ERIC Forum Implementation Project

Report on the scientific evaluation practices for pan-European RIs

Work Package 4 - Deliverable 4.2

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Executive summary

The European Research Infrastructure Consortia (ERICs) are organisations funded by the governments and have to report to their stakeholders, and in particular their founding bodies. In recent years, there have been discussion within ERICs, at European and national levels, regarding the evaluation of the ERICs and in particular their performance and impact.
The aim of Task 4.2 of the ERIC Forum Implementation Project is to evaluate the scientific evaluation practices and processes, and to provide elements to support the development of a standardised system or of best practice for ERICs. This report describes the current situation of ERICs regarding the scientific evaluation, provides examples of independent scientific evaluation, including the selection of the evaluation committee/experts, the evaluation criteria, the methodology, results and feedbacks from the ERICs evaluated. It also, provides some recommendations and follow-up actions.
This task is part of the work package 4 "evaluation and impact assessment" designed to help ERICs to periodically measure their performance relative to their mission goals, and guide them in the process of selecting relevant and achievable Key Performance Indicators (KPIs), metrics and indicators. Thus, the scientific evaluation is directly linked to the other activities within this work package, and the approaches regarding the Monitoring and Development of KPIs for ERICs, Socio-Economic Impact (SEI) Assessment Practices, Elements of Sustainability Plans, and harmonisation of reporting can be integrated in the evaluation process.

For half of the ERICs, the statutes include a provision about the scientific evaluation, the evaluation bodies and the frequency of the evaluation, however no harmonised process has been established within the ERICs' community.

The main challenges identified by the ERICs that underwent an independent scientific evaluation were the pioneering nature of the evaluation that required an extensive engagement and heavy workload to develop the whole evaluation concept, prepare the assessment report to provide evidence. Nevertheless, the overall process was considered as useful for the RI and providing solid ground for future evaluation.

The evaluation process and area to be evaluated should correspond to the strategic objectives of the RI. Alignment of stakeholders' expectations, procedures as well as guidance about KPIs and SEI would be useful.

The following points have to be considered and further discussed to develop a consistent framework that ERICs could adapt and adopt for an independent and professional scientific evaluation:
-use an already existing professional evaluation methodology and adapt to the ERICs needs or develop a specific methodology
-develop a common set of core area/domains for the evaluation to be used by each RI based on their own mission, organisation
- evaluation panel/experts selection with the need to maintain independence while having enough knowledge of the RIs landscape and their specific missions

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-consistent evaluation process
-anticipation of the workload linked to the evaluation process that could be mitigated by consistent expectations from stakeholders and an harmonised and stable over time procedure.

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Document log

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List of abbreviations

ECRIN ERIC	European Clinical Research Infrastructure Network- European Research Infrastructure Consortium
ERIC	European Research Infrastructure Consortium
ERIEC	European Research Infrastructure Evaluation Consortium
ESFRI	European Strategy Forum on Research Infrastructures
EURO-ARGO ERIC	European Research Infrastructure Consortium for Observing the Ocean
FTE	Full Time Equivalent
GA	General Assembly
Hcéres	Le Haut Conseil de l'évaluation de la recherche et de l'enseignement supérieur (High Council for the evaluation of research and Higher Education)
ICOS ERIC	Integrated Carbon Observation System European Research Infrastructure Consortium
KPI	Key Performance Indicator
OECD	Organisation for Economic Co-operation and Development
PI	Principal Investigator
PM	Person-month
RI	Research Infrastructure
SEI	Socio economic impact

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Background

In recent years, there have been discussion within ERICs, at European and national levels, regarding the evaluation of the ERICs and in particular their performance and impact. The impact assessment and monitoring have been highlighted as an important element of long-term sustainability of research infrastructures by ESFRI, European Commission, Competitiveness Council as well as Organisation for Economic Co-operation and Development (OECD).
This has resulted in an adoption of a report Monitoring of Research Infrastructures Performance by ESFRI in 2019, and a focus on impact assessment and monitoring by a number of research infrastructures.

As mentioned in the ERIC practical guidelines- Legal framework for a European Research Infrastructure Consortium, the ERIC statutes must contain the basic principles covering the scientific evaluation policy.
As this could be have been interpreted as the scientific evaluation of the projects accessing the research infrastructure, the second version (2015) of the practical guidelines[1], specified that " As regards scientific evaluation, the statutes must provide provision for a scientific evaluation of the ERIC activities. This evaluation may be included in the tasks of the scientific board or may be carried out by other external experts/committee or board. In the statutes template from the practical guidelines, the article 21 related to scientific evaluation policy propose the following: "The activities of {name} ERIC shall be evaluated annually by {…}". The scientific evaluation prior to access to the ERIC facilities, is covered under 'Access policy for users".

The scientific evaluation is a complex task, with no defined process and could encompass various aspects.
Several initiatives, projects highlighted the importance of evaluation procedures and recommended to develop standardised evaluation procedures through independent international peer-review.

