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Deliverable Report:
D3.3 Strategy for training of ILOs/ICOs and outreach towards industry

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Terminology

'Big Science' – Big Science organisations are a common term used for legal entities which build and manage large-scale international research infrastructures, where the scope and cost of the investment exceeds the capability of just one country. Thus, several countries (member states) join forces to finance the infrastructure. These are usually found in the ESFRI Physical Sciences & Engineering domain, and examples are particle accelerators and telescopes. Examples are: CERN, ESO, ESRF, and ITER.

BSBF – The Big Science Business Forum is a business-oriented congress which congregates the main European Big Science Research Infrastructures, focused on technology and with the aim to be the key meeting point between these Research Infrastructures and industry. The first edition was held in 2018 in Copenhagen. The second edition will take place in October 2022 in Granada.

ESFRI RESEARCH DOMAIN – The European Strategy Forum of Research Infrastructures (ESFRI) has identified six main thematic domains of research (ESFRI Strategy Report and Roadmap 2018; pg. 38): Energy (ENE), Environment (ENV), Health & Food (H&F), Physical Sciences & Engineering (PSE), Social & Cultural Innovation (SCI), and – since 2017 – Data, Computing and Digital Research Infrastructures (DIGIT).

GEORETURN – The financial return of a member country on the investment in developing and operating research infrastructures.

ILO – INDUSTRY LIAISON OFFICER. Officially appointed by the Member States and Associated Countries to stimulate the collaboration amongst the national industry and the international RIs, providing advice on business opportunities, R&D collaborations, calls for tenders, and industrial services."

ICO – INDUSTRY CONTACT OFFICER. Research Infrastructures staff in charge of developing business relations with all potential industrial suppliers of innovative components or services, as well as encouraging the economical use of their facility by private players.

PERIIA – The Pan-European Research Infrastructure ILO Association (PERIIA) network launched in 2019 as a grassroots movement offering a communication and discussion platform for ILOs. The aim of the network is to pave the way and prepare for the establishment of PERIIA as a legal entity in the form of a European association.

RI – RESEARCH INFRASTRUCTURES are facilities that provide resources and services for research communities to conduct research and foster innovation. RIs can be used beyond research, e.g. for education or public services. Research Infrastructures include: major scientific equipment or sets of instruments; collections, archives, or scientific data; computing systems and communication networks; and any other research and innovation infrastructure of a unique nature which is open to external users.

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Abbreviations

BSBF	Big Science Business Forum
CERN	Conseil Européen pour la Recherche Nucléaire
CDTI	Centre for the Development of Industrial Technology (CDTI)
CLARIN	Common Language Resources and Technology Infrastructure
DTI	Danish Technological Institute
EATRIS	European infrastructure for translational medicine
EIT	European Institute of Innovation & Technology
EMSO	European Multidisciplinary Seafloor and water column Observatory
ENRIITC	European Network of Research Infrastructures & Industry for Collaboration
EOSC	European Open Science Cloud
ESFRI	European Strategic Forum on Research Infrastructures
ESO	European Southern Observatory
ESRF	European Synchrotron Radiation Facility
ESS	European Spallation Source
F4E	Fusion for Energy
ICO	Industry Contact Officer
ILO	Industry Liaisons Officer
ITER	International
KPI	Key Performance Indicators
PERIIA	Pan-European Research Infrastructure ILO Association
RI	Research Infrastructures
SME	Small and Medium-Sized Enterprises
SSH	Social Sciences & Humanities
STEM	Science, Technology, Engineering, and Math
SZN	Stazione Zoologica of Naples

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1. Executive Summary

The ENRIITC project aims to build a permanent pan-European network of Industrial Liaison and Contact Officers (ILOs and ICOs) and enable industry to become a full partner of research infrastructures whether it is as a user, supplier, or co-creator. In other words, ENRIITC supports the establishment of strategic, cross-border partnerships between industry and research infrastructures.

This document proposes a strategy for training of ILOs and ICOs in their outreach capacity towards industry. At the heart of the strategy are the proposed training paths to develop the skills needed to lead the RI innovation awareness-building, design industry outreach and communications strategies, develop the organisational structure, define the range of specialised support services and training, and ensure quality and continuity.

The strategy and recommendations were developed based on input from:

- ENRIITC survey presented in D2.1
- Small survey targeted ICOs and ILOs (results are presented in Appendix 2 and 4)
- Discussions from ENRIITC Focus Groups 1 and 3
- Discussions from ENRIITCyourcoffee meetings
- General discussions and knowledge nested at the ENRIITC partners representing both ICOs and ILOs

The analysis of the ILO function highlighted the need for training targeting the development of both soft and hard skills. Considering the skills to be developed or improved, only half of the interviewed ICOs in our survey deem that they have already developed the skills that they need, and one-third of them have not received any useful training to deal with the role. This suggests the urgent need to put in place a complete offer of training paths to fill the gap as part of a complex and complete network to support the work of the ICOs.

The table below lists the skills that are considered relevant for ICOs:

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Soft skills	Hard skills
•Communication (including storytelling, writing reports, language, etc.) •Leadership (facilitation, negotiation, conflict management, decision making, etc.) •Critical thinking (problem-solving, troubleshooting, thinking outside the box, etc.) •Creativity (open-mindedness, lateral thinking, brainstorming, vertical thinking) •Teamwork (empathy, interpersonal skills, social skills, team building, etc.) •Management (time, human resources, risk, costs, projects) •Integrity (work ethic, motivation, perseverance, reliability, result-oriented, etc.) •Positive attitude (courtesy, cooperation, enthusiasm, patience, etc.) •Marketing (development and presentation of the offer)	•Fundraising (local, regional, national and European level) •International networking and collaboration skills targeting new industry business relations •Technical and policy insight into the RI and, in particular, tools on how to analyze, compile, and deploy technology transfer and licensing agreements •Knowledge about industry collaboration models and formation of new industry partnerships, spin-offs/start-ups •Event organisation (seminars, meetings, hackathons) with industry to obtain input to the RI industry strategy (see D3.4) •Communication (in collaboration with the RI Communication Officer) for maintaining an RI Communication Plan targeting industry and writing annual reports with engaging innovation case studies to be showcased by the RI •IPR and GDPR data management (in collaboration with the RI Data Manager) to be able to handle confidentiality and access issues with industry

ILOs have very different backgrounds and may be either government officials, researchers, or staff in business-oriented positions. In fact, knowledge from all these sectors is relevant in order to fulfill the ILO-function. Despite of this complex mix of policy, science, and business, most ILOs (80% as reported in D2.1) have not received any special training.

For the training of ILOs, the following skills must be developed:

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Soft skills	Hard skills
•Communications, including internal RI communications •Management skills •Networking and collaboration skills	•Business knowhow to be able to perform consultancy and support on procurement and tenders •Understanding industry collaboration in the innovation eco-system and possibilities for EU funding •Organisation of brokerage events (see D3.4) and organisation tools (e.g. use of databases) •insight into the operations of the RI from both technical and policy perspective (including rules and regulations) •Industry collaborating models including Technology transfer processes •Negotiations, IPR, and the legal aspects of contracts

The input from all sources (questionnaires, discussions, focus groups) reveal that there is a huge difference in the way ILOs and ICOs operate, both from one RI to the other and from one country to another. There is no clear job description and KPI against which they are measured. This muddled landscape manifests itself as unbalance and unequal opportunities for industries from different regions and countries, leaving a significant innovation potential underexplored.

A joint European strategy for training of ILOs and ICOs is proposed to unlock the innovation potential of RIs:

- Strategic recommendation #1: The role of ICO and ILO should be defined at a European level including the identification of Key Performance Indicators.
- Strategic recommendation #2: New and existing ILOs and ICOs must have access to pan-European training resources including a) training of relevant skills, and b) specific technical training programmes for ILOs and ICOs.
- Strategic recommendation #3: Establish a pan-European HUB containing training resources, best practices, and success stories. The HUB will also operate as a meeting place for ILOs, ICOs, and ICOs/ILOs together.

The platform is further introduced in ENRIITC D3.1 “Strategy to Exploit the Innovation Potential of RIs” should be a permanent network place and meeting point for ILOs and ICOs to enable fruitful exchanges and collaboration in all matters involving RIs, industry, and innovation. In particular, the platform should contain training material and guidelines for ILOs and ICOs on how to fulfil their job function.

The preparation of common and standardised training and guidelines will result in homogenous training of ILOs, regardless of the country, and, thus, ensure that companies from different countries may be served on a similar level – in other words, levelling the playing field.

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1. Introduction

In the world of Research Infrastructures, as has been described in ENRIITC D3.1 “Strategy to Exploit the Innovation Potential of RIs” and D3.2 “Strategy for Innovation and Industry-RI Cooperation,” the roles of ICO and ILO are key in the link between RIs and industry. They are, thus, at the core of the strategy for improving the RI engagement with industry both as suppliers, users, and co-developers/collaborators.

However, there is currently no clear definition of how to perform the job function of ICO and ILO, and, thus, the persons charged with these task have to either learn from predecessors or develop solutions and best practices as they go along. Often, there is, in fact no predecessors to learn from, and measured across all RIs and European countries, this constitutes a huge loss of resources since the knowledge and best practices, in principle, already exist at other RIs or with ILOs in other countries.

This document is the starting point for creating an understanding of the contexts, functions, and potential of ILOs and ICOs. It includes a profile description and guidelines for training of the persons appointed to these job functions. The overview of the current training opportunities and requests from the communities themselves should also help shape tailored training offers in the future.

Thanks to the discussions and inputs collected, a catalogue of recommendation for training opportunities is proposed. This aims to equip both new and already appointed ILOs and ICOs with knowledge about the basic training requirements recommended for them to fulfil their roles.

Ultimately, to support homogeneity between ILOs and ICOs in Europe, a strategy for cross-border collaboration and training is proposed. An important aspect of the strategy is the creation of a common knowledge hub further detailed in ENRIITC D3.1 “Strategy to Exploit the Innovation Potential of RIs” where training material and “best practice” descriptions for ILOs and ICOs may be stored and kept updated and available for the community. Outreach to industry, that is an important aspect of both the ILO and ICO function, is also supported by ENRIITC D3.4 “Practical Step-By-Step Guide for ILOs/ICOs to Organise Brokerage Events” that details how to organise events with industry. Finally, ENRIITC D3.2 “Strategy for Innovation and Industry-RI Cooperation” contains a list of recommendations to the organisational structure of RIs (including ICOs) and the interaction of RIs with multipliers (including ILOs).

