdocs) and secondarily research managers, funders and project coordinators. All our training resources are free for anyone to reuse.

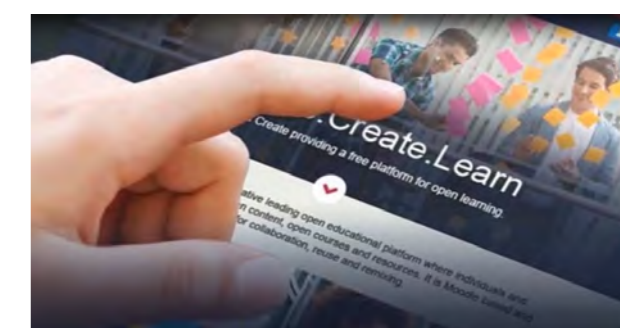
In order to amplify the effect of the ORION project, we have disseminated what we were learning through social media and conferences, and we also ran a popular podcast series.

The changes produced at ORION RFPOs along the project have been followed and evaluated around the different actions and through the final interviews to directors and RRI promoters at the final stage of the project.

At the beginning of the project, two surveys (addressed both to the general public and to staff members of ORION RFPOs) and a set of interviews to ORION key actors (directors and RRI promoters) were carried out in order to assess initial views about Open Science and RRI at the starting point of the project.

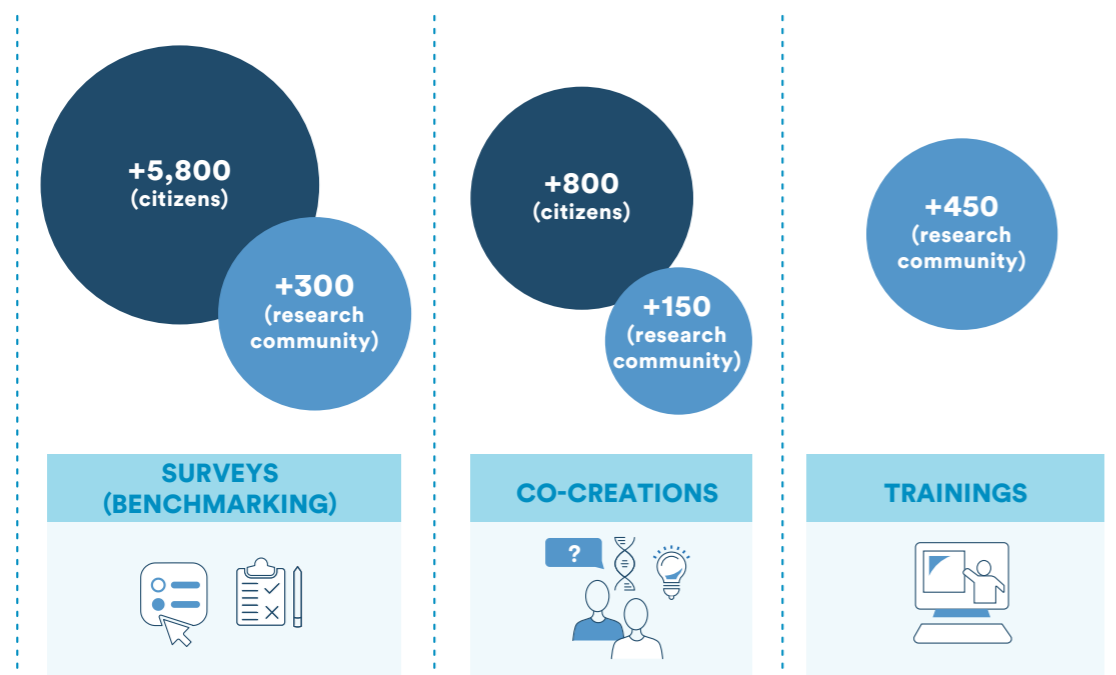
As part of the Open Experiments, diverse co-creation actions were carried out involving multiple stakeholders around three specific challenges:

- Opening up the research engine;
- Identifying risks and opportunities presented by disruptive technologies;
- Promoting multi-stakeholder collaboration.



02 ORION PARTICIPANTS

+7,400 PARTICIPANTS IN ORION ACTIONS



OTHER ORIONERS REACHED THROUGH SOCIAL MEDIA

- @ORION_opensci: 1.944 Followers
@OOSP_ORIONPod: 607 followers
- Facebook: 236 followers
- LinkedIn: 132 followers
- ORION newsletter: 219 subscribers
- ORION website: 29.580 users and 88.228 page views
- ORION podcast: 7.446 downloads (44 sessions)

(Reference data: 1 Sep. 2021)

HOW MANY PEOPLE DID ORION REACH?

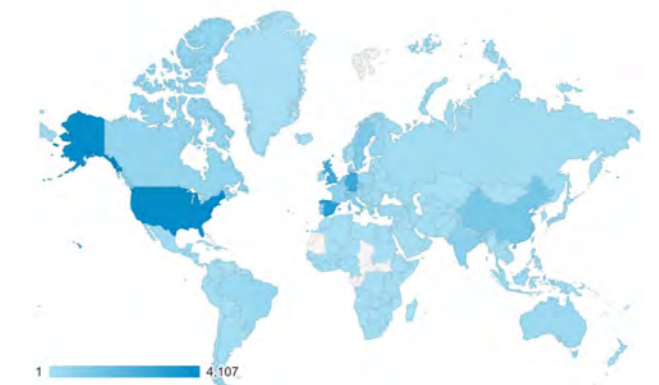
Over the lifetime of the project, ORION has made an effort to engage many different types of stakeholders, including RFPOs, citizens, policy makers, and industry.

More than 7,500 people have directly participated in ORION actions, in different ways and with different degrees of involvement. While some ORION participants were engaged occasionally (e.g. respondents of the ORION benchmarking surveys) or attended short-scale ORION single events (e.g. one-day workshops), others participated extensively in immersive events (e.g. public dialogues) and over large periods of time (e.g. ORION MOOC trainings or co-creation actions). As a result, ORION has reached different degrees of impact regarding the different modalities of participation and engagement levels in the ORION activities.

On the other hand, ORION has reached a wide audience through the project's formal and informal communication channels. For instance, the different ORION social media accounts (twitter, facebook and LinkedIn) have attracted thousands of followers in 4.5 years. The word about ORION and its activities have spread across the globe, engaging stakeholders in all the continents. The ORION quarterly newsletter has kept its 200 subscribers up to date with project ongoings and invitations to conferences, call for proposals and other collaborations. The ORION Open Science Podcast produced 44 episodes on topics ranging from Open Science career pathways to pre-prints and public engagement, to date with more than 7,400 downloads by an audience from all over the world.

The ORION partners have also given presentations on ORION and/or on specific project activities at national, European as well as global conferences, thus giving visibility to the project. Examples of conferences are ESOF 2018 in Toulouse, ESOF 2020 (virtual), Berlin Science Week, Future of SciComm conference 2021 and the PCST conference 2021.

The steady increase of followers to all the different communication channels clearly shows that the interest in the ORION project is still very high. The COVID-19 outbreak and lockdown has not hindered the communication flow and dissemination activities of the ORION project. On the contrary, thanks to the transfer to online workshops, meetings and conferences more new followers have found their way to the projects' dissemination channels and participated in ORION events.



(Website visitors 2017-2021)

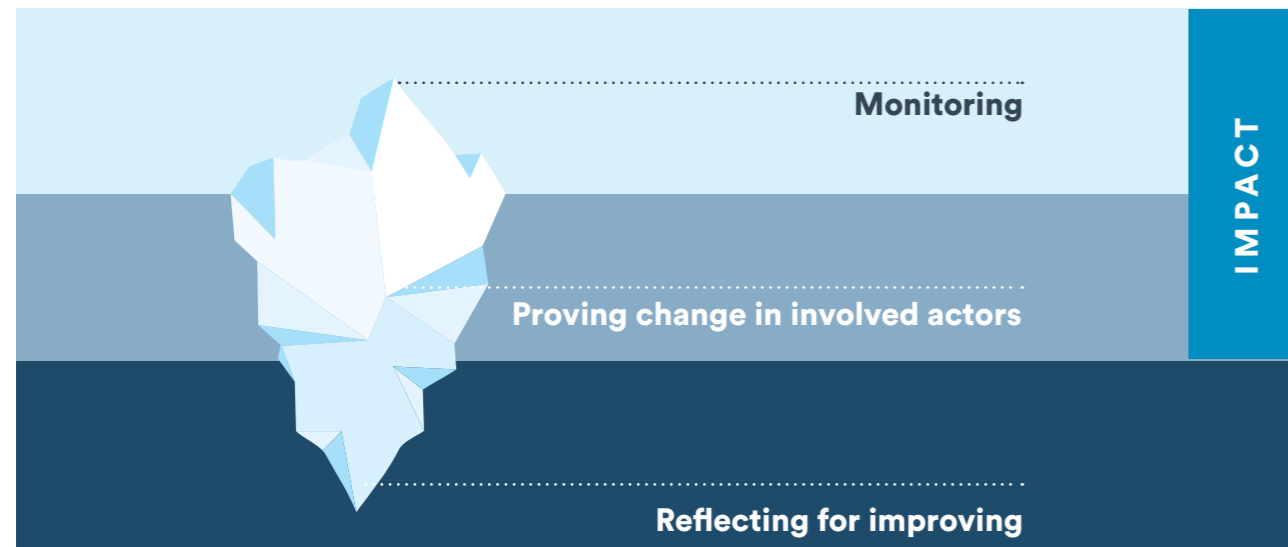
03 EVALUATION STRATEGY FOLLOWED IN ORION

1. Evaluation framework

EVALUATION is the systematic and reflective revision process of an ongoing or finished project or initiative, including its design, implementation and outcomes, with the final aim of proving impact and improving the project.

EVALUATING AN INITIATIVE is important because it can provide us credible and useful information for the decision-making process regarding the efficiency, efficacy, impact and sustainability of such initiative.

2. Aims and perspectives of evaluation at ORION



To evaluate an initiative, we need to decide what are the main objectives or goals of the initiative and which is the evaluation perspective or focus, that is, what is the evaluation aimed for. At ORION we have evaluated from three perspectives:

- **Monitoring** the scope and progress of each ORION initiative, that is, analyzing how many people participated or were reached and their profile. At ORION, the professional profile of those participating, particularly within the community of researchers, has been interesting to monitor.