The final report of InRoad[2], recommends the evaluation of the RI according to scientific, managerial, strategic and societal dimensions and based on a review of the national RI road mapping processes in Europe, proposed the criteria that are commonly used in evaluation procedures and classified into four broad categories: scientific dimension, management dimension, strategic dimension and societal dimension (see appendix 2).
Recommendations and evaluation elements are also provided in the ESFRI reports on Long Term sustainability of Research Infrastructure[3], Working Group Report Monitoring of Research

[1] European Commission, Directorate-General for Research and Innovation, *ERIC practical guidelines : legal framework for a European Research Infrastructure Consortium*, Publications Office, 2015, https://data.europa.eu/doi/10.2777/72348
[2] InRoad:
[3] ESFRI report: Long-Term Sustainability of Research Infrastructures: https://www.esfri.eu/sites/default/files/u4/ESFRI_SCRIPTA_VOL2_web.pdf

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Infrastructure Performance[4] and Supporting the transformative Impact of Research Infrastructures on European Research[5].

A credible, independent and high-quality scientific evaluation of the ERICs is essential for the scientific communities accessing the services, facilities, samples, data, to generate high quality data and robust results through the ERICs, particularly in the context of the debate on the reproducibility of research results. The evaluation should cover the technology, methodology, quality of services, cost model, access procedures, scientific impact of supported projects, socio-economic impact, as well as the organization and its national nodes if distributed.

The activities of the work package 4 of the ERIC Forum Implementation Project "evaluation and impact assessment" are designed to help ERICs to periodically measure their performance relative to their mission, goals, and guide them in the process of selecting relevant and achievable KPIs, metrics and indicators.
This cover the Monitoring and Development of KPIs for ERICs, Socio-Economic Impact Assessment Practices, Elements of Sustainability Plans, harmonisation of reporting, and the scientific evaluation.
Regarding scientific evaluation, the task 4.2 was designed to evaluate the best practices and provides elements to support the development of a standardised system or best practice for ERICs.

This report describes the current situation of ERICs regarding the scientific evaluation, provides examples of independent scientific evaluation already performed, including the selection of the evaluation committee/experts, the evaluation criteria, the methodology, results and feedbacks from the ERICs evaluated. It also, provides some recommendations and follow-up actions.

How the scientific evaluation is foreseen by ERICs? (data analysis from Statutes)

The statutes of the 23 ERICs created to date (March 2022), were analysed to check how the scientific evaluation was foreseen.
The ERICs are at various stages of their implementation; 6 newly granted with the ERIC status (less than 4 years), 15 with the status granted between 5 and 10 years, and 2 with the status granted more than 10 years ago.

[4]ESFRI WORKING GROUP REPORT Monitoring of Research Infrastructures Performance Dec 2019 https://www.esfri.eu/sites/default/files/ESFRI_WG_Monitoring_Report.pdf
[5]Supporting the Transformative Impact of Research Infrastructures on European Research https://ec.europa.eu/info/sites/default/files/research_and_innovation/strategy_on_research_and_innovation/documents/ec_rtd_transformative-impact-ris-on-euro-research.pdf

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Half of the ERICS statutes include an article with provision about the scientific evaluation or mention scientific evaluation in the statutes or in annex.

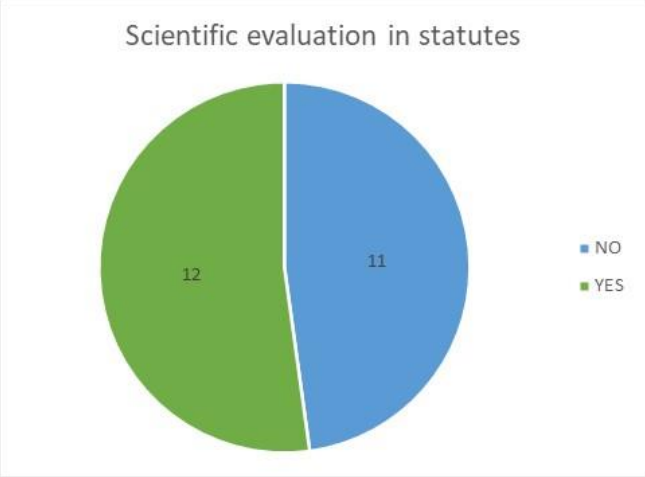

Figure 1: ERICs Statutes and scientific evaluation

In most of the cases, the body in charge of the evaluation is mentioned in the statutes. For 10 infrastructures, this evaluation shall be performed by independent international experts or independent body. This body is appointed by the General Assembly.
For 4 infrastructures, the body is an internal scientific Monitoring group which can be complemented by additional experts specifically appointed for the purpose of the evaluation.
For 2 ERICs, there is no mention in the statutes of the evaluation body foreseen for the evaluation.