2. Methodology

The strength of the ENRIITC project has been the close interaction with a huge network of stakeholders from more than 20 countries and 40 institutions. This group has been used to extract information on training needs for ILOs and ICOs to enable industry outreach. In particular, the following channels were used:

- The main ENRIITC questionnaire reported in D2.1 targeting all activities of RIs, ICOs, and ILOs. For ILOs, 47 responses from 20 different countries were collected, while 44 RIs and similar institutions responded to the ICO survey.

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- Two additional smaller questionnaires were distributed to a smaller group of ILOs and ICOs and focused on training and preparedness for industry outreach. The responses constitute a benchmark on the current training programmes being used in the ILO and ICO communities, respectively, and the expressed needs for training from ILOs and ICOs.
- The subject of the training was widely discussed as part of the work of the ENRIITC Focus Group 1 and 3. Both groups were established with a good balance of ILO and ICO representation. The group's results, methodology, and final conclusions are presented in this document.

Two ENRIITCyourCoffee sessions were held on the topic of training. The session on March 18, 2021 was devoted to the training needs of the ILOs, while the March 25 session concerned training for the ICOs. The description of the meetings together with the conclusions are reported in this document.

A request to all the coordinators of the ESFRI clusters has been sent out to collect information about the training that those projects are providing to facilitate the relationship between RIs and industry.

Two types of questionnaires were prepared to collect information about the experience of ICOs from European RIs, on one side, and national ILOs, on the other, in building and managing relationships with industry.

The answers were analysed to develop a suitable training strategy for shaping the next generation of ICOs and ILOs, and to facilitate the relationship of the RIs with industry as a partner (as a user, a supplier, or a co-creator of knowledge or technology).

The questions included in the survey were designed in particular to acquire as much information as possible on what the state-of-the-art in terms of training opportunities for ICOs and ILOs is, and on the other hand, in understanding the main characteristic of the work environment in which ICOs and ILOs are working, looking into the support they receive from the team and the level of their readiness in carrying out the activities that are part of their role.

Based on the broad input range from stakeholders, conclusions were drawn regarding training needs. An important part is the need to also integrate and consolidate the ILO and ICO environment, which has been broadly discussed in activities within the ENRIITC project. In general, in activities taken within Deliverable 3.3 equal representation of ILOs and ICOs were ensured. In the document, we describe proposals for training and joint activities, which include:

- Recommended training for ICOs towards improved industry outreach
- Recommended training of ILOs towards improved industry outreach
- Platform for training and knowledge exchange between ILOs and ICOs

3. Analysis of ILO/ICO training requirements and opportunities

3.1 Training of ICOs

Input from ENRIITC survey D2.1

The analysis of data from the ENRIITC survey of RIs and ICOs collected in Deliverable 2.1 "ENRIITC Report on the Mapping of Industry as RI-supplier and RI-user" identified areas where ICOs highlighted

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the role of trainings in the development of the ecosystem of companies collaborating with Research Infrastructures.

D2.1 highlight on industry outreach concluded that there is a good correlation between the services offered by the RIs and the request from industry (see Fig. 1 below). The most popular services offered to the industry are: access to facilities, instruments, and testing (67% of RIs); access to data; modelling (49% of RIs); and access to specialised training (49% of RIs).

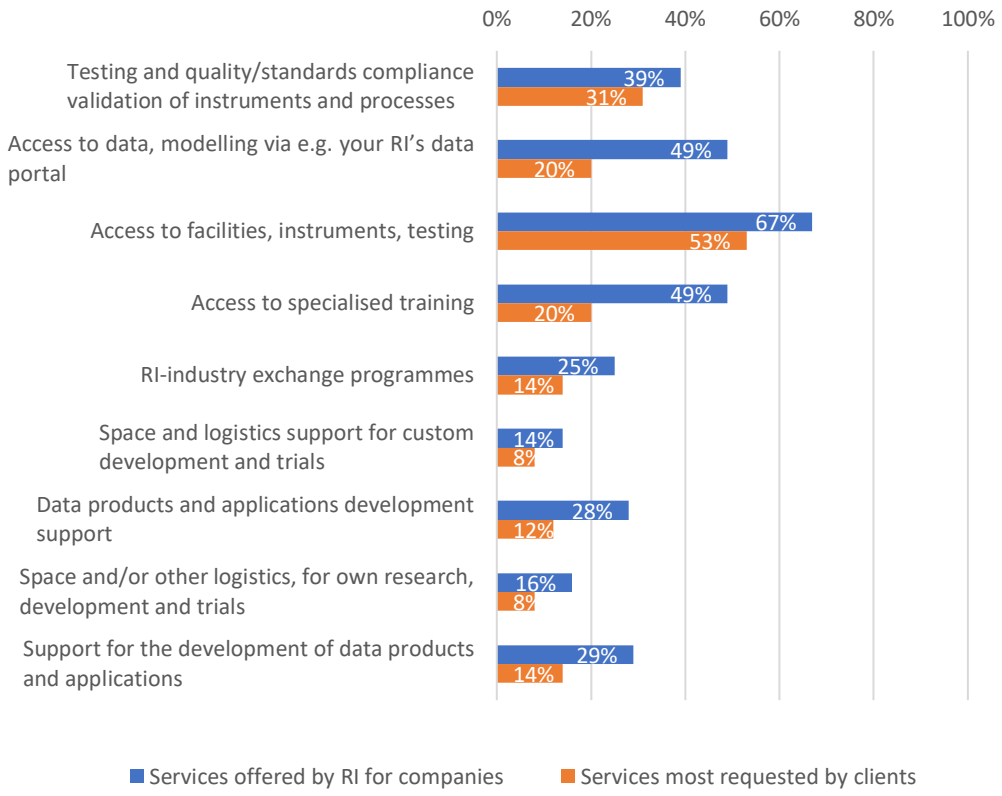

Figure 1: RI service offer vs. services most requested by industry clients

It also came out that RIs which employ an ICO more often offer access to specialised training (58% vs. 30%). Single-sited RIs also identify more entities they work with to engage with industry and establish more industry contracts.

When discussing the ICO role and which training requirements are needed, it should be noted that there are differences and similarities between single-sited and distributed RIs. Both types of RI have:

- an active programme of joint technology innovation pilots involving the industry (33% vs. 27%);
- a central Innovation Hub/Service offering industry-cooperation information, support, tools, and training to RI distributed facilities/nodes (33% vs. 27%).

Whereas services that are offered more by distributed RIs include:

- Testing and quality/standards compliance validation of instruments and processes (42% vs. 33%);

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- Access to specialised training (54% vs. 39%).

Single-sited RIs more often than distributed RIs offer:

- RI-industry exchange programmes (39% vs. 18%);
- Space and logistics support for custom development and trials (22% vs. 9%).

It is worth adding that clients of distributed RIs more often request access to specialised trainings (24%), than clients of single-sited RIs (11%).

Input from the ICO questionnaire

To supplement the broad survey responses, a set of 18 questions focusing on the ICO role and training were submitted to a subset of ICOs (see Appendix 1). Thirteen answers were received from European organisations covering both the SSH and STEM areas, both large, mid and small scale RIs and both distributed and single-site RIs.

The answers are presented in Appendix 2.

One initial observation point is that the term 'ICO' is not yet recognised as the one embodying what is in the definition given by the European Commission and used in the call text of ENRIITC. Stronger communication is needed to develop a common taxonomy and vocabulary to facilitate the birth of a functional language in the field.

As seen in question 2 (Q2) of the survey, about one-third of the interviewees are new (1–3 years of experience in the function) and 54% have more than eight years of experience in the role. That is a quite remarkable span, and the very different level of experience must be taken into consideration when designing the training path for ICOs.

But going deeper in the survey's results, we present here the most remarkable outcomes relating to the ICO job function. The question Q4, "Do you feel you have all the needed skills to work efficiently and effectively as an ICO?" (Q4, Appendix 2) reveal the extensive need for training for the personnel in this role. More than half of the respondents do not feel they currently have the skills to work efficiently as ICOs. This is a key question which draw a picture of the personnel currently acting as an ICO as not well prepared to carry out the activities expected.

In Q6, the respondents responded to which skills they needed to develop further. The answers are grouped and inserted below:

- Understanding the market needs (also for data), translating RI research and services to value for industrial customers (value proposition),
- technology and knowledge transfer, patent strategy and IP,
- working with customers (e.g. identifying contact persons, outreach and marketing, acquiring customers/sales, negotiations, collaboration models),
- spin-offs creation,
- communications (design company targeted landing page on web, visibility on SoMe, participating in the right events).

In question Q10, about two-thirds of the interviewees answered that their organisation does not provide training for ICOs. This underlines the need for a clear strategy of training ICOs together with

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the identification of the organisations able to provide the necessary training courses (RIs, EIT, national organisations, etc.). To take full advantage of the ICO function, a solution must be found to ensure that ICOs receive appropriate high-quality training.

It is considered more positive that about two-thirds of the interviewees confirm to have a clear set of goals to be reached during their activities (Q11). This means that RIs have a vision in most cases of what must be achieved and what are the KPIs in the process.

From the answers received in response to the question Q7 "Are you in charge of both the upstream and downstream side of the procurement process?" it emerges that about two-thirds of the interviewees do not cover the two sides of the process. That is, in our opinion, good news because it implies that a wider team is handling the relationship with the industry, meaning once again acknowledgement for the relevance of the connection with industry. But this point will be further developed in the next chapter.

Question 12 asks: "Are you also in charge of the co-development and technology transfer activity?" shows that the personnel currently involved in building and managing relationships with industry have also been charged strongly with co-development and technology transfer activity. In our opinion, this is truly good news and shows that RIs are already focused on enhancing the socio-economic impact by being drivers of innovation as requested by the European Commission and ESFRI.

When we asked, "What kind of training have you already participated in during your carrier?" (Q13) the interviewees had mainly joined training classes about communication, soft skills/negotiations, funds scouting, and IPR management.

In response to the question "Which training would you like to participate in?" (Q14) The most requested training courses are: how to obtain funding, how to foster international collaboration, how to manage intellectual property rights, and how to develop soft skills (i.e., negotiations, presentation of the offer). It is interesting to compare Q13 and Q14 and underline that even though most of the interviewees declare that they attended courses to develop soft skills useful for the role, they request more training opportunities in this area. The answers highlight that courses on international collaboration and fund raising are felt as important and not provided at European level at the moment.

The full list of responses may be found in Appendix 2.

Regarding the question "Would you like to participate in knowledge exchange meetings with other ICOs from other RIs?" a huge majority of respondents is interested in knowledge exchange meetings with other ICOs. This underlines the need to develop a common platform between ICOs to meet for exchanges of lesson learned and best practices.

The answers to the question 16 "Does your organisation have a strategy and an annual plan to engage the Industry?" match with question 11. Most of the RIs represented in the poll have defined goals and KPIs for ICOs, and the annual plan takes into account these metrics to formulate a consistent plan and strategy able to formalize the structure of the actions at least on an annual basis.