- **Proving change** in involved actors implies measuring the impact of the ORION initiatives on the involved participants and institutions at different levels. In particular, evaluation of ORION actions sought to assess impact in terms of satisfaction, awareness, learning and perception of change of participants' views regarding Open Science.

- **Reflecting** for future improvement, by using the evaluation findings to reflect on ORION actions, identify inspiring stories and extrapolate what has been learnt to new initiatives.

3. Methodological approach

In order to evaluate from these different perspectives, we have followed a mixed methodological approach, which combines quantitative and qualitative perspectives:

The **quantitative approach** to evaluation at ORION has allowed us to reach a larger number of participants answering descriptive questions such as "How many...?" or "To what extent...?". This was done through large-scale surveys and semi-structured questionnaires.

The **qualitative approach** to evaluation at ORION has been used for being able to interpret results at a deeper level, allowing us to answer questions such as "How...?" or "Why...?". This was done through long personal interviews and focus groups with purposely selected participants.

Perspective on evaluation of impact

- Monitoring the extent and progress of the project
- Proving Change in involved actors
- Reflecting for the future improvement

Evaluation goal

- Control and accountability
- Assessment
- Provide new knowledge

Methodology

- Quantitative
- Quantitative and qualitative
- Qualitative

4. Participants and informers of the evaluation at ORION

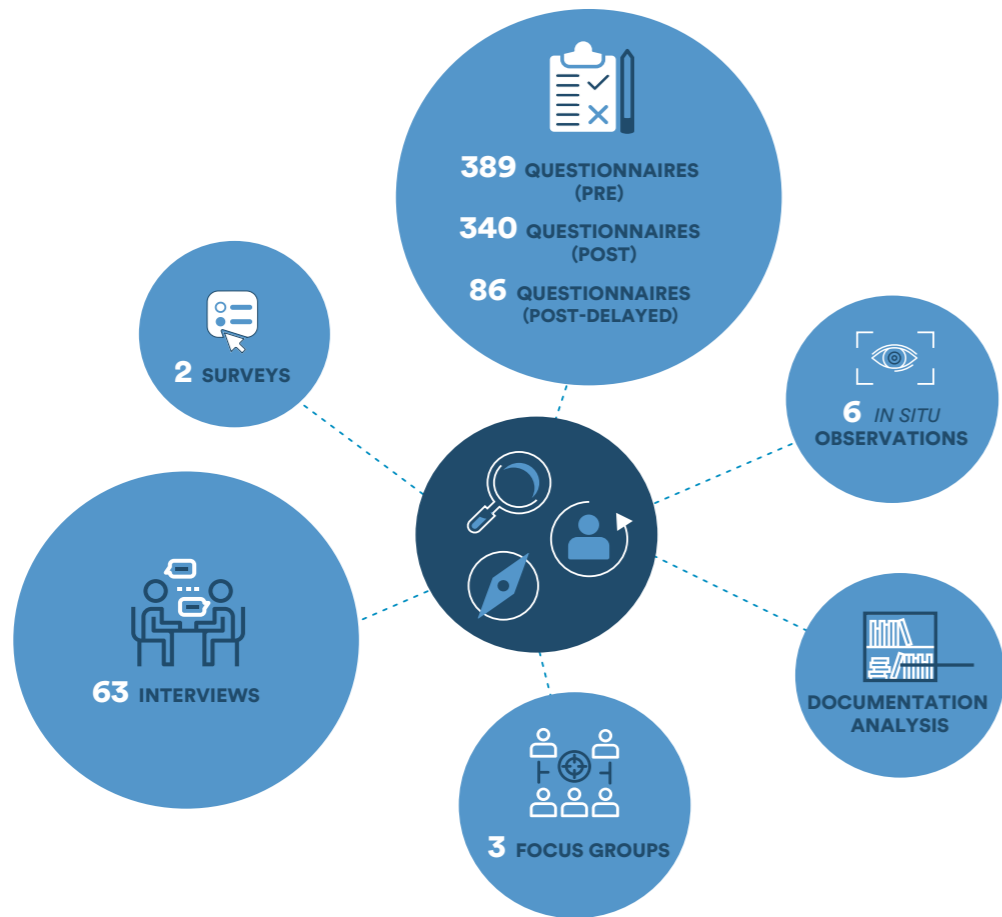
An evaluation is a complex process in which multiple stakeholders can be involved. At ORION, the source of evaluation data came from both participants (i.e. the target population of the actions), ORION team members and other key actors (e.g. directors of the RFPOs). In all cases, we have followed practices and methodologies

to ensure that the evaluation process was guided by a set of ethical, participatory and security criteria (e.g. informing participants about their involvement in the evaluation, requesting informed consents to interviewees, or assuring confidentiality in public documents derived from low compromising data).

Criteria to guide and regulate the way participants engage with evaluation

- Informed consent** Contract between the evaluators and participants of an action regarding the purpose of the evaluation and the way data would be gathered, analysed, reported and secured.
- Feedback to informers** Ensuring that information, results and conclusions of an evaluation needs to be shared with those participants of the evaluation, both to ensure adequate interpretation of data and in order to be informed of what is found.
- Voicing participants** Gathering data and views from all relevant participants and actors, considering that all profiles are represented.
- Data protection** Actions taken to ensure that sensitive data is gathered, documented, stored, analysed and shared adequately, according to ethical principles and security measures to ensure the level of anonymity and legitimate use referred to in the informed consent.

04 INSTRUMENTS AND DATA GATHERING AT ORION



EXAMPLES OF QUESTIONS:

“Can you think of any benefits related to the development of this Public Dialogue?”

“Do you think researchers like you have enough knowledge about Open Science?”

Q2. In your opinion, TO WHOM should science be opened?
From each item, rank it from 1 to 5 (1=should NOT be opened, 5=should be very opened)

	1	2	3	4	5
Open to scientists from the same area / discipline					
Open to scientists from other disciplines					
Open to all citizens					
Open to civil and social organizations					
Open to specially concerned groups (e.g. patients)					
Open to funders and policy makers					
Open to industry and companies					

EVALUATION INSTRUMENTS AND STRATEGIES USED IN ORION

To evaluate the ORION actions, a series of data gathering instruments were designed, piloted and used, in compliance with those planned in the ORION Deliverable D5.1 “Evaluation and Quality Plan: Instruments, strategies and indicators”.

Instruments used for the quantitative evaluation approach include:

-Two **surveys** that were carried out at the beginning of the ORION project as part of Work Package 2 (Analysis and Benchmarking): one in the frame of the quantitative study about the views and practices of Open Science in ORION RFPOs (which was based on an online questionnaire disseminated through all the staff members of the 6 ORION RFPOs), and another one directed towards the general public (involving nearly 6,000 respondents in Czechia, Germany, Italy, Spain, Sweden and the United Kingdom).

-A series of **questionnaires** (pre, post and post-delayed) that were used to evaluate trainings and co-creation actions. To allow comparison, these instruments were designed with common core of questions for each of the different types and formats of ORION trainings and co-creation actions, despite adapted to the current specific characteristics and idiosyncratic context of each of them.

Instruments used for the qualitative evaluation approach include:

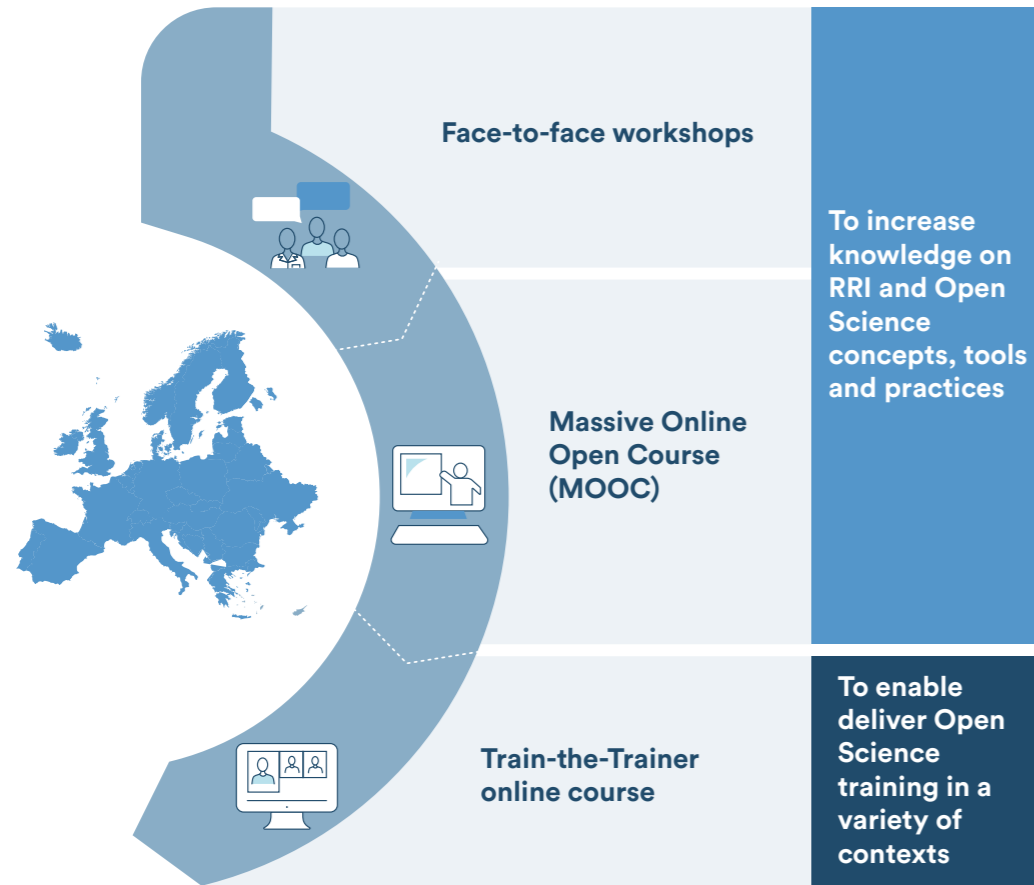
-*In situ* **observation protocols** of Public Dialogues that allowed external observers to comment aspects related with the dialogic atmosphere of these events.

open questions that emerge during the discussion.