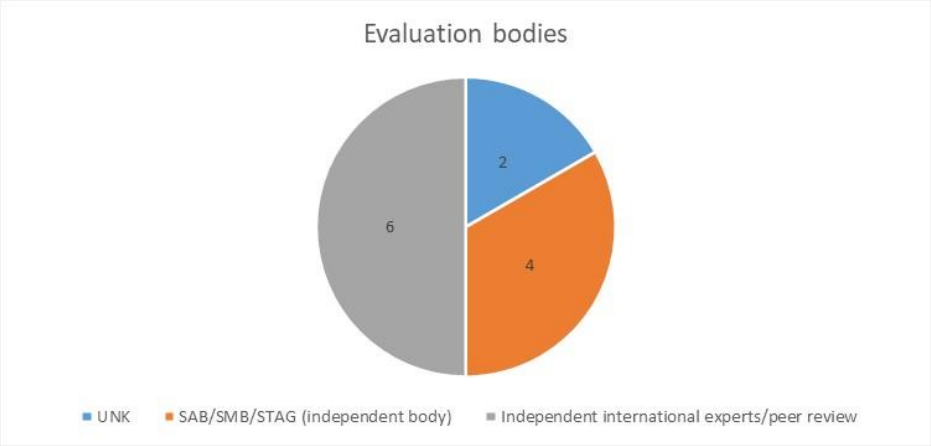

Figure2: ERICs statutes and scientific evaluation bodies

The frequency of the evaluation varies between one to 5 years (most common) according to the infrastructure. For 2 infrastructures, the frequency is not mentioned in the statutes.

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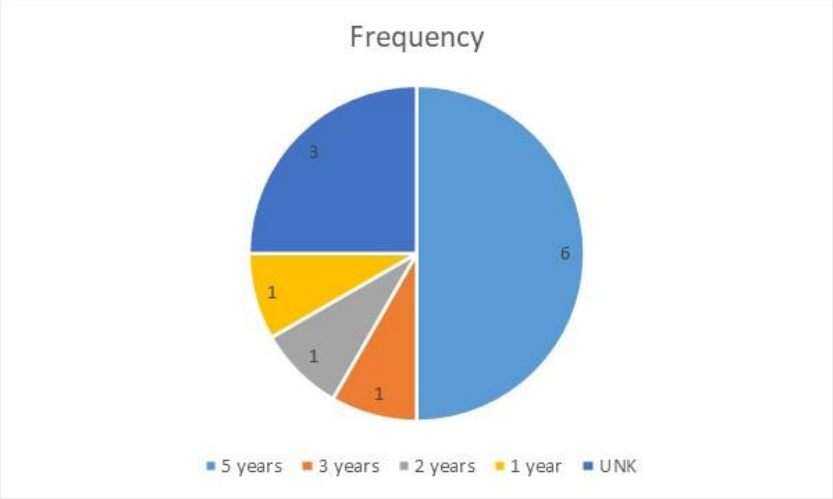

Figure 3: ERICs statutes and frequency of the evaluation

Scientific evaluation process; some practical examples

When the working group started its activity, two research infrastructures with the experience of independent external evaluation were identified; ECRIN-ERIC and ICOS-ERIC.
Their experience was shared during a joint meeting with the Horizon 2020 Accelerate project on the 16 December 2020.
In this report, the main elements shared during the meeting, the evaluation process methodology, and some elements of feedback/reflection from the infrastructures after the evaluation will be provided.

EXAMPLE-ICOS

1- Initiation: Purpose of the evaluation, establishment of the methodology and selection of evaluation committee

The scientific evaluation of ICOS ERIC was foreseen in the statutes and included the decision body, the periodicity, the type of evaluation committee and topics to be evaluated as well as the reporting (see below art 20 from ICOS-ERIC statutes).

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Article 20

Evaluation

1. Every five years an independent panel of international external evaluators of the highest quality, appointed by the General Assembly, shall carry out:

(a) scientific and management evaluations of the activities of ICOS ERIC;

(b) evaluation of ICOS RI activities, scientific and strategic orientation and operation of all components of ICOS RI.

The panel shall give special attention to the fulfilment of user requirements.

2. The results of the evaluations referred to in paragraph 1 shall be reported to the General Assembly.

To perform the evaluation, the ICOS-ERIC General Assembly set up an evaluation committee in charge of establishing an evaluation concept and set of areas of evaluation, including the evaluation of Key Performance Indicators (KPIs).

External experts spanning all key areas of ICOS activities were appointed.
Those experts worked with ICOS Head Office to elaborate and confirm the evaluation concept and on the documentation and data to be collected as evidence for the evaluation.

2- Criteria

Five areas/categories of activities were defined:
-Management
-Financial management
-ICOS internal engagement and integration
-ICOS data and user expectations
-International cooperation
Some categories were divided into a set of subcategories and each of these categories was assessed against a set of criteria, each of which had KPIs that were developed during the evaluation process.

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In total 15 subcategories were evaluated against 36 criteria.