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Input from ENRIITCyourcoffee

The ENRIITCyourcoffee was invented by the ENRIITC project as a light way to engage the community in discussions on particular topics. An event was held on April 1st, 2021 to discuss "Training Challenges and Opportunities for Industry Contact Officers."

The notes from the session are presented in Appendix 5.

One important point from the session is that the RIs operate very differently needs across sectors and, especially, between the SSH and STEM areas. This will of course mean that the different needs in terms of ICO training must be considered, and no one strategy will fit all RIs. The discussions also highlighted the importance of putting in place mechanisms to secure a closer collaboration among the ICOs at the European level. In this respect, a platform was proposed for establishing a permanent network supervised by a central hub to facilitate ongoing dialogue and knowledge exchange among the ICOs. This is detailed in D3.1.

3.2 Training for ILOs

Input from ENRIITC survey D2.1

Turning to the supplier industry, in the ENRIITC survey, ILOs were asked to suggest KPIs that could help evaluate the impact of their work. In their opinion, the most important KPI (68% of the respondents) concerned the organisation of brokerage events (Fig. 2). Therefore, ILOs should seek training in communication and facilitating meetings, as well as in the use of digital tools for planning 1:1 meetings.

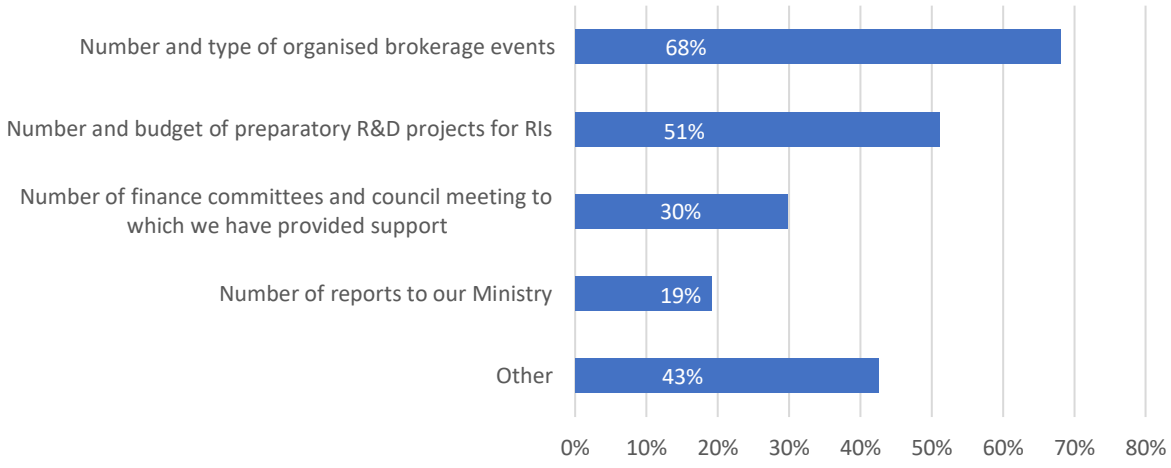

Figure 2: ILOs Suggestions for KPIs that could help evaluate the impact of ILO services (multiple choice).

Input from ILO questionnaire

A questionnaire focusing on training and industry outreach was distributed in May 2021 to a group of ILOs from different countries and operating for Big Science organisations such as CERN, ITER, ESS, and ESO. The survey included questions about the trainings already done and the technological and business background of each person. That attitude helped to identify the level of current knowledge.

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A total of 18 survey answers were received, where ILOs shared their insights concerning training needs. Also, they indicated in which areas they still need support, and which training courses they have already attended. The questionnaire showed the need to both gain the business and technical knowledge, but also to improve the so-called 'soft skills,' including e.g. political and social skills.

The questions from the survey are listed in Appendix 3.

The following replies were received. They are published in aggregate form:

1. How many years have you acted in the role of ILO?
    - Two respondents serve the ILO role for less than one year,
    - Three of them from 1.5 to 2 years,
    - The majority (>50%) between 5–8 years, 30% (6–10 years), and
    - Two over 10 years.

2. Do you have other roles which supports your ILO work? (Please specify with key words)
   50% of respondents also held supporting roles and listed the following roles:
    - Technology transfer delegate, innovation consultant, export consultant, also being a KT delegate for CERN;
    - Playing the role of ILO simultaneously in other big science facilities like ESS, F4E, and ESRF;
    - Involvement in the H2020 Research Infrastructures programme;
    - Involvement in National Business Development Agencies and Universities;
    - Playing a role as a supplier network coordinator, project manager, and innovation responsible person;
    - Coordinating industrial contact and knowledge transfer.

3. What best describes your background: business, science, or technology?
    - Most of the ILOs (72%) have a background in science and technology;
    - 17% have a background in business;
    - 11 % have a background both in business and technology.

4. Does your organisation provide training to help you operate as an ILO?
    - Very significantly, most of the ILOs (80%) have not received any specific training.

5. Do you have a specific set of goals and milestones to achieve in your work as ILO?
    - 22% indicated that they do not have set of goals or that this is not specific.

If YES, please describe the primary goals and milestones.
Among the goals and milestones the respondents indicated (for all answers, please see Appendix 4):

- Maximising the number of offers from a country for calls for tender;
- Achieve balanced industrial return for the country, regular reporting;
- Organise events with big science.

6. Which skills do you need to develop? (Insert key words)

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To help guide the ILO training programmes, the ILOs were also asked to identify the most relevant skills needed to perform their functions. The most dominant skills were communication and business know-how. This may be caused by the fact that most ILOs indicated technology and science as a professional background. Twenty-two percent indicated that they do not have any special needs.

A series of questions furthermore detailed the need for training:

1. What kind of training have you already participated in?
ILOs indicated trainings they received although some of them highlighted that no external training sessions followed during their ILO mandate. ILOs also indicated that they receive trainings on tenders in the Big Science facilities (like CERN ILO training, etc.). It also seems that the ministries rely on the specific experience of selected ILOs (good knowledge of related industries, experience in business).

2. Which trainings would you like to participate in? (multiple choices possible) – and which of the trainings you selected you consider to be most useful? Rank them 1) Very important; 2) Important; 3) Less important.

Most ILOs see the necessity to attend training courses on one or more of the following topics (listed in the rank of the importance – the full list is seen in Fig. 3):

- procurement and tenders,
- promotion of tenders and technologies from the RI,
- organisation of brokerage events,
- communication (not specific for promotion of tenders and technologies).

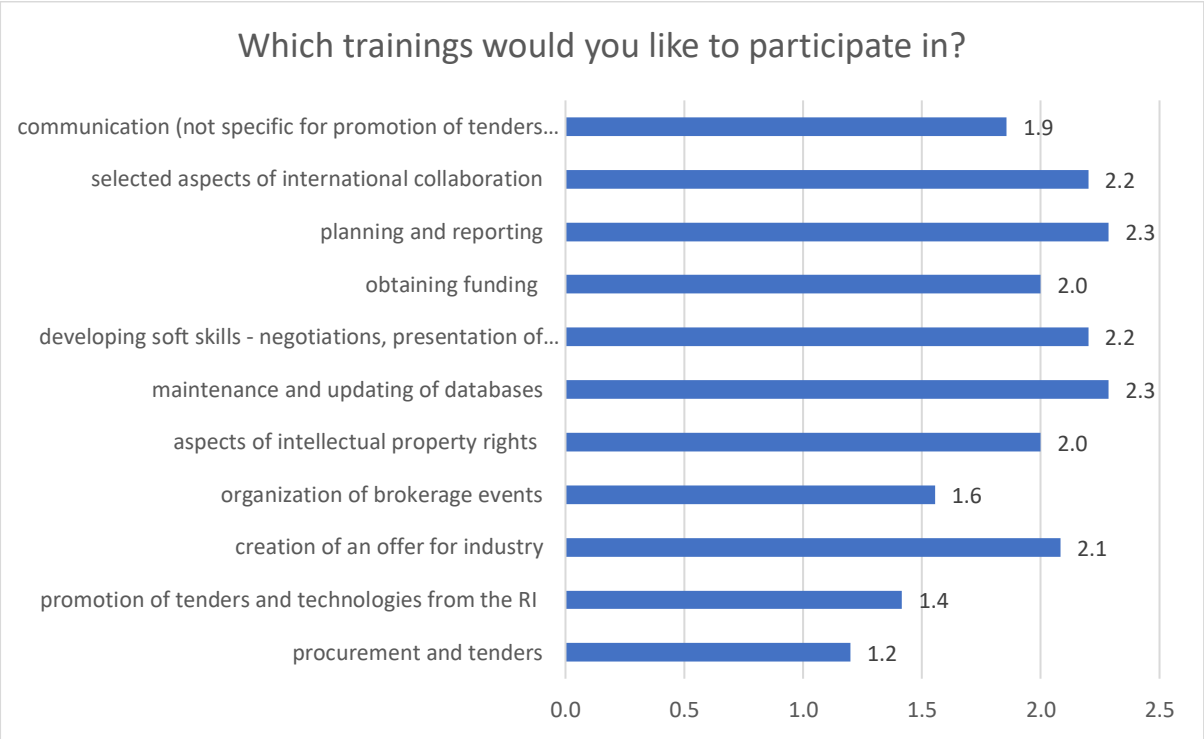

Figure 3: Which trainings would you like to participate in?

Finally, a series of questions were asked concerning knowledge exchange:

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3. Would you like to participate in knowledge exchange meetings with other ILOs?
Most of the ILOs (over 94%) indicated that they are interested in the knowledge exchange meetings.

4. Would you like to participate in knowledge exchange meetings between companies?
Most of the ILOs simply answered "yes" to that question. Thirty-three percent of all ILOs do not see the necessity to participate in the exchange meetings between companies

5. Please suggest other knowledge exchange activities you find relevant.
Among other knowledge exchange activities ILOs indicated (all answer are found in Appendix 4):

- knowledge exchange between RI and companies;
- having an understanding/appreciation of the technologies involved, the areas of difficulty and the future developments needed;
- help to make industry connections.

Input from ENRIITCyourcoffee

As was the case for ICOs, the ENRIITCyourcoffee concept was used to gauge the attitude from the community on "Training Challenges and Opportunities for Industry Liaisons Officers."

The full set of notes is reported in Appendix 6.

3.3. Input from Focus Groups

A final tool used to obtain input from the persons involved was the ENRIITC Focus Groups that were established as more detailed fora for in-depth discussions of particular topics. Training and industry outreach was discussed in several of the groups. The main results on the topic from Focus Groups 1 and 3 are presented below:

Results from Focus Group 1

ENRIITC Focus Group #1 was established to discuss what ILOs and ICOs can learn from each other and how they are trained to fulfil their respective objectives, trying to analyze potential collaboration in future training programmes. The FG#1 has counted on the participation of 15 people with a good balance of seven ILOs and eight ICOs. The full report can be found in Appendix 5.