-**Templates for documentation analysis** of the different calls and reports published regarding the ORION actions.

-**Interview protocols** for the long, personal interviews carried out with participants involved in ORION trainings and co-creations and with key actors in ORION RFPOs (directors and RRI promoters). All the interview protocols followed a semi-structured approach with open questions, and were completely adapted, including spontaneous questions when needed.

-**Protocols** to organise and guide **focus groups** with organisers of the Public Dialogues on Genome Editing, the Citizen Science call and the Open Science Funding calls. These included guiding questions but also space for



SCOPE OF ORION TRAINING ACTIONS



Face-to-face workshops



Massive Online Open Course (MOOC)



Train-the-Trainer online course

CONTEXT OF TRAINING

The ORION Open Science face-to-face workshops took place in different locations around Europe from January to December 2019. A total of 10 workshops (summarised in Table 1) were delivered, some of them at ORION participant institutions and some others at external ones (mostly part of the EU-LIFE network).

Workshop	Organizing institution	Country	Date	Duration
1	TU Braunschweig	Germany	18/01/2019	Full day
2	Institute Curie	France	21/03/2019	Full day
3	Universitat Pompeu Fabra	Spain	08/04/2019	Half day
4	Universitat Pompeu Fabra	Spain	10/04/2019	Half day
5	JCMM	Czech Republic	02/05/2019	Full day
6	JCMM	Czech Republic	03/05/2019	Full day
7	University of Copenhagen	Denmark	14/10/2019	Full day
8	VA	Sweden	10/10/2019	Full day
9	BI	United Kingdom	14/10/2019	Half day
10	UAB	Spain	21/12/2019	Full day

Table 1. Face-to-face training workshops carried out in ORION WP4



The ORION Open Science Massive Online Open Course (MOOC), designed as a six-weeks guided course, was launched in October 2019 for the first time, running along October and November 2019 ([link to the MOOC](#)). A second edition ran in a semi self-paced format from February to April 2020.

More details on both the ORION OS face-to-face workshops and MOOC can be found in the ORION Deliverable [D4.1 "Optimised offline and online trainings"](#).

The ORION Open Science Train-the-Trainer (TtT) online course ran from October 19th 2020 to November 4th 2020. It featured two webinars, two online modules (hosted on OpenLearnCreate from Open University), and it culminated in the participants delivering a 20 minute talk or micro-training at a live-streamed online event for the Berlin Science Week called the Open Science Cafe. As advertised in the ORION website, previous knowledge of Open Science was required. More details on this course can be found in the ORION Deliverable [D4.3 "Train the Trainer workshops"](#).

More information available in Deliverable [D5.5 "Final evaluation report on trainings"](#)
<https://www.orion-openscience.eu/publications/deliverables>

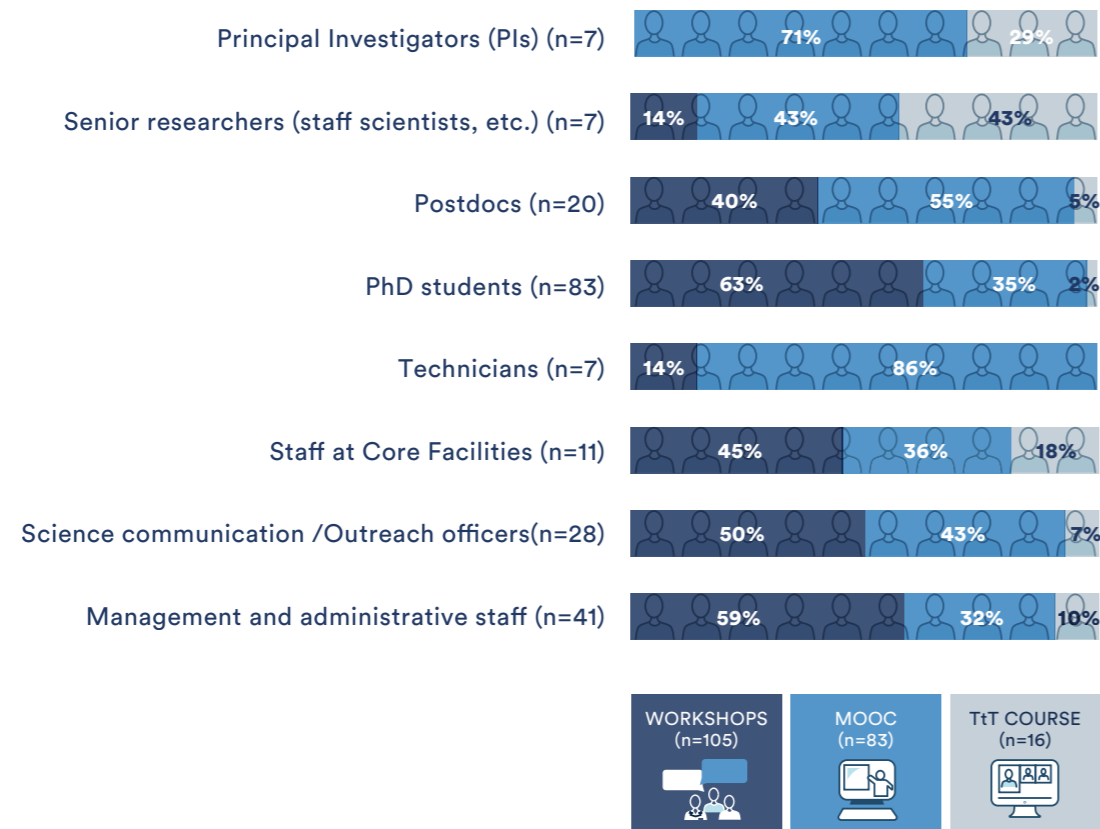
**ORION TRAINING I
EVALUATION RESULTS**

1. Attendees' profiles

Most attendees of ORION training activities were early-stage researchers in their RFPO (less than 5 years). Particularly, **PhD students were the main public attending the ORION workshops and MOOC** (those trainings which reached a larger audience, more than 400 people). As recognised by the ORION trainers, this implies that most of the trained people, despite introducing Open Science in their present research actions, will not have the power or resources to promote, in their near future, Open Science at an institutional level. However, they will be empowered to promote change and embrace Open Science on long-term.

Management and administrative staff followed by senior researchers were the main profiles attending the Train-the-Trainer (TtT) course (which was completed by 14 participants), and these actors might have a larger influence and contribute to a higher degree to multiplying the effect of ORION trainings on short term.

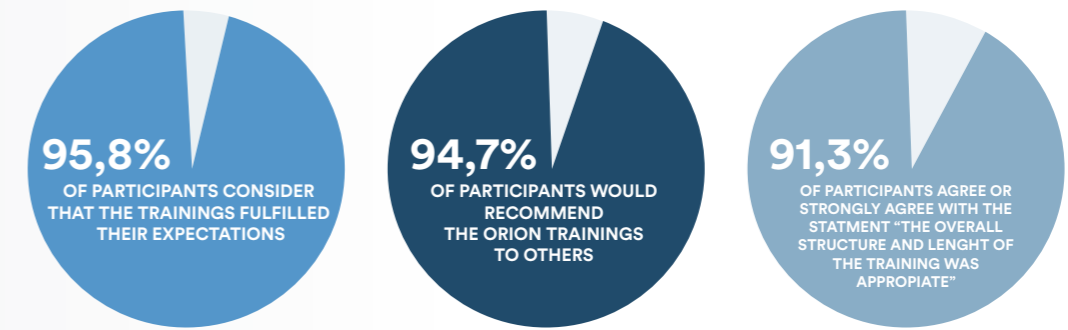
PARTICIPATION OF THE DIFFERENT PROFESSIONAL PROFILES TO THE ORION TRAININGS



**ORION TRAINING I
EVALUATION RESULTS**

2. Satisfaction

For all trainings, 9 out of 10 participants express that the training met their expectations, and they would recommend it to others.



3. Format and content assessment

No significant differences were found between the evaluation results of the face-to-face and the online trainings regarding the learning of content and regarding the evaluation of the format of the activity.

High quality content, interactive character of the trainings, innovative engagement methods, professional and knowledgeable trainers, and the friendly atmosphere of the face-to-face events were highlighted as the characteristics most valued by the attendees of the ORION trainings.

«...I loved the friendly atmosphere (...) I liked the methods they use» (workshop participant)

«one of the good things about the MOOC was that there was a lot of learning together, even though we didn't meet anyone virtually, (...) you felt like you were communicating and interacting anyway. And then, the Train-the-Trainer course left it up to another level, where you actually had to be part of the team, you had discussions» (MOOC and TtT participant)

«...it was interactive, the methods were innovative, the organisers of the course were lively, and they had different kind of activities, and that was really important, kept my interest» (TtT participant)

**ORION TRAINING I
EVALUATION RESULTS**

4. Change in views about open science

The views on Open Science of those participating in the ORION trainings are already very positive before their participation in these activities. **8 out of 10 of ORION training participants view Open Science either as an exciting opportunity for science, mostly with benefits or as an opportunity with benefits overcoming its drawbacks.**

Participating in ORION trainings did not affect the views of attendees regarding to which stakeholders science should be open. **Both prior and after the ORION trainings, participants show the same openness pattern** which emphasises the openness to the scientific system (scientists in the same or different fields), and (to a lesser extent) to funding organisations, special interest groups and the global citizenship, and recognises the need to openness to the industrial world.