CATEGORIES		CRITERIA
MANAGEMENT	General Management	CRITERION 1 Management processes are in place CRITERION 2 Documentation is available CRITERION 3 Processes are well executed
	Operational management	CRITERION 1 Availability of technical requirements for ICOS instrumentation CRITERION 2 Availability of ICOS-approved operational practices for the measurement of variables CRITERION 3 Stations are labelled CRITERION 4 Data coverage in temporal and spatial dimensions is effective CRITERION 5 New technologies are implemented
	Data life cycle	CRITERION 1 Data workflows are well defined and effective CRITERION 2 Data is made available in a timely fashion CRITERION 3 Data is compliant with FAIR principles CRITERION 4 All data and data-related services are available via the Carbon Portal as the single-access point/centralised entry gateway
FINANCIAL MANAGEMENT	Core funding	CRITERION 1 The amount of core funding is in line with operations CRITERION 2 Measures to monitor mid-term financial sustainability are implemented CRITERION 3 Risk mitigation methods are in use
	Project funding	CRITERION 1 Project funding is actively sought and reported CRITERION 2 Project funding is effectively used and its usage is monitored
INTERNAL ENGAGEMENT AND INTEGRATION	Internal engagement	CRITERION 1 ICOS participants feel that their work is recognised, identify themselves as ICOS partners and are active in branding ICOS CRITERION 2 ICOS participants are interested in and participate in common activities, as well as take part in organising them
	Internal integration and structure	CRITERION 1 Internally, ICOS is a well-integrated organisation, in which participants feel properly included CRITERION 2 The ICOS organisation has the ability to improve its activities and respond in an agile way to new opportunities or challenges CRITERION 3 ICOS has potential for an alternative and improved structure

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ICOS DATA AND USER EXPECTATIONS	A priori design	CRITERION 1 ICOS participates or enables participation in international efforts to codesign standards for ICOS measurements
	Data download	CRITERION 1 ICOS data is downloaded from the Carbon Portal by users in all ICOS domains CRITERION 2 ICOS data is downloaded via other portal
	ICOS data usage	CRITERION 1 ICOS data is used and cited in scientific publications CRITERION 2 ICOS data is used across different scientific fields CRITERION 3 ICOS data is used in educational tools and education activities
	Active data promotion and meeting user/stakeholder expectations	CRITERION 1 ICOS facilitates scientific initiatives successfully CRITERION 2 ICOS Science Conferences successfully enable scientific exchange CRITERION 3 Articles are published in online media/general media outlets, and the RI is present on social media
	Downstream private sector cooperation for ICOS data usage	CRITERION 1 ICOS engages in downstream projects with the private sector
INTERNATIONAL COOPERATION	Estimation of the intensity of ICOS international cooperation	CRITERION 1 Cooperation with the main actors of the European and global GHG information systems CRITERION 2 Relevance for the global response to climate change
	The individual level of ICOS involvement in international cooperation	CRITERION 1 Participation in events of regional or global relevance
	ICOS international cooperation in the eyes of the stakeholders	CRITERION 1 Common observational sites with other RIs at country level CRITERION 2 Formal agreements (Memoranda of Understanding, MoUs) with other RIs or organisations

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3- Evaluation process and report

The whole process from the mandate given by the ICOS-ERIC General Assembly to the Head Office to coordinate with the external evaluation committee, to the final report took one year. The ICOS office supported the concept development and prepared the evidence report (documentation and data). This was a high overall workload, estimated to 2 full time equivalent. The process also includes surveys with of a wide range of internal ICOS community from all bodies to all scientific domains (station Principal Investigators (PIs), central facility directors, members of committees, the Head Office, and the General Assembly (GA) (stakeholders), and engagement in a two-day meeting (remote due to pandemic situation) between the Evaluation Committee and surveyed stakeholders.

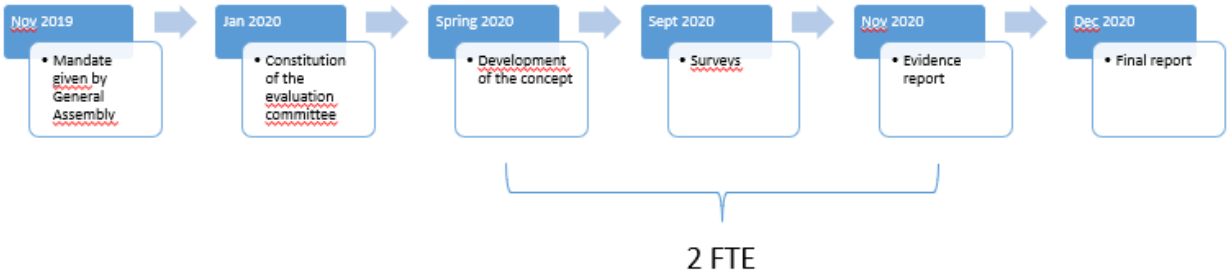

Figure 4: Evaluation schedule (ICOS-ERIC)

The final report is composed of summary of key findings and evaluation of relevant key performance indicators for each category and each criterion followed by conclusion and recommendations.
The report is publicly available[6].

4- Sharing feedback

The development of the evaluation concept required much more work than expected.
Defining the evaluation concept required the identification of any potential conflict of interest, defining and clarifying the areas of evaluation and the focus within them, and assigning clear tasks for the Head Office and the evaluation committee.
The pioneering nature of the review led to extensive engagement between ICOS Head Office and the Evaluation Committee.
However, the overall process was important and useful for optimising operations and this first experience will give solid ground for future evaluation.