Most of the participants think that the relationship between ILOs and ICOs offers room for improvement. The collaboration needs to be improved, among others in the area of common training activities, and establishing ILOs networks at the national and international levels.

We identified areas where training will be very much appreciated such as technology transfer, procurement rules, internal RI communication, interaction with industry, soft skills, and finally technical knowledge. Participants consider important developing interpersonal skills, business culture or brokerage events. Finally, it was recommended to create a network of ILOs and ICOs for exchanging best practices and analysing common goals.

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Other recommendations given by FG1 includes:

- ILO and ICO common training days;
- Training activities focused on the ILOs side, according to the general need of ILOs;
- organised by PERIIA;
- Common ILO and ICO training;
- updating the "Procurement Handbook" edited under the umbrella of BSBF.

Results from Focus Group 3

Focus Group#3 "Outreach strategies for Research Infrastructures" was oriented towards discussing outreach strategies towards both industry, policy stakeholders, and financing bodies at national and European levels with the purpose of raising awareness of the social benefit of RIs. The report from FG#3 is found in Appendix 6.

The discussed topics included:

- Impact of communication of strategies and outcomes of ENRIITC project;
- Engagement with national/EU policy stakeholders;
- The link between RIs and the mission-oriented structure of EUs innovation efforts, including EU funding mechanisms and ambitions;
- FG#3 could be to have ENRIITC/Big Science represented at one policy-oriented high-level EU conference and gave EU Industry Days 2021[1];
- Brokerage Events;
- Best practices and challenges for communicating RI/Industry collaboration.

[1] https://ec.europa.eu/info/policies/business-and-industry/eu-industry-days_en

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4. Discussion and recommendations for ILO and ICO training

Multi-talented mediators of innovation are required in order to efficiently deal with the more and more complex societal challenges Europe is facing, from the consequences of the next climate changes, like geohazards and pandemics, to the threats to the European identity, like Brexit.

Once again, the complexity and the novelty of the ILO and ICO role emerge as barriers to having a coherent landscape of skilled and experienced persons that are central to harvesting the innovation from RIs. A strong message emerges: Europe needs a common path of training for ICOs and ILOs to have a common language, one that is a harbinger of a new community of practice, and common procedures in order to activate economies of scale and scope that Europe has been waiting for a long time in the field.

As stated in the introduction of the ESFRI report on innovation:

> - the industrial involvement in the conceptual design phase and more generally in the construction of RIs: need to develop the upstream business model (*industry as a supplier*);
> - what *Research* performed in the RIs (as distinct from *Development and Testing*) can bring to industrial R&D and innovation; that is a *hybrid* use of research could be promoted to develop downstream business models (*industry as a user*);
>
> *ESFRI Working Group on Innovation Report March 2016*

The viewpoints and input from the community presented in the previous chapter underlines that there is a need for more focus on the job description of ILOs and ICOs – and how to support the function with training and exchange of best practices for industry outreach. A piece of good news from the survey in ENRIITC D2.1, is that 61% of RIs have a strategy for collaboration with companies. Conversely, only 20% of the RIs have an active industry advisory committee, and this increases the risk of jeopardizing the relationships with industrial partners, since only a low level of industry interaction is maintained.

For the purposes of presenting recommendations, the most frequently repeated responses were selected, some of them concerning both ILOs and ICOs, some with only one of the groups.

4.1 Recommendations for training of ICOs

The analysis presented in the previous chapters highlighted the needs for training targeting the development of both soft and hard skills. Considering the skills to be developed or improved, only half of the interviewed ICOs in our survey deem that they have already developed sufficiently the skills that they need, and one-third of them have not received any useful training to deal with the role. This

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suggests the urgent need to put in place a complete offer of training paths to fill the gap as part of a complex and complete network to support the work of the ICOs.

The table below contains a list of recommended skills to consider for the training of ICOs. In the list, priority has been given to the responses coming from the survey and from the past experience of the ENRIITC consortium.

Soft skills	Hard skills
•Communication (including storytelling, writing reports, language, etc.) •Leadership (facilitation, negotiation, conflict management, decision making, etc.) •Critical thinking (problem-solving, troubleshooting, thinking outside the box, etc.) •Creativity (open-mindedness, lateral thinking, brainstorming, vertical thinking) •Teamwork (empathy, interpersonal skills, social skills, team building, etc.) •Management (time, human resources, risk, costs, projects) •Integrity (work ethic, motivation, perseverance, reliability, result-oriented, etc.) •Positive attitude (courtesy, cooperation, enthusiasm, patience, etc.) •Marketing (development and presentation of the offer)	•Fundraising (local, regional, national and European levels) •International networking and collaboration skills targeting new industry business relations •Technical and policy insight into the RI and, in particular, tools on how to analyse, compile, and deploy technology transfer and licensing agreements •Knowledge about industry collaboration models and formation of new industry partnerships, spin-offs/start-ups •Event organisation (seminars, meetings, hackathons) with industry to obtain input to the RI industry strategy (see D3.4) •Communication (in collaboration with the RI Communication Officer) for maintaining an RI Communication Plan targeting industry and writing annual reports with engaging innovation case studies to be showcased by the RI •IPR and GDPR data management (in collaboration with the RI Data Manager) to be able to handle confidentiality and access issues with industry

In addition, as reported in the ENRIITC D2.1, some 47% of the surveyed RIs employ dedicated ICOs or equivalent staff to oversee engagement with industry (29% employ full-time staff, 18% part-time). This relatively low percentage is an important finding, although RIs lacking a central ICO may work through equivalent positions located in the decentralised structures. What should, however, be highlighted is that, firstly the number of full-time staff may be quite low, and does not guarantee a long-term commitment and a constant effort in pursuing the goals. In all cases, the training path should include courses to strengthen soft skills and develop the hard ones in a continuous effort to keep update the ICOs expertise.

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4.2 Recommendations for training of ILOs:

ILOs have very different backgrounds and may be either government officials, researchers or staff in business-oriented positions. In fact, knowledge from all these sectors is relevant in order to fulfill the ILO-function. Despite of this complex mix of policy, science, and business, most ILOs (80% as reported in D2.1) have not received any special training. ILOs across Europe have made their own experiences of what works and learned from their predecessors (if possible). Thus, the ILO-function is performed very differently across Europe, and knowledge exchange has only begun with the formation of the PERIIA network a few years ago. Thus, both effort and opportunities are wasted from ILOs making their own errors and experiences and from missed opportunities for industry interactions.

When the community of ILOs are asked (see Appendix 4), most of them see the necessity to attend trainings. The top five areas where ILOs require training are (ranked by importance):

- Procurement and tenders,
- Organisation of brokerage events,
- Communication (not specific for promotion of tenders and technologies),
- Obtaining funding,
- Aspects of intellectual property rights.

Also quoting the survey (complete results are in Appendix 4), the ILOs identify that they need to develop the following skills:

- Business knowhow to be able to perform consultancy and support (in the field of tenders);
- Understanding rules and regulations at the RI, and have the ability to negotiate and train SMEs in the field of Big Science infrastructures;
- Communications;
- Management skills, organisational tools, legal aspects of contracts;
- Networking;
- Technology understanding related to specific RIs;
- Understanding of the entire RI eco-system;
- Understanding of the RI eco-system (including industry clusters) and industry collaboration and how they can be promoted via the EU funding system.

The topic of ILO training was also discussed in the ENRIITC Focus Groups, in particular FG1 and FG3 (see Appendices 7 and 8).

The Focus Groups participants had the following wish-list for ILO training:

- Technology transfer
- Procurement rules
- Internal RI communication
- Interaction with industry
- Soft skills
- Technical knowledge

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The participants also requested the specific training sessions listed below for new ILOs:

- Procurement rules
- Understanding of the innovation ecosystem
- How does an RI operate
- Improve technical knowledge in relevant fields
- Improve networking abilities (e.g. collaboration within networks such as PERIIA and ENRIITC)
- Usage of databases

Finally, the Focus Group participants found it useful to develop skills in the following categories: interpersonal skills, business culture and negotiation, organising brokerage events, lobbying, and marketing.

When combining the different sources of input, we propose the following list of soft and hard skills that must be considered when planning the training of ILOs:

Soft skills	Hard skills
•Communications, including internal RI communications •Management skills •Networking and collaboration skills	•Business knowhow to be able to perform consultancy and support on procurement and tenders •Understanding industry collaboration in the innovation eco-system and possibilities for EU funding •Organisation of brokerage events (see D3.4) and organisation tools (e.g. use of databases) •insight into the operations of the RI from both technical and policy perspective (including rules and regulations) •Industry collaborating models including Technology transfer processes •Negotiations, IPR and legal aspects of contracts

Brokerage events were indicated not only in Focus Group meetings or questionnaire answers but also in the ENRIITC survey. Please consult ENRIITC D3.4 “Practical Step-By-Step Guide for ILOs/ICOs to Organise Brokerage Events” for a thorough and practical guide on how to organise brokerage events.

In the survey, ILOs were asked to suggest KPIs that could help evaluate the impact of their work. In their opinion, the most important KPI (68% of the respondents) concerned the organisation of brokerage events. Therefore, ILOs should seek training in communication and facilitating meetings as well as in the use of digital tools for planning 1:1 meetings.

It should be noted that the funding situation and working approaches varies depending on the country where the ILO is working. Hence, it is important to provide a similar training offer, so that ILOs from different countries have similar competences and equal opportunities. A new platform for ILOs at the

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EU level to organise training will provide better homogeneity and coverage of fundamental training needs for all European countries. For further details, see D3.1 "Strategy to Exploit the Innovation Potential of RIs." The platform will secure an excellent quality management of the training process and the uniformity of notions, techniques, and procedures to be taught.

5. Strategy for training of ILOs and ICOs and outreach towards industry

The input from all sources (questionnaires, discussions, focus groups) reveal that there is a huge difference in the way ILOs and ICOs operate both from one RI to the other and from one country to another. There is no clear job description and, e.g., for ILOs, there is a discrepancy between the innovation opportunities seen by the ILOs and the KPI against which they are measured. This muddled landscape manifests itself as unbalance and unequal opportunities for industries from different regions and countries leaving a significant innovation potential underexplored.

Also stated from the appointed ILO and ICO persons themselves, there is an urgent need to define the roles, responsibilities, and KPIs related to these functions in order to enable them to engage with industry in an optimal way.