5. Learning and disposition

The impact of ORION trainings in preparing participants to implement Open Science is very high in terms of knowledge acquisition. **9 out of 10 participants state that after their training they have learnt valuable knowledge on Open Science. 8 out of 10 participants of ORION trainings feel more confident and enabled to do Open Science.** A similar slightly lesser percentage state they will use information and materials from the ORION trainings in their future work. **Some participants of the Train-the-Trainer course claimed that they were planning to give specific trainings in their current institutions**

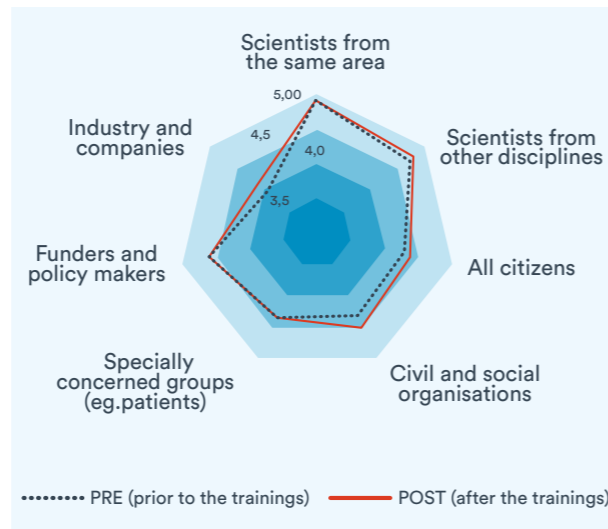


Figure showing the answers to the question: "In your opinion, to whom should science be open?" (pre-post questionnaires, n=118 participants in ORION trainings)

based on the ORION course, something which shows both usefulness and the potential multiplying effect of ORION trainings.

«To me really this was something new (...) I learnt something about the idea which is behind Open Science and I understand it's quite problematic.» (Workshop Participant)

«I learnt about teaching in general, online teaching, interactive teaching, but I also learnt about specifically teaching Open Science in ways of making it personal to you.» (TtT Participant)

**ORION TRAINING I
SUMMARY OF MAIN RECOMMENDATIONS**

1. Future Open Science trainings should maintain the quality in content, and the well proven formats, interactive teaching methods and professionalism of the trainers of ORION trainings.

2. Open Science trainings in the future need to cover different levels and stages, from focusing on raising awareness about Open Science, to teaching general Open Science competence and covering a diversity of specific in-depth competences on different aspects of Open Science, in addition to a Train-the-Trainer branch.

«I came to the course as a way to learn how to teach, how to make training materials (...) We realized the training is about not only practical, you know, what is Zenodo, or how do you upload your data, and how do you make metadata (...) there is training needed in why should I do this, and how can I make it easy for myself and my team to make my research open (...) I found that there's is a lot more to Open Science than what I thought» (TtT Participant)

3. Variety of attendance could be improved in Open Science trainings by increasing visibility, adding flexibility, and exploring incentive programmes particularly for mid-career researchers and senior profiles.

4. More training on Open Innovation that shows new models on how to involve the industrial and business sector in Open Science is needed.

5. It is important to support researchers and managers along the process towards Open Science, not only during but also after Open Science trainings.

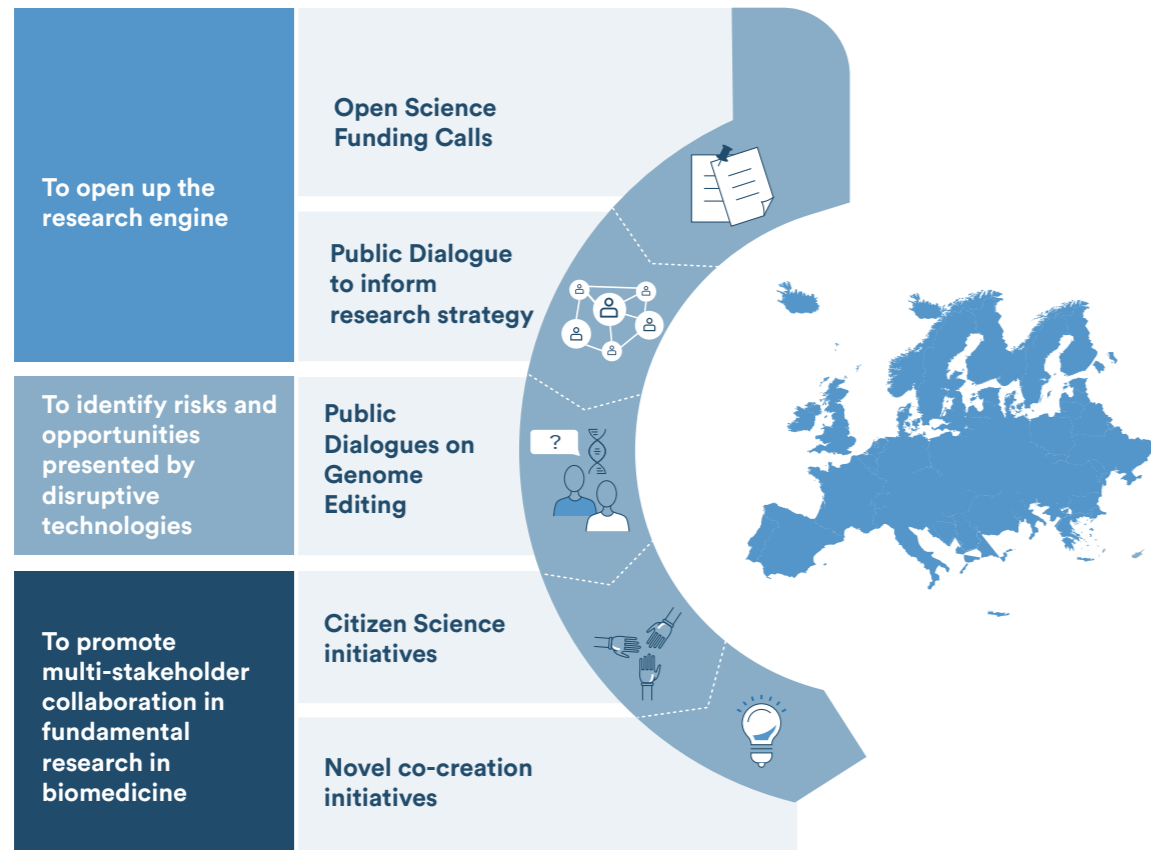
6. Sustainability of training activities should be ensured by developing a competent and empowered taskforce of Open Science trainers able to implement training such as those at ORION.

«If you start putting these ideas into early career researchers, in about 5-6-7 years you do start to see a shift because they then become postdocs and PIs and so forth (...) it takes time for people to feel comfortable and empowered enough, so I think realistically the training is going to be a slow burning thing, but I do believe that it will have an effect over time, and I think the Train-the-Trainer is a really good multiplier.» (Trainer)

7. Evaluation of Open Science trainings is needed in order to continue assessing their impact and improving their quality.



06 ORION CO-CREATIONS



SCOPE OF ORION CO-CREATION ACTIONS

13 PROJECTS FUNDED WITHIN THE	2 OPEN SCIENCE FUNDING CALLS	ISCIII (Spain) and JCMM (Czech Rep.)
+200 PARTICIPANTS IN	5 PUBLIC DIALOGUES	BI (UK), CRG (Spain), JCMM (Czech Rep.), MDC (Germany) and VA (Sweden)
+750 PARTICIPANTS IN	2 CITIZEN SCIENCE AND	CRG (Spain) and MDC (Germany)
	2 NOVEL CO-CREATION INITIATIVES	ISCIII (Spain) and BI (UK)

CONTEXT OF CO-CREATION ACTIONS

Two pilot calls were organized to promote openness of the funding research engine in fundamental research in life sciences. Through these calls, which have been extensively described and documented in Deliverable D3.5 “Specification of new pilot funding calls”, the two participating Research Funding Organisations (ISCIII and JCMM) worked to explore integration of RRI principles in funding processes. More details on the funded projects can be found in Deliverable D3.9 “Implementation of New Funding Calls”.

The Centre for Genomic Regulation (CRG) conducted a Public Dialogue to gather opinions from civil society and strategic stakeholders and explore how to take them into account in the development of the next CRG strategy for the period 2021-2024. This exercise has been described in Deliverable D3.7 “Implementation of the public dialogue to inform CRG’s research strategy”.

Four national Public Dialogues were organised to explore public views on genome editing. These events had two parts-structure consisting in two events that were held in each country with members of the public to discuss genome editing technology. More information can be found in Deliverable D3.8 “Implementation of Public Dialogues on Disruptive Technologies”.

A call for the promotion of innovative Citizen Science projects in the field of Life Sciences was launched to support

initiatives that enable scientists and citizens to work together with the ultimate goals to 1) generate new scientific knowledge and 2) create bridges and new collaborative opportunities between citizens and scientists. The design of this call, as well as the implementation of the two funded projects (GENIGMA and SMOVE), have been documented and described in Deliverables D3.4 “Design of the Citizen Science call” and D3.10 “Multi-stakeholders Citizen Science projects”, respectively.

The call for Novel Co-creation initiatives was launched to support long-term cross-sector collaborations to carry out co-creation initiatives that bring together different stakeholder groups (such as academia, industry, civil society, public sector, etc.) in innovative and exciting ways. A total of 15 proposals were submitted (the details of the evaluation process are reported in Deliverable D3.6 “Selected New-Co-creation initiatives”) and there were two winning projects: MELTIC and VACCINE (*).



(* The name of the game has been changed to “Virus Fighter”.

More information available in Deliverable D5.4 “Final evaluation report on co-creation experiences” <https://www.orion-openscience.eu/publications/deliverables>

OPEN SCIENCE FUNDING CALLS | EVALUATION RESULTS

1. Co-creation processes used for organising the calls

The ORION Research Funding Organisations (RFOs) organised different co-creation processes (such as a quadruple helix of stakeholders and two professionally guided co-creation workshops) which addressed to **receive input from diverse stakeholders regarding the organisation of a call more in line with the Open Science agenda.**

2. Novelty of the calls

The ORION Open Science (OS) Funding Calls were **novel experiences for the involved organisations which included Open Science principles** (both in the preparation of the call and in its evaluation criteria). Examples of the introduced novel strategies were: (a) improving communication aspects; (b) open peer-review procedures; and (c) attempting public involvement in the evaluation. Unfortunately, this latter was not possible due to global COVID-19 pandemic situation, which prevented, for instance, to have citizens participating as juries of the ISCIII prizes.