[6] https://www.icos-cp.eu/sites/default/files/2021-05/ICOS%20Evaluation%202020%20Report%20_online%20low.pdf

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Citation from the report "The Evaluation Committee found the evaluation process to be very challenging, requiring the whole evaluation concept that the General Assembly had outlined to be developed in much greater detail with ICOS ERIC. The committee was also involved in the development of KPIs, the list of items to be gathered as evidence, devising and implementing surveys and even developing the nature of the reporting documentation and evaluation meeting. Some of this was a consequence of the pioneering nature of the process, concerning the evaluation of a distributed infrastructure for the first time. However, with the benefit of hindsight, it would have been more efficient and effective for the Evaluation Committee if all the material to be assessed, together with the definition of all processes and documents, had been in place before it started the evaluation, and the primary sources of evidence – the ICOS ERIC report, with the survey results – all complete before the first evaluation meeting. This would have required a longer period of development of the evaluation concept with the General Assembly. Nevertheless, the Evaluation Committee believes it was able to maintain sufficient distance from ICOS ERIC to be able to provide a fully independent view and did find the process interesting and rewarding, which should provide a useful basis for future reviews"

EXAMPLE-ECRIN

1- Initiation: Purpose of the evaluation, establishment of the methodology and selection of evaluation committee

The scientific evaluation of ECRIN ERIC was foreseen in the statutes and included the decision body, the periodicity, the type of evaluation committee (see below art 10 from ECRIN-ERIC statutes).

Article 10

Annual report and reviews

1. The ECRIN-ERIC Director-General shall draw up, with the Network Committee, an annual activity report containing the scientific, operational and financial aspects of ECRIN-ERIC. The Assembly of Members shall approve the annual activity report and transmit the report to the European Commission. After approval, the annual activity report shall be made publicly available through the ECRIN-ERIC website.

2. ECRIN-ERIC shall undergo every five years a scientific review performed by international experts appointed by the Assembly of Members, providing guidance and recommendations on the ECRIN-ERIC development strategy.

The evaluation was discussed within the ECRIN -ERIC Assembly of Members and it was proposed, due to the location of the head office in France, to contact the independent evaluation

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Agency namely the French High Council for Evaluation of Research and Higher Education[7] (Hcéres) and to benefit from their evaluation experience and methodology.
Hcéres identified other European agencies interested to participate in the evaluation of Research Infrastructures (larger scope than mandate of the agency) and after a first meeting the three evaluation agencies (France, Italy and Spain) decided to move forward, to initiate ERIEC (EUROPEAN RESEARCH INFRASTRUCTURE EVALUATION CONSORTIUM), and develop criteria to evaluate European Research Infrastructures[8].
Terms of Reference were developed for the evaluation of ECRIN-ERIC, submitted to and agreed by ECRIN.
Based on the Terms of Reference developed, the independent experts (4 in total plus a representative from the ERIEC to guaranty the respect of the procedure) were selected and proposed by the ERIEC. The experts were selected based on their expert profiles, the absence of link of interest with the ERIC, and to have a proper geographical distribution of ERIC user base and gender equality. ECRIN-ERIC had the right to reject experts, which was not the case.

2- Criteria

The external evaluation focused on the most recent operation period of ECRIN- ERIC (*ex-post* evaluation) and analysed the trajectory followed by the ERIC during the reference period, and especially the implementation of development policies for activities and the associated cycles of continuous improvement, with regard to the overall strategy trajectory. Importantly it was mentioned that the external evaluation respects the strategy decisions taken by the ERIC, or more likely by its Assembly of Members.

Three main domains have been considered; Positioning and strategy, Governance and management, and Activities that were assessed against 14 standards considering the 3 following criteria; quality of services provided to support research and excellence, the impact and relevance for society and the sustainability and management efficiency. Others aspects such as research integrity, ethics, capacity building and interaction with other organisations could possibly be considered.

[7] Hcéres: Le Haut Conseil de l'évaluation de la recherche et de l'enseignement supérieur (High Council for the evaluation of research and Higher Education): https://www.hceres.fr/en
[8] ERIEC: European Research Infrastructure Evaluation Consortium: https://www.eriec.eu/

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DOMAINS	STANDARDS
Positioning and strategy	Standard 1: the ERIC presents its positioning and its operation model in light of its missions in the European landscape of research and innovation. Standard 2: the ERIC has an institutional strategy in relation to its missions and skills in the European landscape of research infrastructures and innovation. Standard 3: the ERIC has a strategy of alliances and partnerships on a local, national and international level.
Governance and management	Standard 4: the ERIC defines a functional and geographical organization for the implementation of its activities in support of its missions and strategy. Standard 5: the governance of the ERIC is based on authorities and decision-making processes consistent with the strategy and chosen modes of action Standard 6: the ERIC has implemented an overall quality policy which takes into account the monitoring of all activities and results, and the implementation of corrective actions Standard 7: the ERIC develops a communication policy Standard 8: the ERIC manages multi-annual implementation of its strategy by using prospective analysis tools Standard 9: the ERIC structures its management processes and relies on a suitable set of support and assistance services Standard 10: Data management Standard 11: Intellectual property
Activities	Standard 12: Service provision to users Standard 13: the ERIC demonstrates its ability to monitor, analyse and qualify the results of its various activities Standard 14: the ERIC controls its development trajectory