Given the international nature of the RIs and the commonalities across borders, a joint European strategy for training of ILOs and ICOs is required to unlock to innovation potential of RIs.

The strategy is condensed into three strategic bullets outlined below:

Strategic recommendation #1: The roles of ICOs and ILOs should be defined at a European level including the identification of Key Performance Indicators.

The profession of ILOs and ICOs is still undefined. Sometimes ILOs and ICOs act as international brokers, linking their national businesses with research infrastructures, collaborating on the European level platform, and in other cases they are under-resourced functions which are performed as a secondary job.

Chapter 4 of this report defines and discuss the skills associated with the ICO and ILO job functions. KPIs for ICOs and ILOs have been mapped in ENRIITC D2.3 "Analysis of performance indicators for ILOs/ICOs across countries and domains." This will be fully elaborated in ENRIITC D3.5 "Policy Recommendations for the Optimisation of ILO/ICO Performance" (due summer 2022).

Due to differences in the RI structure (e.g., distributed or single-site, PHYS, or SSH domain cluster, etc.), and national priorities towards e supplier industry, the ICO and ILO functions may vary in between facilities and countries. However, there is no generic difference between, e.g., an ILO operating in Italy or Denmark and the strategic guidelines offered from above are generally valid to consider for all.

Linked with the poor ILO/ICO job description is the lack of specialised training. This leads to the next strategic recommendation:

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Strategic recommendation #2: New and existing ILOs and ICOs must have access to pan-European training resources including: a) training of relevant skills, and b) specific technical training programmes for ILOs and ICOs.

As is evident from the previous chapters, the skillset and, thus, required training needs will be quite complex and divergent. An individual training plan should be developed in a dialogue between the individual ILO/ICO and the employer. The list of skills and attributes presented in the previous chapters should be used as a basis for this dialogue.

The training material and offer should be made available across Europe on a platform that can be accessed by ILOs and ICOs. This leads to the final strategic recommendation:

Strategic recommendation #3: Establish a pan-European HUB containing training resources, best practices, and success stories. The HUB will also operate as a meeting place for ILOs, ICOs, and ICOs/ILOs together.

The platform which is introduced in ENRIITC D3.1 should be a permanent network place and meeting point for ILOs and ICOs to enable fruitful exchanges and collaboration in all matters involving RIs, industry, and innovation.

In particular, the platform should contain training material (e.g., CERN ILO training programmes) and guidelines for ILOs and ICOs on how to fulfil their job function. The platform would also be a natural repository of the knowledge generated by ENRIITC and other European activities in this field. Finally, examples of successful industry collaborations and best practices may also be stored in the platform.

Having a permanent centralized platform for the network would avoid the dispersion of the knowledge and would guarantee a long-lasting supporting framework to exploit the innovation developed in RIs, and “Make Science Happen,” as said in the ESFRI report.

To assure successful achievements of the recommendations, adequate financial support should be envisaged to support the development and update of the training material, and the roll-out of the training programmes on a regular basis to ensure life-long learning and market needs updates. To ensure homogeneity of the gained skills and knowledge, a standard basis should be developed transnationally with the support of EU funds.

Provided sufficient funding for staffing can be found, the platform should also take on an active role in setting up collaborations between the ILOs and ICOs and exploiting the fact that each ILO and ICO are connected to many companies. This can be realised by:
- establishing a natural platform for exchange with a strong digital interaction interface;
- set up matchmaking tools;
- organizing events to develop the network between ILOs and ICOs (both separate and together).

The platform would be the natural place to discuss and develop a common vocabulary for creating a functional language in between ILOs and ICOs, and for establishing a clear set of goals for ILOs/ICOs.

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The preparation of common and standardised training and guidelines will result in homogenous training of ILOs, regardless of the country, and, thus, ensure that companies from different countries may be served on a similar level – in other words, levelling the playing field. In addition, thanks to joint training, ILOs and ICOs will have the opportunity to get to know each other. These personal links may enable to build joint consortia between international companies. It may also facilitate the creation of a joint offer by large corporations and small and medium-sized enterprises from different countries. The profession of an international innovation broker operating between the RI and industry will result in better information to the industry and better service. It will also help to promote the technology transfer from RIs to companies.

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Appendix 1: Questionnaire for ICOs

1. What is your job title?
2. How many years have you acted in the role of ICO?
3. What is your background? (specify till three disciplines)
4. Do you feel you have all the needed skills to work efficiently and effectively as an ICO?
5. How did you develop such a complex competence?
6. Which skills do you need to develop further? (Insert keywords)
7. Are you in charge of both the upstream and downstream side of the procurement process?
8. Do you have other roles in your organisation which support your work as an ICO? (Please specify the job roles, if any, or write NO)
9. If your Organisation is an ESFRI RI, which is the INFRA-EOSC-04-2018 project (SSHOC, PaNOSC, ENVRI-FAIR, EOSC-Life, ESCAPE) your RI is involved in?
10. Does your organisation provide training to help you work as an ICO?
11. Do you have a specific set of goals and milestones to achieve in your work as an ICO?
12. Are you also in charge of the co-development and technology transfer activity?
13. What kind of training have you already participated in during your carrier?
14. Which training would you like to participate in? (Rank them. 1) Very important; 2) Important; 3) Less important)
15. Would you like to participate in knowledge exchange meetings with other ICOs from other RIs?
16. Has your organisation a strategy and an annual plan to engage the Industry?
17. If your organisation is an ESFRI RI, is there any activity of best practices and lesson learned exchange about the ICO activities within the INFRA-EOSC-04-2018 project (SSHOC, PaNOSC, ENVRI-FAIR, EOSC-Life, ESCAPE) your RI is part of?
18. Please suggest other knowledge exchange activities you find relevant.

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Appendix 2: Responses to the questionnaire for ICOs

1. What is your job title? (13 responses)

- In CLARIN ERIC there are two people contributing to the ICO role: Training and Education Officer and External Relations Officer
- ILO
- Industrial Relations Officer
- Technology Transfer and Industrial Liaison Officer
- Industrial Liaison Office Director
- Head of Industrial Relations
- Industry Contact Officer
- Head of Industrial Liaison
- DARIAH integration officer
- Industrial Liaison Office
- Head of Industrial Liaison office
- Executive Director of CLARIN ERIC (so, I am not an ICO, but some of the work of an ICO is also on my plate). For the next question, I will answer as the tiny ICO roles I have had was the core of my work)
- Head of Business Development

2. How many years have you acted in the role of ICO?

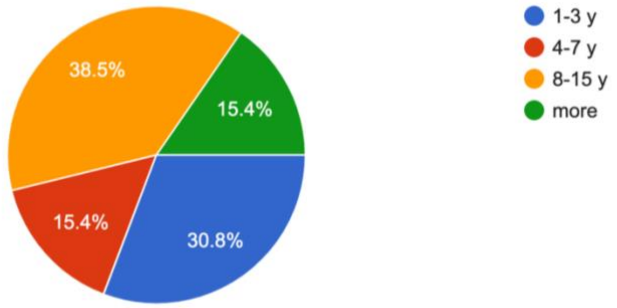

Figure 4 - How many years have you acted in the role of ICO?

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3. What is your background? (specify till three disciplines) (13 responses)

- Computer-Aided Translation, Linguistics & Literature
- Mechanical engineering
- Chemistry, Nanotechnology, Physics
- Industrial Chemistry, MBA
- PhD on Physics
- Chemical Engineer, PhD TEM/nanotech, 8 years industry "Programme Manager - Technology Demonstration"
- PhD, Physics, MBA: Innovation and Data Analysis, MSc Advanced Materials and Nanotechnology
- Chemistry, crystallography
- Arts and Humanities, Social Sciences
- Executive MBA, Aerospace Engineer, Innovation expert
- Degree in Physics
- Linguistics
- Natural Language Processing
- Chemistry, Molecular Biophysics, RI Scientist

4. Do you feel you have all the needed skills to work efficiently and effectively as an ICO?

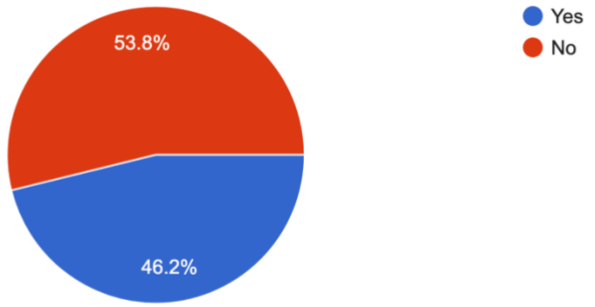

Figure 5 - Do you feel you have all the needed skills to work efficiently and effectively as an ICO?

5. How did you develop such a complex competence?

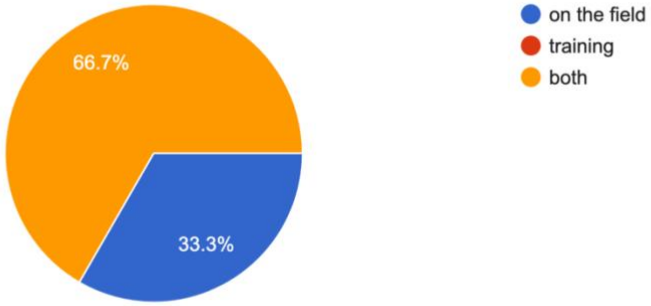

Figure 6 - How did you develop such a complex competence?

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6. Which skills do you need to develop further? (Insert keywords)

- Understand the market needs for the data industry; How to identify the right contact persons in the industry (diversified SMEs, large companies, organisations); Understand the IPR & GDPR issues for open data used in a commercial context; How to develop an effective model for collaboration between representatives in the national nodes that play a role in the ICO role for a distributed RI; How to set up communication & events tailored for commercial parties; How to get access to relevant event calendars where commercial parties would be attending.
- Acquisition, knowledge transfer.
- Technology Transfer, spin-offs creation, IP.
- Sales, outreach, negotiations, networking, advertising, customer acquisition, legal.
- Being able to translate the value created by SSH research to industry values.
- How to identify at which level to find the right people for the kind of exchange an RI is interested in; How to keep track of useful contacts; How to shape a section on our website that may attract companies; How to use social media for becoming visible for companies; How to be able to predict which events are relevant; How to be linked to other ICOs.
- Patent strategy/valorisation.

7. Are you in charge of both the upstream and downstream side of the procurement process?

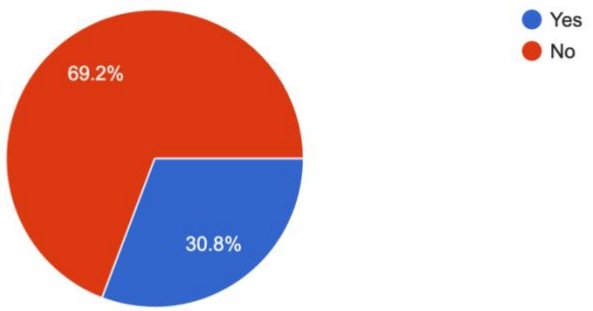

Figure 7 - Are you in charge of both the upstream and downstream side of the procurement process?