«we have given an example of what can be done»
(Call Organiser)

3. Positive aspects of co-creation

Co-creation processes developed for the definition of the calls **were perceived as positive experiences** which, despite requiring extra funding and considerable OS knowledge, **showed to be feasible and impactful in their institutions.** The two

main perceived benefits were related to (a) the **strengthening of cooperation** (both at internal and external level) and (b) **increase in quality by incorporating diversity of views.**

4. Perceived impact of the calls

The main impact of the calls is in the involved participants, both applicant-researchers and organisers from funding organisations. **The organisers consider that the calls, by valuing diverse aspects of research work (such as communication with the public), help researchers to include Open Science principles in their work and their future professional career.** In addition, organisers consider that **participating in the call helps them in their future work by providing actual examples about how this can be done.**

5. High management support and funding required

Organisers think **higher management at their institutions has been supportive** of the ORION Open Science Funding Calls. The overall view is that these sort of calls, despite requiring extra funding, have shown to be feasible in their institutions. **Enough funding to support Open Science Calls is critical and the most limiting factor,** not only regarding the actual funding scheme for researchers but in order to cover the extra time and support institutions need to make funding calls more open.

PUBLIC DIALOGUE TO INFORM CRG RESEARCH STRATEGY | EVALUATION RESULTS

1. Initial views and expectations of participants

Participating citizens in the Public Dialogue to inform CRG's research strategy consider that **the most important reasons for Public Dialogues (PDs) are related with Ethics, Fairness and Impact, and think that all aspects of the scientific process should be open to citizens** (especially research Results and Outcomes). All participants emphasize the **importance of incorporating diversity of views regarding research issues,** and most citizens refer to general learning as their main expectation when participating in the PD.

2. Satisfaction

Participating citizens and researchers attending the PD on research strategy highly value this event. Most citizens consider **it has largely fulfilled their initial expectations** and interviewed researchers consider they will attend similar events in the future. **Direct interaction with scientists** is the most valued characteristic of the PD for citizens attending the event. Researchers were also positively surprised by the **genuine interest of participating citizens.**

3. Citizens' perceived learning

In line with the focus of the event, **the main learning impact that citizens recognised is the learning about scientific research,** with more than 91% of citizens recognising that they could explain to another person the scientific research that is carried out at CRG. This shows a shift from expectations linked to the products of science (scientific knowledge) to recognition of learning about the processes of Science.

4. Perceived impact at own institution

Researchers participating in the PD have a positive view of this experience, which actually support them at different levels such as **increasing their communication skills** or **opening their views regarding private funding.** Dialogue between researchers and stakeholders was more bi-directional than between researchers and the public, mostly due to the existing knowledge gap with the citizens. This could explain the mixed views of citizens regarding the actual need of their inputs in science. Organisers consider **the PD on research strategy has had a tangible impact in the research strategy of their institution,** mostly through the experience of leading management actors and researchers.

«I think that as an exercise it has been valued very well in the CRG (...) we have put an important grain of sand, a turn towards this more open way of doing and that will set a precedent» (PD-CRG Organiser)

5. Main limitations, according to organisers

Challenges to be faced by PDs are about **time constraints, how to ensure equity in participation** and **how to involve more stakeholders** and particularly senior Principal Investigators. The online format of this event due to the COVID pandemic limited but did not avoid its positive impact on all participants.

PUBLIC DIALOGUES ON GENOME EDITING | EVALUATION RESULTS

1. Initial views of participants

Participating citizens in Public Dialogues on Genome Editing (PDs-GE) state the most important reasons for organising Public Dialogues (PDs) are those related with **democratic views (issues of Fairness and Ethics)** and think that **all aspects of the scientific process should be open to citizens** (particularly research results and outcomes).

2. Satisfaction

Satisfaction among citizens participating in the ORION PDs-GE is very high, as **93.7% of them agreed or strongly agreed that the workshop met their expectations**. Participants are also **very much satisfied both with the structure and length of the event** (93.8% of them agreed or strongly agreed that it was appropriate) and **with the information and materials used** (which are relevant and useful for 95.5%). However, PD-GE organisers are critical regarding aspects of calendar, structure and content of the PDs.

3. Perceived impact of PDs-GE.

PD-GE organisers commented positively on the PD giving experts and citizens **an opportunity to have in-depth conversations** and being perceived as a good learning opportunity that should be replicated at wider, local level for informing management and policy making. Scientists and organisers see as benefit of the PD-GE the **possibility for scientists to share with citizens direct, non-biased scientific information**. The international dimension of the PD-GE was also highlighted as a positive outcome since this would allow data comparison between different countries.

«It allows you to spend a long time with the public, to really dig deep in some of these really difficult issues (...) You could never do this in a survey (...) in a 1 to 3 hours focus group, you need two sessions at least to actually, you know, give them some information, get them to a point at which you can take the conversation to a place which is harder, more abstract sometimes» (PD Organiser, UK)

4. Main limitations according to organisers

PD-GE organisers agreed that **the PDs were a very expensive and time-consuming open experiment** that need investing important resources to succeed. Despite recognising success of the PD, external organisers in terms of ensuring representativity of the PD attendees, PDs-GE organisers consider **it is very difficult to extrapolate information from these small samples**. The **active involvement of both senior management and actual scientists from each ORION institution was a challenge** that PD-GE organisers consider very important to tackle.

«It's very time consuming and very costly» (PD Organiser, Sweden)



CITIZEN SCIENCE PROJECTS | EVALUATION RESULTS

1. The ORION citizen science call: general assessment and challenges

A wide range of dissemination strategies were used at ORION research institutes to promote participation in the Citizen Science (CS) call. However, particularly the calendar but also the timing of the call showed to be of utmost importance in order to get enough research applicants. The CS call is considered a **good opportunity for junior researchers due to its relatively small size and budget**, although the eligibility criteria related to contract stipulations and support of senior PIs might have hindered participation for junior researchers. Organisers of the call believe **CS is quite a new concept for researchers, which makes it difficult for them to design an interesting project**, particularly in fundamental research. Researchers don't think they receive enough training about CS and believe there is a general need to increase it. Both researchers and organisers think **there is a lack of examples of how successful CS projects look like, particularly in fundamental research**.

2. Impact of the funded projects (GENIGMA AND SMOVE)

Public Engagement (PE) experts value the impact of CS projects in their institutions in terms of **increasing visibility and raising awareness of CS** both due to its plausibility and funding benefits. Researchers leading CS projects refer to **professional and personal benefits** such as increasing networking, adding diversity of views, improving communication, improving efficiency, feeling their work is worthier and being more self-reflective about their own research. **Despite there can be struggles**

associated with the change in role and way of working of researchers demanded by CS projects with a strong co-creation component, **in the long run the process is perceived as worthy**.

«you are kind of forced of thinking why is your research important for society» (Researcher)

3. The role of public engagement experts

The figure of the PE expert in a CS project, which has been highlighted as **crucial** by both the PE professionals and the researchers involved in the projects, **can range from that of a facilitator to an actual co-leader of the CS project**. In this latter case, researchers, particularly PIs, point out the big challenge this shared leadership model poses to them and demand to be adequately informed beforehand.

4. Main limitations identified through the citizen science projects

There are important limitations to CS projects, particularly for those that involve demanding co-creation processes, mostly related to the **need to adapt traditional roles of researchers and public engagement experts to a co-leadership model** has been also identified as being problematic.

«we scientists are (...) always solving problems in the same way. And sometimes, using an alternative solution such as with citizen science, can help to solve some problems» (Researcher)

NOVEL CO-CREATION INITIATIVES | EVALUATION RESULTS

1. The ORION Call on novell co-creation initiatives: general assessment and challenges

According to organisers, coherence in the creation of a call on Novel Co-creation Initiatives is achieved by co-creating the actual design of the call, ensuring the highest possible diversity of participating stakeholders within reasonable numbers of participating people.

Criteria highlighted by organisers of the call on Novel Co-creation Initiatives include the need to involve more than 2 stakeholders and doing so from an Open Science perspective that promotes active stakeholder engagement.

Engagement of different stakeholders in the exercise of co-creating a call is not an easy task due to the existence of different viewpoints regarding Open Science, lack of enough training in the field and lack of participation incentives.

Early career researchers have shown to be the most active group of participating stakeholders.

2. Insights from the funded projects (MELTIC and VACCINE)

The Novel Co-creation Initiatives evidenced institutional impacts at different levels, including **increasing visibility, adding networking possibilities and enriching the existing research focus.**

At initial stages of participation in Novel Co-creation Initiatives the Principal Investigators (PIs), despite showing satisfaction regarding the societal impact of these initiatives, do not identify an impact for them at professional or career level.

«MELTIC has triggered some sort of small revolution (...) it made scientists realise that they can do other kind of projects that have to do with telemedicine but with much more involvement of human beings» (Public Engagement expert)

3. Main limitations identified throught the novel co-creation initiatives

There are dual and mixed views regarding the value of active co-creation in the project. Despite the products are considered of good quality, the process can be perceived as beneficial or not depending on contextual, organisational and/or personal factors.

Co-creation initiatives can place researchers far outside their comfort zone, particularly for those with an unidirectional view of public engagement. Sources of discomfort are: perception that their scientific expertise is not respected enough and that the rigour of the scientific message could be endangered. **More preparation and transparency regarding the co-creation process and results is needed beforehand**, particularly regarding the co-leading role of public engagement experts with researchers.

«I'm a scientist, I get judged on the science I do. These types of activities will probably be ignored by my colleagues, they're going to look at my science, not look at my public engagement activities. That's fine, though, I don't need to get an advantage from doing this» (Researcher)

ORION CO-CREATIONS | SUMMARY OF MAIN RECOMMENDATIONS

1. Co-creation initiatives to promote Open Science require a clear and well-organised planification and an important investment of resources (both in terms of funding and supporting staff) for a proper implementation.

«it's expensive, it takes a long time and you're only speaking to a (...) relatively small group of people. But you know, as I said, it's not designed to be big scale. (...) dialogue is very much for exploring in detail.» (PD Organiser, UK)

2. Initiatives involving multiple stakeholders and with a high co-creation component can be complex: participating actors might have different views and expectations. Making them aware from the beginning of potential challenges and benefits can help to overcome resistances and facilitate implementation.