3- Evaluation process and report

The whole process from the mandate to the final report took one year and a half. The evaluation itself from the signature of the contract to the final report took 9 months.
The process includes the writing of a self-evaluation report covering the 3 domains and the 14 standards, providing evidence, that was complemented by an on-site visit (2 days) based on

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interviews with internal and external stakeholders (including representatives from the governing or advisory bodies, national partners, scientific board and EC and ESFRI representatives).

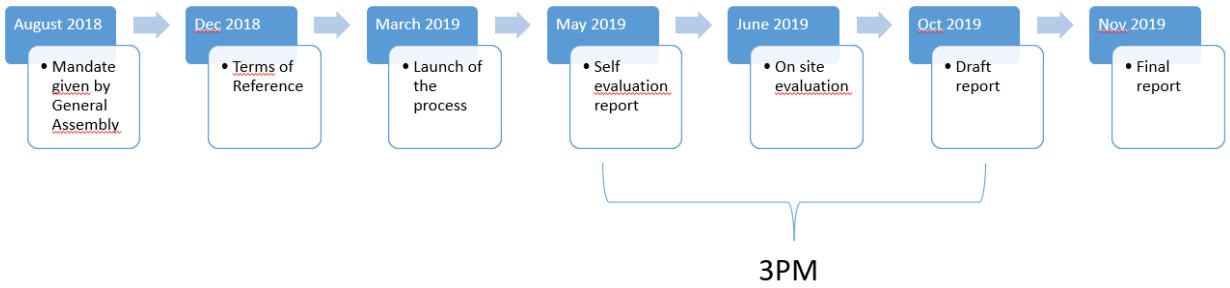

Figure 5: Evaluation schedule (ECRIN-ERIC)

After the on-site visit, the panel produced a comprehensive report, assessing the reference period, taking into account the self-assessment, the interviews and feedback collected during the on-site visit. The report included a SWOT analysis providing the strengths, weaknesses and recommendations for the future trajectory of the ERIC. Before publication, the report was reviewed by ECRIN and observations from the ECRIN-ERIC Director General on the evaluation report was included in the final report publicly available on the ECRIN website[9] and on the evaluation body website[10].
The overall workload was estimated to 3 person -month (PM) in total including the time spent to prepare and to undergo interviews. Most of the efforts were related to the production of the self-assessment report.

4- Feedback

The overall feedback was positive and the strong point identified were:
- the independent evaluation with a professional methodology
- the impact of the evaluation towards the strategy, to strengthening the team in its activities and to its visibility
-recommendations useful for dialogue with the governing bodies and stakeholders.

However, the evaluation was challenging in terms of workload and investment from the direction and staff for the preparation and for the interviews. As it was a pilot, and the first evaluation performed by the ERIEC, it raised some discussions and misunderstandings in

[9] https://0fa63f2e-bb65-461f-8488-8ed066db2a28.filesusr.com/ugd/aee7b1_6fa582f2d2f543a186f4b45cd52e308e.pdf?index=true

[10] https://www.hceres.fr/fr/rechercher-une-publication/evaluation-report-ecrin-eric-european-clinical-research-infrastructure

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particular due to the limited infrastructure landscape knowledge from the evaluation committee.

OTHER EXAMPLES

Some ERICs are evaluated by their independent advisory board/committee (namely Scientific Advisory Board, Scientific and Technical Advisory Group, Scientific, Technical and Ethics Advisory Committee,…) that are consultative bodies composed of independent experts. In some cases, and where relevant, additional experts can be appointed for the evaluation.

EURO-ARGO is one of the ERICs that underwent an evaluation after 5 years' existence and they prepared an activity report covering the evaluation period and including a set of KPIs. They also developed a 5-year plan about the objectives for the next period.
The area covered in the activity report, are quite similar to the domains considered by the independent evaluation committees for the evaluation of ICOS or ECRIN and include:
-governance, coordination, finance
-services
-expansion
-data management and data use
-collaboration
-visibility
-societal impact.

Discussion, recommendations

Evaluation process
Although limited experiences feedback, similarities and differences in approaches can be discussed.
The first step is the development of the evaluation methodology, content and process, the definition of the domains/categories to be evaluated and the evaluation criteria.
In one case, the process, domains to evaluate and criteria were done as a co-development between the ERIC Head Office and the selected evaluation committee, based on the evaluation concept developed by the General Assembly.
In the second case, after a first contact with the Director of the ERIC to define the objective of the evaluation and to provide information about the ERIC organisation, the evaluation agency developed the process, criteria and area of evaluation, based on their existing methodology, and independently of the ERIC. The experts selected afterwards applied the methodology and criteria.