8. Do you have other roles in your organisation which support your work as an ICO? (Please specify the job roles, if any, or write no)

- No.
- As a Training and Education Officer, I have the right skills to organise training for ICO colleagues and industry partners. As an External Relations Officer, I have the necessary skills to establish collaboration with external partners, including EU institutions and industry.

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- I am not specifically in the procurement, I am in co-development and technology transfer
- Management Board member
- I have a pretty broad area of responsibility covering External Relations with industry, academia, institute, financers, etc.
- Legal team.
- A community-manager-like role.
- In-kind Contribution Manager, Contract Manager of Services.
- External Relations Officer (central level) Secretariat staff (central level) We are a distributed RI, and many national consortia have stronger or weaker links with industry that together could be a good starting point for setting up collaborative links. NB. Note that the previous question should have 'not applicable' as an alternative. In our field procurement does not play a role at all. Potential collaboration with industry would mainly be in the model where the industry is using our open data and tools.
- Legal, finance, beamline scientists, directors, engineers.

9. If your Organisation is an ESFRI RI, which is the INFRA-EOSC-04-2018 project (SSHOC, PaNOSC, ENVRI-FAIR, EOSC-Life, ESCAPE) your RI is involved in?

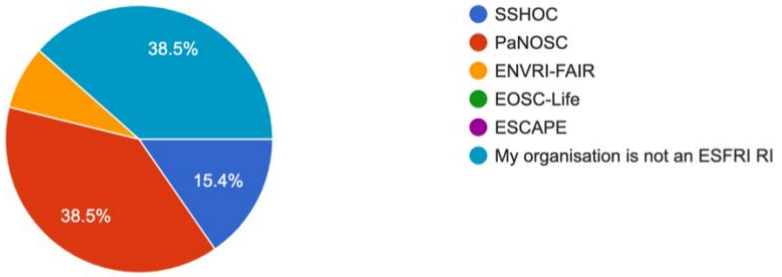

Figure 8 - If your Organisation is an ESFRI RI, which is the INFRA-EOSC-04-2018 project?

10. Does your organisation provide training to help you work as an ICO?

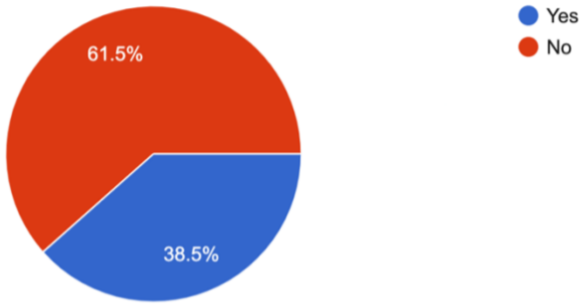

Figure 9 - Does your organisation provide training to help you work as an ICO?

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Q11.Do you have a specific set of goals and milestones to achieve in your work as an ICO?

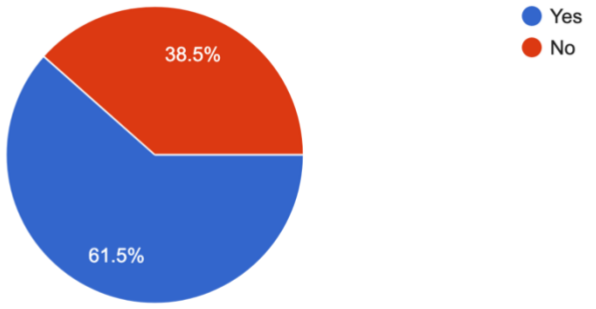

Figure 10 - Do you have a specific set of goals and milestones to achieve in your work as an ICO?

Q12.Are you also in charge of the co-development and technology transfer activity?

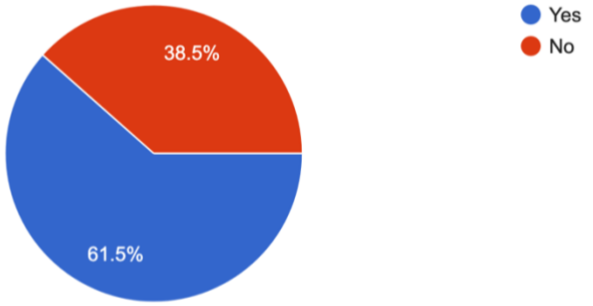

Figure 11 - Are you also in charge of the co-development and technology transfer activity?

Q13.What kind of training have you already participated in during your career?

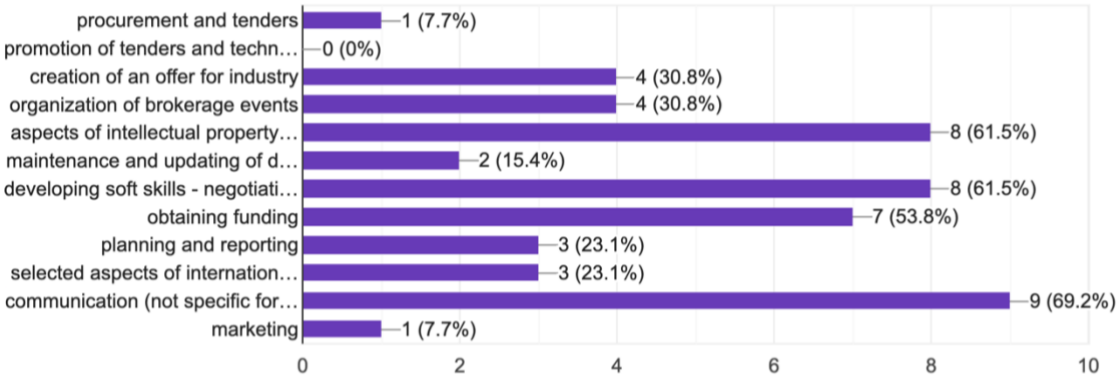

Figure 12 - What kind of training have you already participated in during your career?

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Q14. Which training would you like to participate in? (Rank them.1) Very important; 2) Important; 3) Less important

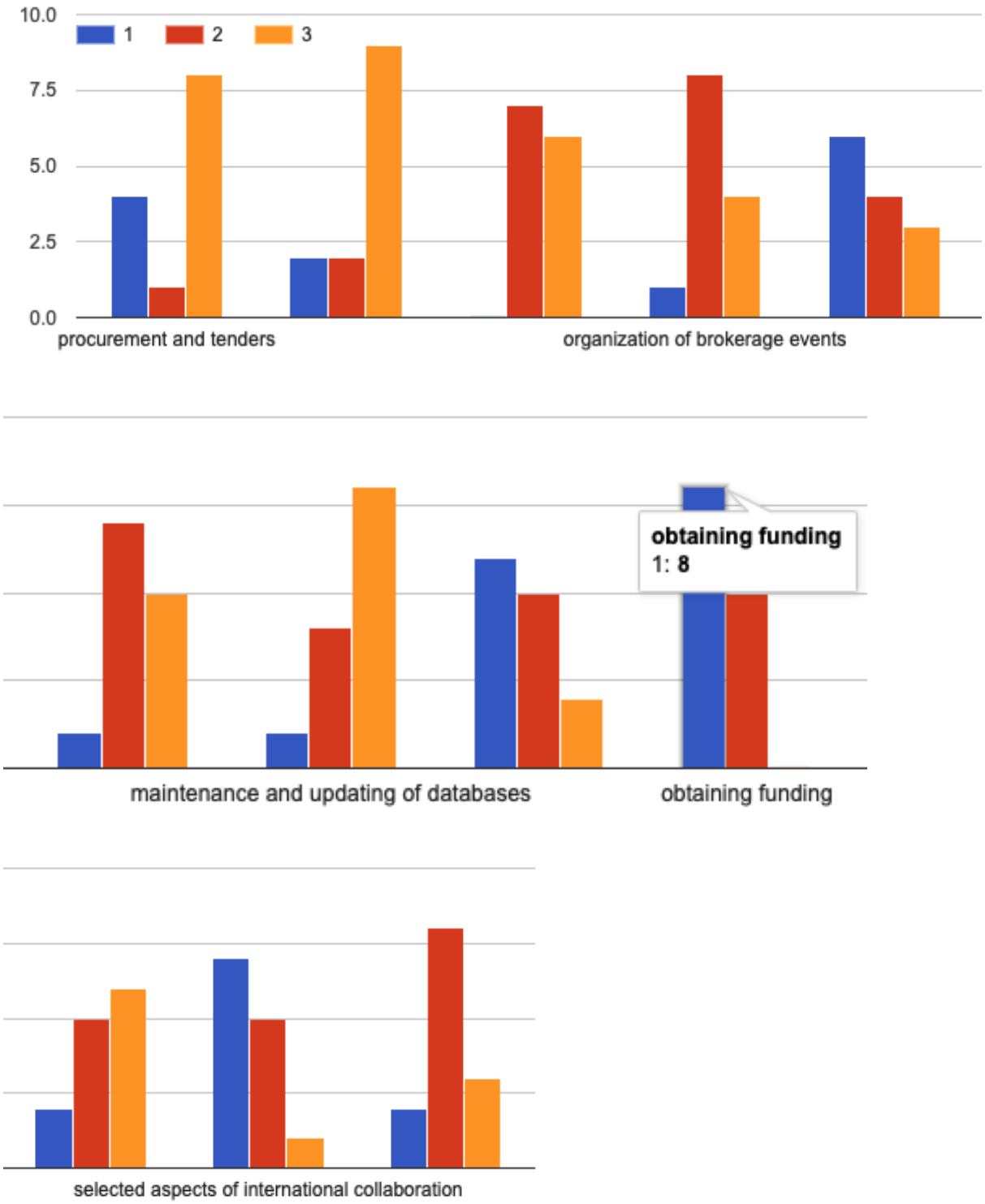

Figure 13 - Which training would you like to participate in?

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Q15.Would you like to participate in knowledge exchange meetings with other ICOs from other RIs?

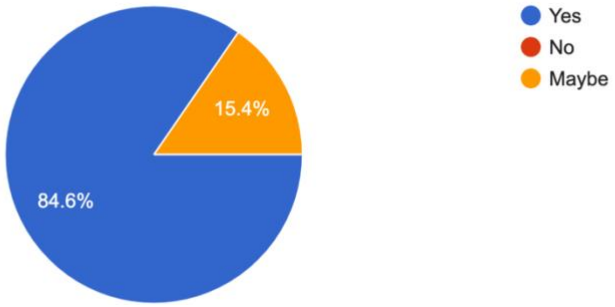

Figure 14 - Would you like to participate in knowledge exchange meetings with other ICOs from other RIs?