«a PI should now that this is a totally different way of doing science and they should be open to do so. And then it doesn't come as a surprise the fact that there is this figure [the Public Engagement expert], which I find is totally essential (...) which is the liaison between all this world of Citizen Science and the PIs or the scientist (...) so, this is the first suggestion, a sort of a disclaimer (...) at the very beginning, because this is not a regular research project» (Senior researcher)

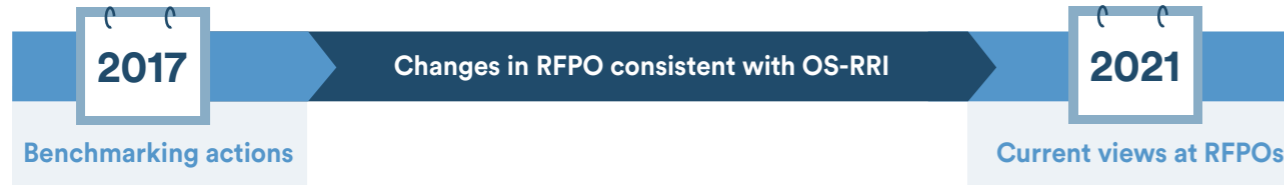
3. For a genuine and beneficial participation of citizens in multi-stakeholder co-creation initiatives, organisers should include an initial phase that ensures that participating citizens have enough knowledge to establish authentic bidirectional communication with researchers.

4. Co-creation and multi-stakeholder initiatives promoted by funding organisations are a source of learning experiences that can help (both them and others) to define other funding schemes to promote useful co-creation and active stakeholder engagement.

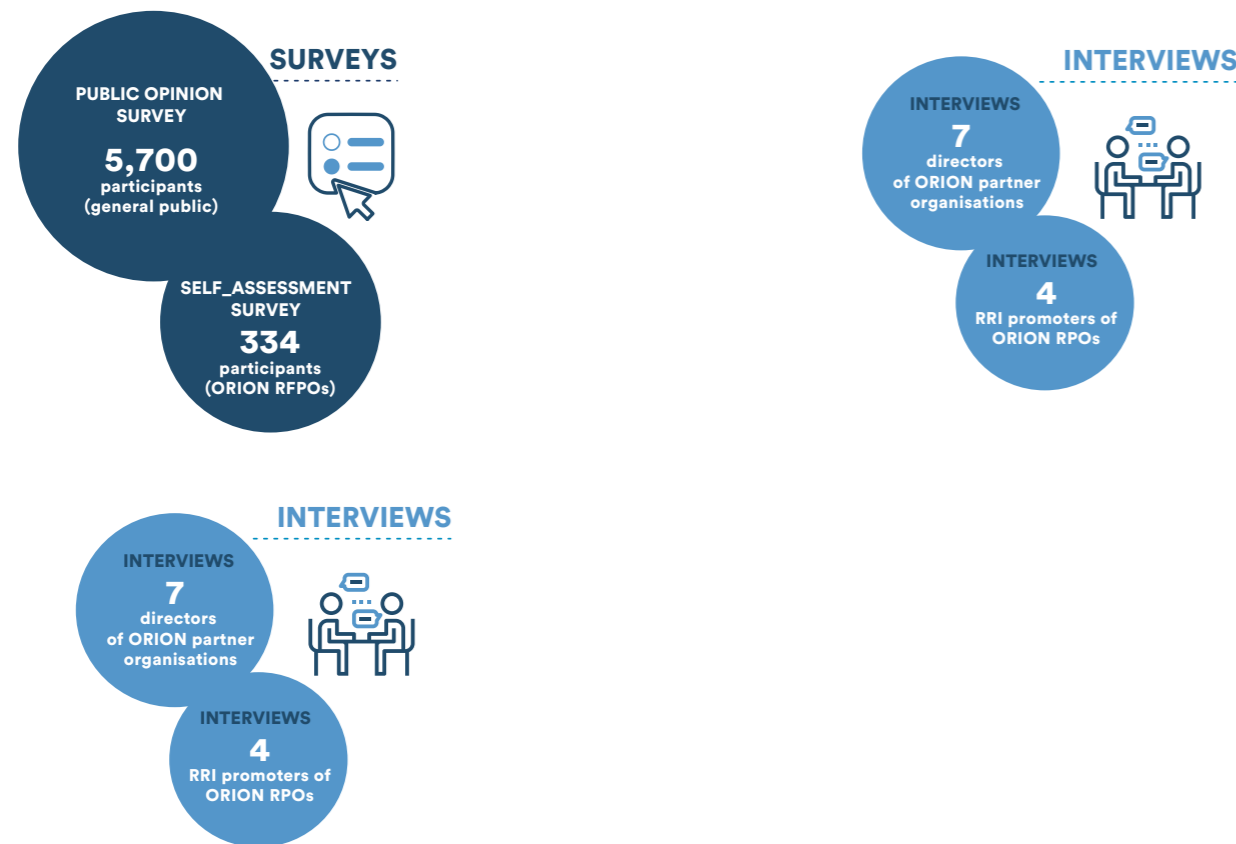
5. Having well-trained public engagement professionals and including evaluation to assess impact at different levels are crucial elements for achieving impactful and sustainable co-creation initiatives.



07 CHANGE OF CULTURE IN ORION RFPOs



INFORMERS TO ASSESS THE VIEWS OF OPEN SCIENCE IN RFPOs



CONTEXT OF THE ANALYSIS OF CHANGES WITHIN ORION

As part of Work Package 2: Analysis and Benchmarking, a set of surveys and interviews were conducted at the beginning of the project to explore the views and practices of Open Science among the general public and within ORION Research Funding and Performing Organisations (RFPOs).

First, a survey to study public attitudes to life sciences research among the general public involved almost 6,000 respondents in Czechia, Germany, Italy, Spain, Sweden and the United Kingdom (UK). The results of this survey, which were presented in D2.3 “Publication on data collection and analysis from public opinion surveys” were used as a starting point for the self-assessment within ORION partners.

On the other hand, a qualitative study of the most relevant views and practices on Open Science at ORION institutions was carried out through 11 interviews that involved the 6 Directors of the RFPOs participating in the ORION project, the Director of 1 civil society organization and the 4 RRI

promoters at RPOs. These interviews took place along the second half of 2017. A large-scale quantitative study was undertaken regarding the prevalence of these views and practices through the ORION RFPOs, based on an online questionnaire (D2.2 “Questionnaire for self assessment on Open Science”) disseminated through all the staff members of the 4 RPOs and the 2 RFO, which gained answers from 334 participants. The results of these two studies were reported under an internal document, Deliverable D2.2 “Analysis and Benchmarking: Self-assessment”.

In order to explore the changes in views within ORION key actors after the lifetime of the project, a set of final interviews were conducted with the Directors of the RFPOs and the civil society organization, and the 4 RRI promoters at RPOs, from March to May 2021.

What comes to your mind when you hear the concept “Open Science”? What is suggested to you by the term “Open Science”?

What would you think it has been the main impact of ORION in your institution?

STARTING POINT I
OPEN SCIENCE CULTURE AT THE BEGINNING OF ORION

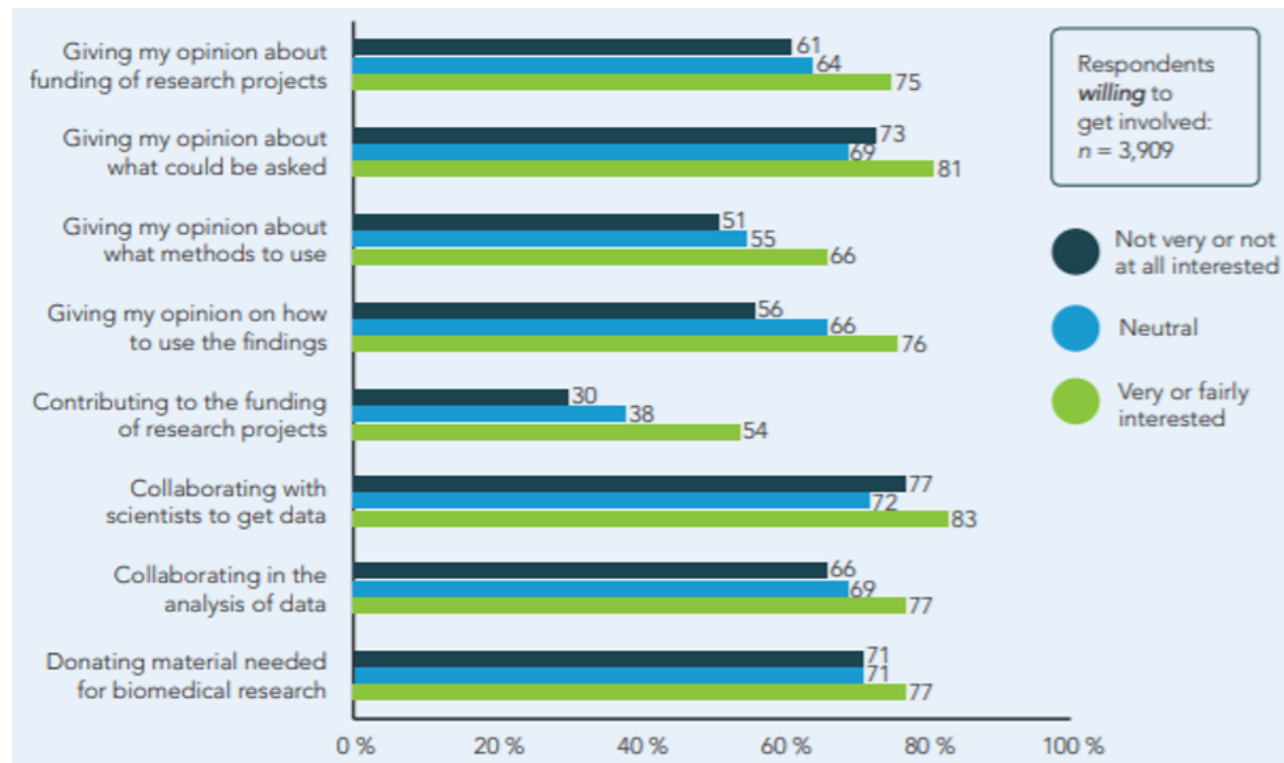


Figure from the Deliverable D2.3 Publication on data collection and analysis from public opinion surveys (public report).

At national level, the ORION survey “Public attitudes to life sciences research in six European Countries” showed that interest in life sciences research was high among citizens.

For those citizens who show positive attitudes regarding involvement in life sciences, the most attractive methods of involvement include collaborating with scientists in data collection, giving opinions on research questions/topics, collaborating in data analysis and donating material in biomedical research.