The second approach uses an existing, proven and professional evaluation methodology that would result in a higher level of independence, although the evaluation committee that was

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involved in the co-development of the evaluation believes it was able to maintain sufficient distance to provide a fully independent view. On the other hand, the co-development allows a better understanding of the evaluation objectives, and adapted criteria.

Regarding the area/domains to be evaluated this is quite standard and the following are covered in the evaluation;
-the management and the demonstration that the organisation has processes and reporting in place allowing to efficiently function and deliver the expected services
-the strategy and strategic development
-the services (dependent on the organisation) including quality
-the partnerships and international cooperation.
A greater attention has been given on governance and decision making process in the case of ECRIN may be explained by the fact that the development of the evaluation was external.
For ICOS evaluation, a specific focus was given on the Key Performance Indicators that should be confirmed and evaluated, and the management of user expectations was quite developed. Both are worth to include in evaluation.
The societal impact and in particular the socio-economic impact (SEI) was not or only partially covered in the evaluation and the recommendations of the work package 4 and work package 6 should be integrated in further evaluations[11].

The selection of the experts of the evaluation committee was different and under the responsibility of the General Assembly or of the external evaluation agency, however the final decision remains at the level of the ERIC.
The experts are independent from the ERIC, and spanning the area of activity of the infrastructure. The knowledge of the research infrastructures landscape was considered as an added value.

The evaluation itself was similar with a first step consisting of a self-evaluation/evidence report addressing the different domain and criteria, complemented by on-site[12] visit including interviews with key internal or external stakeholders. A comprehensive report was then produced, assessing the reference period and taking into account the report produced by the ERIC, the interviews and feedback collected during the on-site visit.

International landscape (from RISCAPE[13] analysis)

The RISCAPE project funded by the 7th Framework Programme of the European Commission, produced a landscape analysis report that describe major research facilities existing worldwide 2019, including analysis on how the European facilities position themselves in the comparison, and on key future developments. This analysis includes questions about evaluation, scientific

[11] Deliverables: https://www.eric-forum.eu/project-deliverables/
[12] Due to pandemic situation, the planned on-site visit for ICOS was transformed to a remote meeting
[13] https://riscape.wordpress.com/

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and socio economic impact of the facilities.
Although not exhaustive and declarative, the feedback collected from various domains (or clusters) showed that the evaluation of research infrastructures and the demonstration of the performance and impact of research infrastructure is a global concern.
In the environment domain, 2 North America based infrastructures indicated that they perform every 5 years a science review. The evaluation is performed by a panel of external scientists and mainly measures the scientific output obtained from the use of data, the number of degree and PhD students involved, the articles published, the work done with educators. Another criterion for scientific impact is the long-term commitment of funders. In addition, funding obtained by researchers (grants) to use the data, products or services provided by an infrastructure can be an element that shows the scientific quality and relevance of the RI.
In the health and food domain, most of the RIs assess their scientific impact through quantitative metrics such the number of publications and impact factor, number of access, patents, number of trainees, number of start-ups created, and this is usually part of the annual report. In half of the cases, the evaluation is performed by internal reviewers and only few (three RIs) use external evaluation or a combination (internal plus external).
In the Energy domain, the majority of respondents note that scientific impact is followed either by the research infrastructure itself or by third parties (an almost even split in the energy domain). Many RIs also publish annual reports on their scientific achievements on-line.
In Astronomy, scientific impact is one of the criteria typically used to evaluate scientific activities; from individual researchers being evaluated based on their publication record, to accessing new working opportunities, to RIs being assessed by funding agencies. Monitoring of the RIs' activities is done internally, for example by collecting the number of users, proposed projects, web counters, number of publications, statistics on user distribution, etc. Funding bodies usually consider societal impact in their evaluation.

Recommendations

The evaluation process should be aligned with the strategy, the main mission of the ERIC and its nature (distributed with involvement of national nodes vs single site).

The anticipated burden associated with the scientific evaluation was underestimated, and RIs with limited number of staff might face difficulties.

The evaluation of research infrastructures has multiple purposes, targets multiple stakeholders (governing bodies, national authorities, ESFRI, European Commission, …) that mean unfortunately multiple evaluations.
Ideally, this would need a better harmonisation in terms of expectations, timelines to avoid those multiple evaluations and duplication of efforts, and that ERICs are pulled in different directions.

As already reported in the other reports developed by the work package 4, guidance and practical help regarding the KPIs and more on the SEI would be welcome.

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The evaluation process should be aligned with the strategy and the main mission of the ERIC in particular in the case of distributed infrastructures where the RI has to demonstrate how it coordinates the different entities and how the RI functions as a well-integrated structure.

Next steps

As some RIs are now reaching and preparing their evaluation, it would be worth to collect additional information related to their approach and feedback to complement the current data, and to maintain the dialogue with the ERIC community, with the stakeholders and with ESFRI monitoring group (in particular regarding the methodology foreseen for the monitoring of the landmarks).