Q16. Does your organisation have a strategy and an annual plan to engage the industry?

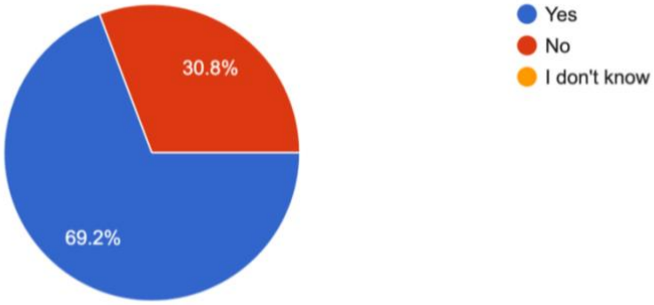

Figure 15 - Does your organisation have a strategy and an annual plan to engage the industry?

Q17. If your organisation is an ESFRI RI, is there any activity of best practices and lesson learned exchange about the ICO activities within the INFRA-EOSC-04-2018 project (SSHOC, PaNOSC, ENVRI-FAIR, EOSC-Life, ESCAPE) your RI is part of?

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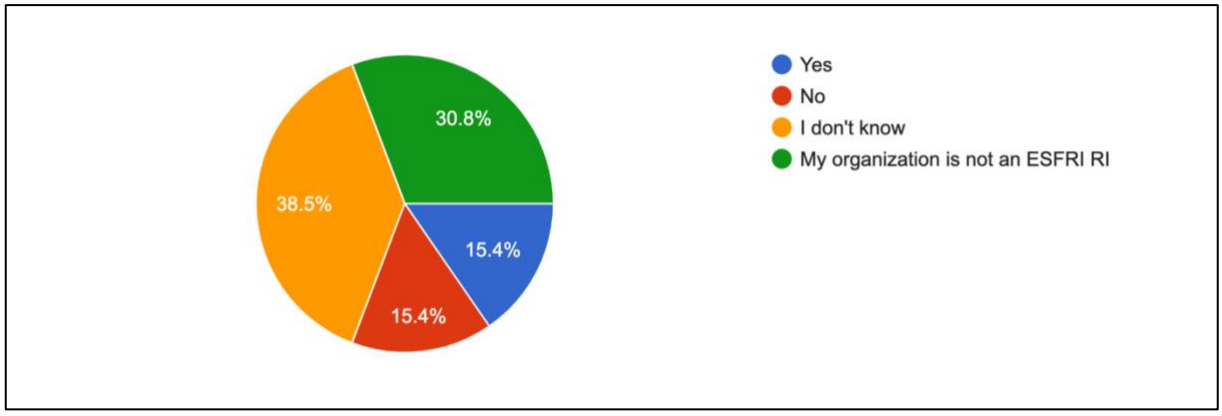

Figure 4 - If your organisation is an ESFRI RI, is there any activity of best practices and lesson learned exchange about the ICO activities within the INFRA-EOSC-04-2018 project?

Q18. Please suggest other knowledge exchange activities you find relevant.

- Knowledge exchange within the SSH cluster with all the people who have one or more aspects of the ICO role in their tasks (both the national nodes and the central organisations);
- Tools to reach new industry;
- Content sharing, like industrial user case stories;
- Study visits, networking with industry;
- Technology Transfer, industrial user and industrial collaboration are different topic but in practice they have in common a pool of companies in the industrial ecosystem around the facility. The three topics should be managed together to have an actual impact.

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Appendix 3: Questionnaire for ILOs

General

1. How many years have you acted in the role of ILO?
2. Do you have other roles which supports your ILO work? (Please specify with key words)
3. What best describes your background: business, science or technology?
4. Does your organisation provide training to help you operate as an ILO?
   - If "Yes" does the training itself has goals and milestones?
5. Do you have a specific set of goals and milestones to achieve in your work as ILO?
   - If YES please describe the primary goals and milestones.
6. Which skills do you need to develop? (Insert key words)

   Business consultancy in the field of tenders

   Negotiations and training for SME in the field of Big Science infrastructures

Training

1. What kind of training have you already participated in (please insert "X")

   a) procurement and tenders

   b) promotion of tenders and technologies from the RI

   c) creation of an offer for industry

   d) organisation of brokerage events

   e) aspects of intellectual property rights

   f) maintenance and updating of databases

   g) developing soft skills – negotiations, presentation of the offer

   h) obtaining funding

   j) planning and reporting

   k) selected aspects of international collaboration

   l) communication (not specific for promotion of tenders and technologies)

   m) other (please specify with key words)

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2. Which trainings would you like to participate in? (multiple choices possible) – and which of the trainings you selected you consider to be most useful? Rank them 1) Very important; 2) Important; 3) Less important

a) procurement and tenders
b) promotion of tenders and technologies from the RI
c) creation of an offer for industry
d) organisation of brokerage events
e) aspects of intellectual property rights
f) maintenance and updating of databases
g) developing soft skills – negotiations, presentation of the offer
h) obtaining funding
j) planning and reporting
k) selected aspects of international collaboration
l) communication (not specific for promotion of tenders and technologies)
m) other ……..(please specify with key words)

Knowledge exchange

1. Would you like to participate in knowledge exchange meetings with other ILOs?
2. Would you like to participate in knowledge exchange meetings between companies?
3. Please suggest other knowledge exchange activities you find relevant.

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Appendix 4: Responses to questionnaire for ILOs

Q1. How many years have you acted in the role of ILO?

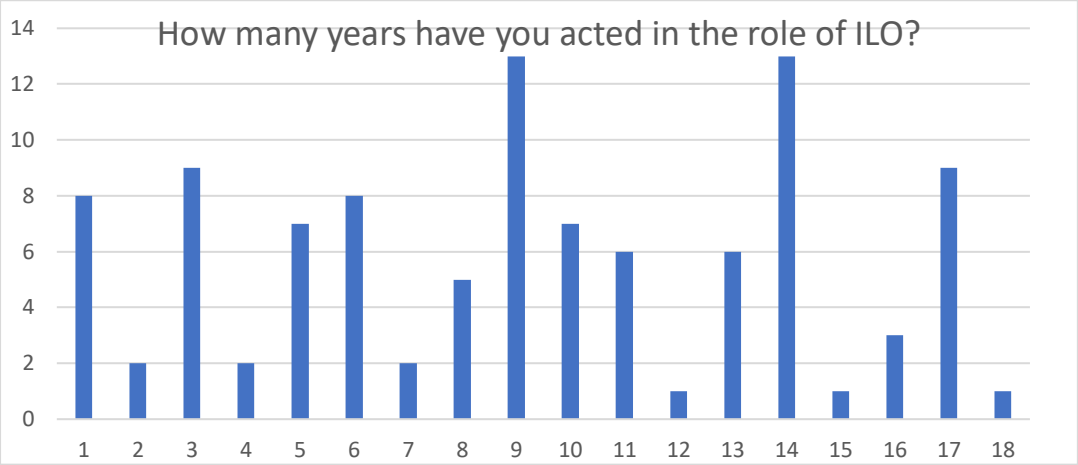

Figure 17 How many years have you acted in the role of ILO?

Q2. Do you have other roles which supports your ILO work? (Please specify with key words)

50% of respondents also held supporting roles and listed the following roles:

- Technology transfer delegate, Innovation consultant, Export consultant, also being KT delegate for CERN;
- Playing the role of ILO simultaneously in other big science facilities like ESS, F4E, and ESRF;
- Involvement in the H2020 Research Infrastructures programme;
- Involvement in National Business Development Agencies and Universities;
- Playing a role as a supplier network coordinator, project manager and innovation responsible person;
- Coordinating industrial contact and Knowledge transfer.

Q3. What best describes your background: business, science or technology?

Most of the ILOs (72 %) have a background in science and technology.

17% have a background in business,

11% have a background both in business and technology.

Some of the ILOs answered this question in a more detailed way by adding as follows:

- a broad background which includes business, technology development,
- supplier into big science,
- developer inside big science,
- have run numerous technology collaborations between industry and big science,
- cluster collaboration experience.

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Q4. Does your organisation provide training to help you operate as an ILO?

Very significantly, most of the ILOs (80%) have not received any specific training. Two persons indicated that the employing organisation provides training opportunities, but not specifically for the ILO function. One ILO highlighted that his predecessor helped him to get started. Some ILOs indicated that the training at the RI was received and collaboration with other national ILOs was indicated as the important factor.

Q5. Do you have a specific set of goals and milestones to achieve in your work as ILO?

- 22% indicated that they do not have set of goals or this is not specific;
- If YES please describe the primary goals and milestones.

Among the goals and milestones the respondents indicated:

- Maximizing the number of offers from a country for calls for tender;
- Achieve a balanced industrial return for the country, regular reporting;
- Signing a certain number of Partnership agreements;
- Ensuring that a certain number of companies from a country participate in European public procurement or European funded projects;
- Ensuring that for each important tender national industry should at least submit one offer if the content fits with available experience;
- Securing business for the industry, increased awareness of opportunities for SMEs, helping Big Science project to succeed;
- Establishing and maintaining a network of research institutes and national businesses whose services, products or activities target the RIs;
- Organise events with big science;
- Foster innovation collaborations;
- Handle specific tasks and routines such as registration of tenders, preparation of overviews of tenders, match making with specific companies based on supplier database, tracking of tenders and match-making.

ILOs were also asked about Indicators for activities, which are divided into four areas focusing on:

1) Amount of offers from companies;
2) Quality of offers from companies;
3) Demand from RI on offers from companies;
4) Framework conditions for offers from companies.

Q6. Which skills do you need to develop? (Insert key words)

To help guide the ILO training programmes, the ILOs were also asked to identify the most relevant skills needed to perform their functions

The answers were as follows:

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- Business consultancy in the field of tenders;
- Negotiations and training for SME in the field of Big Science infrastructures;
- Communications, business know-how;
- Management skills, organisational tools, legal aspects of contracts;
- Political awareness;
- Knowledge of industry;
- Networking;
- How to convey, in an efficient way, tenders to companies and/or specific industry sectors;
- Understanding of rules and regulations for tenders at specific RIs;
- Technology understanding related to specific RIs;
- Understanding of the entire RI eco-system;
- Understanding of the RI eco-system and industry collaboration and how they can be promoted via the EU funding system;
- Understanding of how cluster collaborations can be promoted via the EU funding system.