Citizens also stated that the three most accepted purposes of using genome editing are related to the medical field, in concrete prevention or cure of diseases, prevention of disabilities and organ transplantation. The largest concern associated with genome editing is that the technique could be misused.

STARTING POINT I
OPEN SCIENCE CULTURE AT THE BEGINNING OF ORION

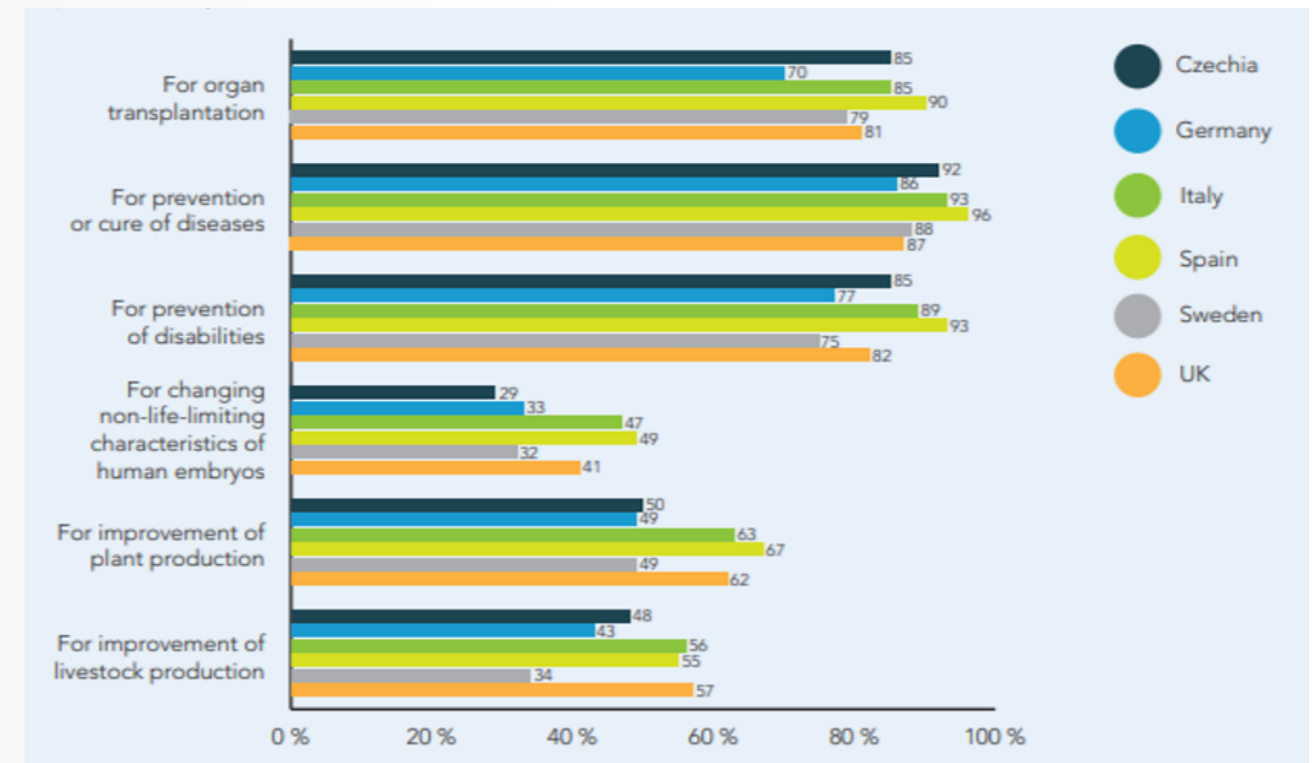


Figure from the Deliverable D2.3 Publication on data collection and analysis from public opinion surveys (public report).

In each of the RFPOs, a self-assessment questionnaire on initial views on Open Science (OS) was administered to professionals working at ORION institutions at the beginning of the project. Main results show that OS is mainly perceived as an opportunity for science but not part of their normal professional life: it is something that happens more sporadically than regularly. In addition, different tensions regarding OS were observed: between top-down and bottom-up approaches; between the theoretical benefits of OS and the operative barriers; between public and private interests and even between opening science to the scientists and to the citizens. Respondents also stated their need for more information and training on OS, in addition to adequate support and incentives.

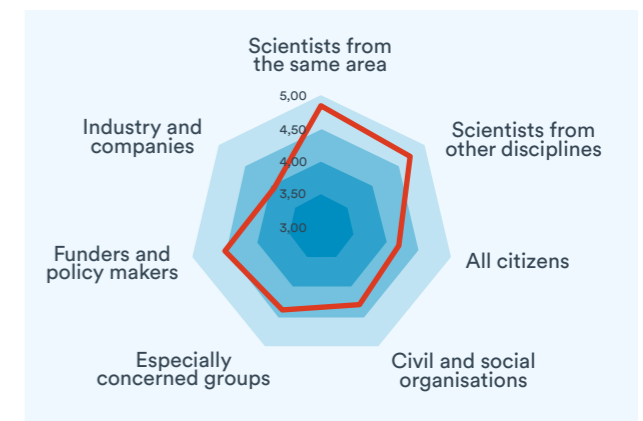


Figure showing the answers to the question: “In your opinion, to whom should science be open?” (self-assessment questionnaire, n=333 professionals working at ORION RFPOs)

CHANGE OF VIEWS ON OPEN SCIENCE DURING ORION

At the end of the ORION project a series of long, personal, semi-structured interviews were conducted to the 7 directors of the participating RFPOs and to 4 RRI promoters in each of the research institutions, replicating the pattern of interviews done four years before at the beginning of the project. The qualitative analysis of these interviews allowed us to identify positive changes in the view of Open Science (OS) of those responsible of supporting and implementing policies and structures of OS.

1. Directors' initial views of OS were strongly associated with Open Access (open publication) to increase sharing among scientists and traditional, unidirectional forms of Public Engagement mostly addressed to society valuing science. They referred to OS as challenging, somehow imposed and still in discussion. At the end of ORION, however, **directors referred to OS as something already in the culture of their institutions**, accepted as a concept despite the difficulties to implement it. Their views of OS have become richer, with Open Data emerging as a common challenge and present focus. Initiatives of public engagement, despite being referred to as exciting and useful, continue not to be among the priorities for research managers. In general, directors' perception is that the COVID pandemic has already put science in the public eye.

«I think Open Science is a very natural thing already at the institute, because the benefits are so obvious that you don't have to advertise for that, so I think we are beyond that stage where you have to talk to people and inform them» (Director 4 post interview).

2. Initially, the reasons in favour of OS were more related to fairness and transparency, and closely connected with the aims and priorities of funders and policy administrators. At the end of ORION, there was much less discussion on why being

involved in OS and more focus on how specifically to do so, in concrete for each aspect of OS. In addition, **reasons for OS become more closely connected with the ideas of improving quality**, particularly in terms of **efficiency** (better use of resources, more potential), **fairness** in the sense of commitment with society and the importance of **diversity and equity perspectives**.

«I would associate [OS] with accelerated pace of science, with the increased collaboration potential, and with a better judgement of the robustness of the science as well» (Director 2 post interview).

3. There were many perceived barriers to OS both at the beginning and the end of ORION project. However, **the nature of those barriers shifted** from lack of funding and minor technical difficulties (mostly related to Open Access) to **lack of very specific knowledge and knowledgeable professionals** (mostly regarding particular aspects of Open Data) and need for innovative strategies and shared methodologies (for instance, regarding research evaluation and new metrics).

«We need infrastructure and we need also professional profiles to facilitate Open Data» (RRI promoter 3 post interview)

4. Concerns regarding the relation between the public/private sector, particularly regarding how to deal with intellectual property rights or organise Open Innovation, **have been referred to as problematic from the beginning of ORION project but emerge as more important at the end of it**, particularly connected with the context of the COVID pandemic.

«IP properties are complicated... in the beginning everyone shares but as soon as it comes to the point that the data are used for a patent, or for start a company or for anything that could bring money back, then the institutions are not sharing on a free will anymore» (Director 4 post interview).

5. The perception of lack of enough funding for OS has been an issue that has not changed along the project. However, an important shift can be appreciated from small-scale funding to cover researchers' expenses of Open Access to more large-scale, at the level of institutions, regarding IT infrastructures and professionals for Open Data. Directors are concerned about the non-balanced use of this funding, for instance, spending most in making public data and little in infrastructure or expertise.

«We did some accounting on how much were we spending since the implementation of Open Access and it is quite a lot. And now with Open Data [...] data should be accessible, visible, re-usable... Where do we get the money to do this?» (Director 3, post interview).

6. The role of experts in OS and RRI in the research institutions is more visible by the end of the ORION project, particularly regarding their achievements in increasing public visibility of institutions through ORION and raising awareness of OS internally. However, their role is increasingly more referred to as that of facilitators, and trainers on OS rather than just promoters of it, which emphasises the importance of updated training and networking capabilities of these profiles. For most of them, ORION has been a very extensive working and learning opportunity that has also had an impact in their professional careers in terms of promotion.

7. Both directors and RRI promoters are very satisfied of ORION actions and consider **there is an ORION legacy**, particularly in the form of the Action Plans and other policy and management documents and strategies that have been developed. They also consider that after ORION future initiatives/projects on OS might be more focused on specific OS actions (for instance, Open Data, Open Innovation, ...) to be able to go deeper in terms of knowledge and strategies. They also consider that more training should be provided to particularly address research data, open innovation and ways to support cultural changes.

«I think an important part of the work, a legacy of ORION that will live after the project is related with Human Resources, in the sense that now we recognise and reward OS practices» (RRI Promoter 1, post interview).

08 OVERALL MANAGEMENT AND COORDINATION

The goals of the ORION Coordinator are to coordinate the consortium and proposed activities, and to manage the project to reach the expected results and impact within the proposed budget and timeframe at the highest quality standards. Collaboration between the consortium's members has been and still is excellent, as was demonstrated by numerous joint activities through the different WPs. The Coordinator was supported by the Project Manager, and they held regular weekly meetings to supervise ORION's activities.

To ensure efficient coordination and quality of ORION activities, two main bodies have carried out fundamental roles.