Conclusion

RIs are asked to justify their existence and operations and to show their added value for the for the European research community accessing services, facilities, knowledge, samples or data.
RIs are largely funded by public money and therefore evaluating their quality, scientific and socioeconomic impact and their return on investment is legitimate.
Consistent expectations from stakeholders, and harmonised and stable over time procedures would help the ERICs to adapt and adopt an independent and professional scientific evaluation.

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Appendix 1: ERIEC

ERIEC[14] - EUROPEAN RESEARCH INFRASTRUCTURE EVALUATION CONSORTIUM
On 1 April 2019, the European evaluation agencies HCÉRES (France), ANVUR (Italy) and AEI (Spain) signed a framework agreement to cooperate in the evaluation of European research infrastructures, thus establishing the ERIEC (European Research Infrastructure Evaluation Consortium).
Currently the consortium includes: AEI (Agencia Estatal de Investigación – Spain), ANVUR (Italian National Agency for the Evaluation of Universities and Research Institutes – Italy), Hcéres (High Council for the Evaluation of Research and Higher Education, France), evalag (Evaluationsagentur Baden-Württemberg - Germany), QANU (Quality Assurance Netherlands Universities – Netherlands)
The consortium established Terms of Reference.
Operating at the request of ERIC infrastructures, the ERIEC consortium offers them an evaluation system based on international and European best practices in quality assurance.
Supporting the development of a European research strategy, the ERIEC invites any European evaluation agencies that might be interested, to join the consortium and take part in these joint evaluations of European research infrastructures, whether with ERIC status or not.

Appendix 2: InRoad roadmapping process (from report)

Based on a review of national RI roadmapping processes in Europe, criteria that are commonly used in evaluation procedures can be classified into four broad categories:

1. **Scientific dimension**: collaboration and degree of internationalisation; strong user base; scientific and technological excellence of the RI; etc.
2. **Management dimension**: mission and value proposition; governance and management; impact assessment and societal challenges; user strategy and access policy; data management plan; financial plan and funding framework; stakeholder engagement strategy; communication and outreach; implementation, monitoring and risk management; ethical and regulatory aspects; intellectual property rights managemen.
3. **Strategic dimension**: mission; visibility; identified priority areas; industrial relationships; innovation potential; etc.
4. **Societal dimension**: education and training; contribution to sustainable development goals; socio-economic impact; etc.

[14] ERIEC: European Research Infrastructure Evaluation Consortium: https://www.eriec.eu/

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Appendix 3: Minutes of the ACCELERATE meeting 16 Dec 2018

CERIC, together with the Rathenau Institute, European Spallation Source, and EFIS Centre, respectively representing the 3 co-organizing H2020 projects ACCELERATE[15], ERIC Forum and RI-PATHS, organized an online workshop highlighting recent developments in the field of impact assessment, scientific evaluation and monitoring of Research Infrastructure. The event brought together more than 130 participants from over 65 different organizations, representing Research Infrastructures' (RI) communities, policy makers, funding agencies and more, to tackle the topic from different perspectives. The event focused on 3 main areas: 1) scientific evaluation, 2) monitoring and 3) socioeconomic impact of research infrastructures. To showcase the full picture of a scientific evaluation example, the ERIEC (European Research Infrastructure Evaluation Consortium) scientific evaluation methodology was presented through the ECRIN-ERIC experience, highlighting its process, timeline, efforts, results and usefulness. Moreover, the event provided an overview of the ERIC Forum's survey and position paper on the development of Key Performance Indicators (KPIs) for RIs, grouping input from 32 European Research Infrastructures about their KPIs' status and motivation, as well as feedback on ESFRI KPIs. It was also an opportunity to get policy makers' updates on the topic, specifically referring to the ESFRI RI monitoring approach. These were important aspects to tackle considering that over 75% of the attendees monitor their performance with KPIs as a useful tool for monitoring, although nearly 70% of them have difficulties in defining KPIs. The session focusing on socio-economic impact provided an overview of the societal impact protocol approach developed by the Rathenau Institute within the frame of the ACCELERATE project. The approach was a tool for project partners (CERIC, European Spallation Source, ELI, HZG and FRMII) to apply the methodology for their respective RIs/ ERICs and therefore develop their social return report. During the workshop, each partner presented the results of this exercise and the main impact pathways and areas of their infrastructures identified throughout the assessment process. In addition to the results, the presentation of the ACCELERATE and RI-PATHS' case studies also included an overview of the purpose of the assessment, the approach followed by the RI and the efforts in terms of person month needed for the completion of the societal report. The aim was to highlight to the audience the application of the protocols by RIs from different sectors, structures and objectives, showcasing the key learning points from the study of the impact and its added value. For the event's attendees, over 80% of them define the main value of impact assessment in terms of conveying the RI's impact to its stakeholders (such as its funders), and over 65% in its usefulness as a strategic tool to steer activities towards enhanced impact.

[15] ACCELERATE is funded by the European Union Framework Programme for Research and Innovation Horizon 2020, under grant agreement 731112 https://www.accelerate2020.eu/

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