The **Steering Committee**, composed by the Coordinator, the Project Manager and WP leaders, supervises the project's activities. The progress in the different WPs was followed up closely, by monthly video-conferences with the Steering Committee (instead of every three months as stated in the GA) and by dedicated video-conferences on specific tasks, including sometimes additional ORION partners. A total of 42 Steering Committee meetings were held and Minutes written and circulated, to confirm the follow-up actions agreed upon. The high level of commitment and unceasing efforts of the Steering Committee in ORION are to be praised.

The **General Assembly**, composed of representatives from each ORION partner, took fundamental decisions on the project and met regularly at least once a year. Through the whole project, a kick-off meeting and three Annual meetings were organized to boost the ORION community

feeling and work in an interactive and co-creative manner on ongoing and future tasks:

1. The project kick-off meeting was held on 10th-11th May 2017 at the CRG's premises in Barcelona (and counted as well with the participation of the EU project officer and two members of the Advisory Board). The meeting was successful in revising together project's goals and expectations, and starting co-designing several activities.

2. The first Annual Meeting was held on 17th – 18th April 2018 at the ANT-premises in Bologna. ANT hosted the partners and provided the equipment for the realization of the meeting.



3. The second Annual Meeting was held on 6th – 7th May 2019 at the CEITEC-MU premises in Brno (Czech Republic). MU hosted the partners and provided the equipment for the realization of the meeting.



4. The third Annual Meeting was held entirely by videoconference due to the COVID-19 pandemic on 28th- 30th April 2020.



A specific characteristic of ORION has been the spin-off of additional projects that were awarded through the years. This required additional managerial tasks to ensure the alignment of these projects with ORION and the H2020 guidelines and rules.

ORION spin-off projects: Four spin-off projects were launched after opening two competitive calls. The evaluation of the proposals, the preparatory phase to launch the projects (such as the ethical requirements and their data management plans) and the follow-up of their progress required a significant amount of effort from the ORION Project Manager. Each of these projects were led by distinct teams at their respective institutions, thereby expanding the ORION community by 15-20 persons. More info about these projects can be found here:

1. Citizen Science project [Genigma](#) at [CRG](#)
2. Citizen Science project [SMOVE](#) at [MDC](#)
3. Co-creation project [MELTIC](#) at [ISCI](#)
4. Co-creation project [VirusFighter](#) at [BI](#)

ORION members: ORION had a duration of 53 months, during which a surprisingly high turnover of personnel has been observed. Around 10 maternity/paternity leaves were taken, and for an equal number of members ORION represented a jumping board to another position in which their experience on RRI and OS was valued.

The Consortium Agreement was drafted and signed by all the members before the start of the project (in February 2017). The ORION Project Manager is the main contact point for the consortium for any administrative, financial, technical and legal aspects.

Queries with a significant impact on the project were discussed with the EC Project Officer before taking any action. As a result, the Grant Agreement of ORION was amended on 4 occasions, the latter for extending the project duration to compensate for the delays that occurred due to the COVID-19 pandemic.

09 COMMUNICATION MANAGEMENT

The Project Manager set up three **mailing lists** to ease communications within the consortium (SC members, Editorial Board, all ORION members). Upon request, the Project Manager also set up videoconferences for the members of the consortium via the Zoom platform.

The **project website** <http://www.ORION-openscience.eu/> was developed in collaboration between CRG, VA and the company Scienseed, with a modern and interactive user experience in mind. For example, the different stakeholder icons used by the RRI tools project, were re-used and built in for users to click on, to be redirected to relevant content for them. The ORION Editorial Board members, consisting of the partners CRG, MDC, BI and VA, have editing rights on the website and news articles on project on-goings were published on a regularly basis (1-2 articles/month). The website is also used as the communication node, and the contents disseminated in the ORION social media channels are linked to the website. CRG is responsible for hosting the website and will continue to host it beyond the life of

the project so that all resources will remain accessible. Three social media accounts were set up during the ORION project: Twitter, Facebook and LinkedIn. The aim with these accounts has been to showcase and communicate the activities and the results of the project to the different target audiences. Social media has also been used to disseminate information broadly, create a dialogue, to interact with the larger Open Science and RRI communities and to reach new audiences. VA has been responsible for ensuring regular social media postings and monitoring accounts although all partners have been encouraged to post and share information too.

VA started initially an internal **newsletter** to inform and engage all ORION partners in the project's activities; the **newsletter** is now public to engage associated partners and other stakeholders. The newsletter contains past and future project activities as well as interviews with ORION team members.



Aligning an entire country to develop an Open Science action plan - ORION Inspiring story



The future of research is open: results of pilot researchers workshop



ORION Inspiring story: Introducing co-creation in fundamental life sciences



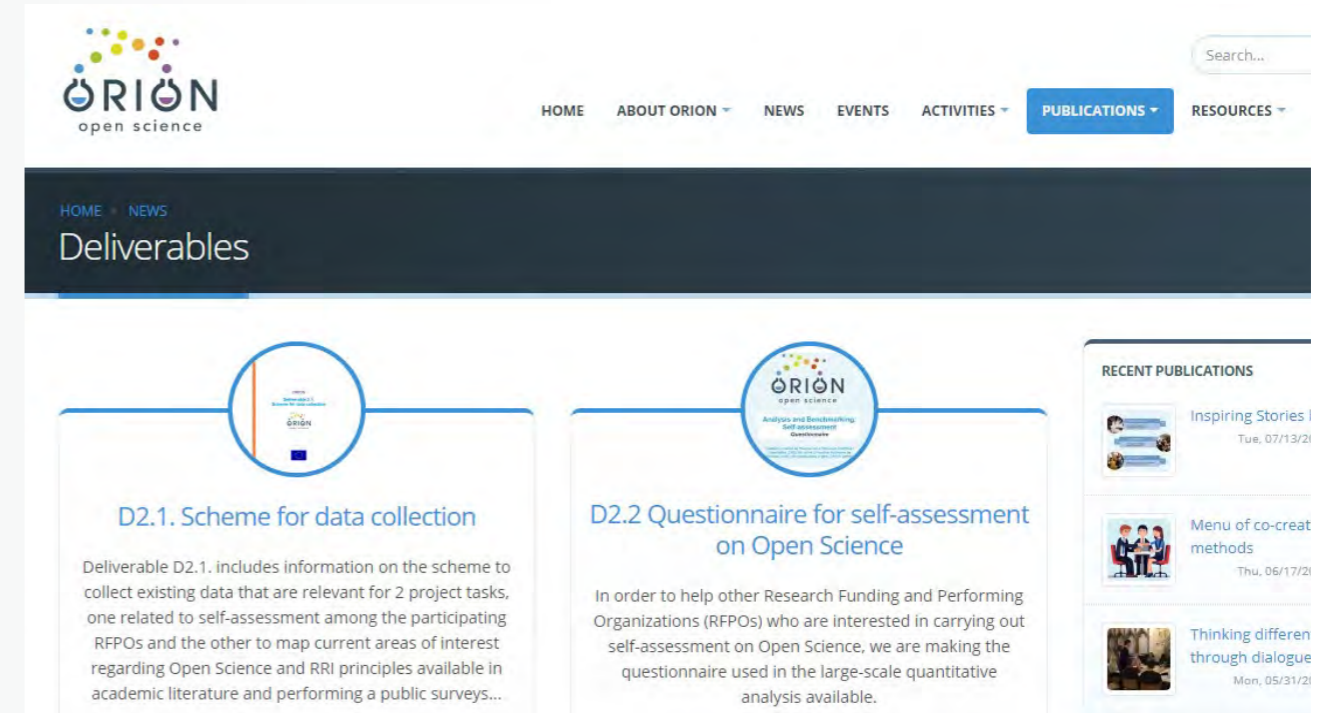
Let's talk about genome editing!

The first **Data Management Plan (DMP)** was prepared by CRG with inputs from UAB, VA, MDC, MU, BI and was submitted on 30/10/2017. A second and third version were prepared by CRG and submitted to the Project Officer on 20th September 2018 and 9th December 2019, respectively, to better reflect the changing needs in ORION. The main additions compared to the second version of the DMP are:

1. Introduction – updated description of the citizen science projects. Upcoming co-creation project included.
2. Data sharing systems – added the description of resources that are shared via the ORION website.
3. Data set description – list of data sets updated.
4. Data management responsibilities – the list of persons involved in data management updated.
5. List of Annexes: ORION Data sets updated and DMPs from Genigma and SMOVE included.

For **common working documents** that are not confidential nor personal, the file sharing system that is used between all the partners of the consortium is **Microsoft OneDrive for Business**. This system allows opening and editing documents in the cloud environment, thereby greatly enhancing the efficiency of working together.

Any data set or documents that cannot be considered as public, are securely stored on a server at the CRG in a self-hosted and dedicated data management system with the support of the CRG Bioinformatics Unit and Information and Technology (IT) department. This **ORION data management system** is accessed via the open source platform **NextCloud** (domain server name: <https://ORIONdata.crg.eu>). It has the required SLL-certificates, allowing encrypted connection and making it a secure storage. Only the data management persons from each institute have access, limited to the data they contributed or need in the project. Any change in access should be requested to the ORION Project Manager.



Regarding data sharing with the **community and the public**, we will make our best efforts to ensure data openness and sharing. Under the section ‘Publications’ (link <https://www.ORION-openscience.eu/publications>), the following items are available for the public:

- Deliverables:** all the public deliverables that have been approved by the EC.
- Newsletter:** all the past newsletters can be consulted.
- Training Materials:** including factsheets, case studies, online courses, etc., are all presented in a dedicated web page in the ORION Open Science website, and are freely available in Zenodo (link https://zenodo.org/communities/orionmooc_resources/?page=1&size=20). In addition, the podcasts developed by MDC are hosted on the platform PodBean (link <https://ORIONopenscience.podbean.com>), also in the the format of a smartphone app that can be downloaded on iTunes and Google Play stores.
- Inspiring stories**, presenting “eureka” moments in the diverse ORION training and co-creation activities.
- Peer-review publications.**
- Reports and guidelines**, on the specific details for implementing ORION activities and “how to” protocols to reproduce certain co-creations.

Whenever possible, we will share the data through other public repositories, such as the Consortium of European Social Science Data Archives (**CESSDA**, <https://www.cessda.eu>) or the Swedish National Data Service (**SND**, <https://snd.gu.se/en>).