Training

Q1. What kind of training have you already participated in (please insert "X")

ILOs indicated trainings they received although some of them highlighted that no external training sessions followed during their ILO mandate. ILOs also indicated that they receive trainings on tenders in the Big Science facilities (like CERN ILO training, etc.). It also seems that the ministries rely on the specific experience of selected ILOs (good knowledge of related industries, experience in business)

Most of the ILOs indicated training in procurement and tenders – 55%

- communication (not specific for promotion of tenders and technologies) – 44%
- planning and reporting – 22%
- developing soft skills - negotiations, presentation of the offer – 22%
- organisation of brokerage events – 22%
- promotion of tenders and technologies from the RI – 18%
- creation of an offer for industry – 18%
- maintenance and updating of databases – 18%
- obtaining funding – 18%
- selected aspects of international collaboration – 11%
- aspects of intellectual property rights- 5%

Q2. Which trainings would you like to participate in? (multiple choices possible) – and which of the trainings you selected you consider to be most useful? Rank them 1) Very important; 2) Important; 3) Less important.

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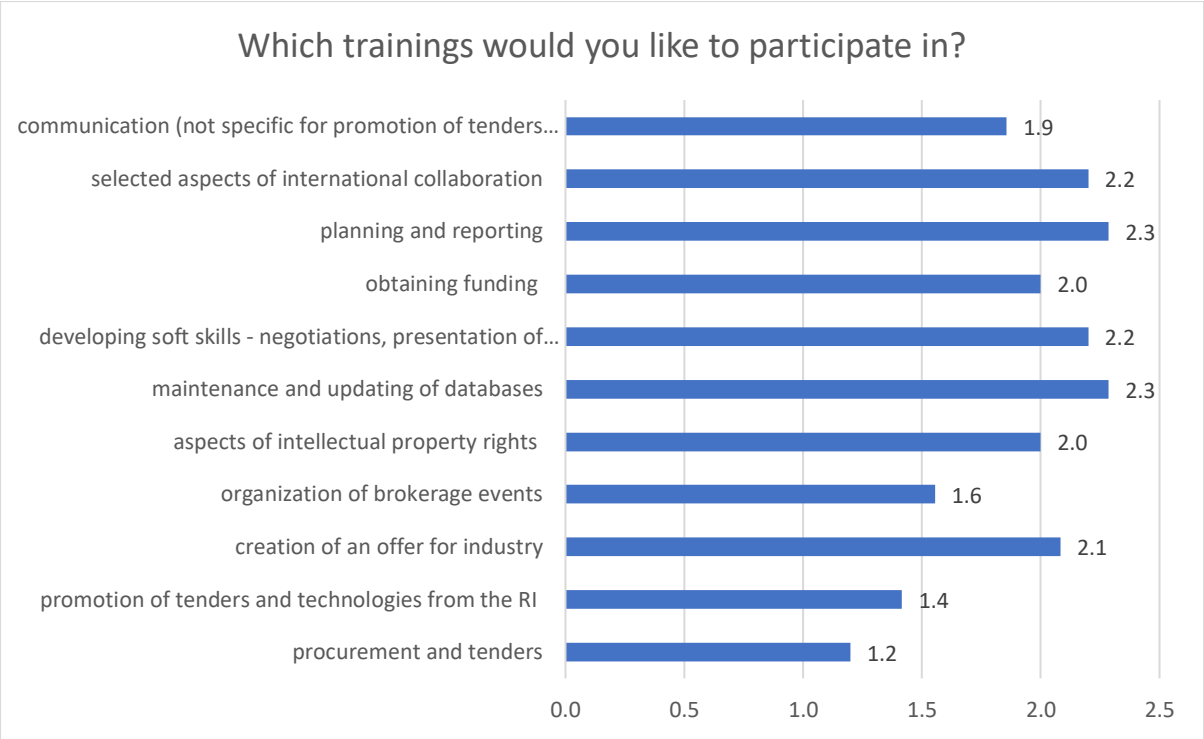
Most ILOs see the necessity to attend training courses on one or more of the following topics (listed in the rank of the importance):

a) procurement and tenders,
b) promotion of tenders and technologies from the RI,
c) organisation of brokerage events,
d) communication (not specific for promotion of tenders and technologies),
e) obtaining funding,
f) aspects of intellectual property rights,
g) creation of an offer for industry,
h) selected aspects of international collaboration,
i) developing soft skills - negotiations, presentation of the offer,
j) planning and reporting,
k) maintenance and updating of databases.

Among "others" there was international partnering mentioned.



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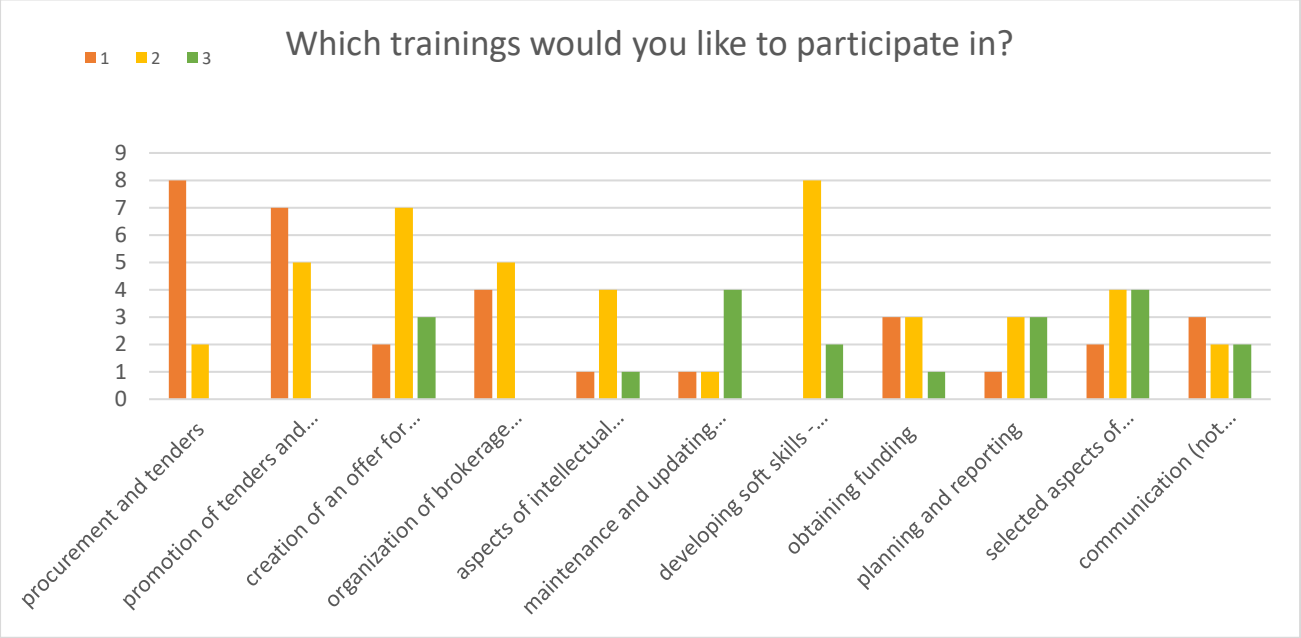

Figure 18. Which trainings would you like to participate in? (2. Version)

Knowledge exchange

Q1. Would you like to participate in knowledge exchange meetings with other ILOs?

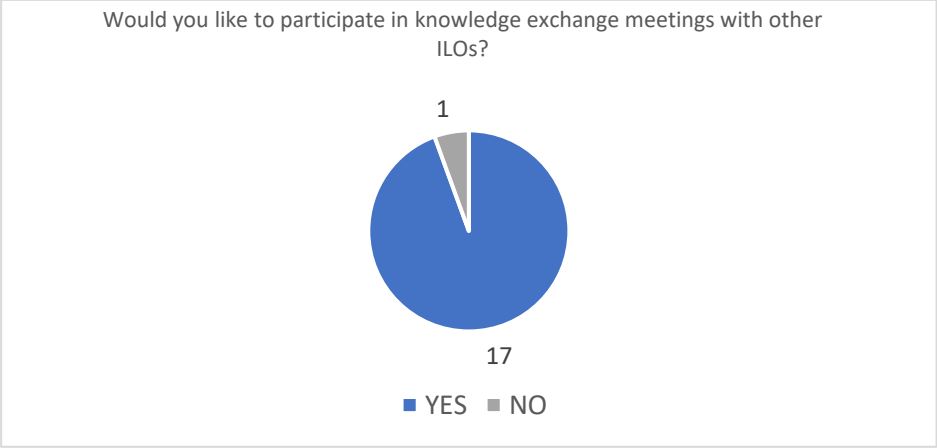

Figure 19. Would you like to participate in knowledge exchange meetings with other ILOs?

Q2. Would you like to participate in knowledge exchange meetings between companies?

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Figure 20. Would you like to participate in knowledge exchange meetings between companies?

Q3. Please suggest other knowledge exchange activities you find relevant.

Among other knowledge exchange activities ILOs indicated:

- knowledge exchange between RI and companies,
- having an understanding/appreciation of the technologies involved, the areas of difficulty and the future developments needed,
- help to make industry connections,
- help to hold a conversation with the customer/developer,
- Perhaps the ideal ILO skill set is a balance of technical/commercial/geopolitical and business experience,
- Exchanges between ILO performance metrics and performance benchmarking,
- Knowledge of how to arrange virtual and hybrid brokerage events,
- Knowledge exchange meetings with other cluster and supplier network coordinators.

Knowledge Exchange:

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	Knowledge exchange		
Resp. No.	Would you like to participate in knowledge exchange meetings with other ILOs?	Would you like to participate in knowledge exchange meetings between companies?	Please suggest other knowledge exchange activities you find relevant
1	Yes	No	Knowledge exchange between RI and companies
2	Yes	Yes	-
3	Yes	-	-
4	Yes	Yes (sure)	-
5	Yes	Yes	-
6	Yes	Yes for knowledge of who is doing what and where	Exchanges between ILO performance metrics and performance benchmarking
7	Yes	Yes	-
8	Yes	Yes	-
9	Yes	yes (already done in the past)	-
10	yes	-	-
11	yes	[not sure about specific meetings, they need to be too much of a hard sell. I am however very keen to regular [summary] updates from industry on developments, new products, big physics contract wins]	[Whilst the ILO role is not strictly a technical role, having an understand/appreciation of the technologies involved, the areas of difficulty and the future developments needed, does help to make industry connections, and helps to hold a conversation with the customer/developer. Perhaps the ideal ILO skill set is a balance of technical/commercial/geopolitical and business experience.
12	yes	no	-
13	yes	yes	how to arrange virtual and hybrid brokerage events
14	no	yes	-
15	Yes	no	-
16	Yes	No.	Knowledge exchange between policy makers, government.
17	yes	yes	
18	yes	yes	Knowledge exchange meetings with other cluster and supplier network coordinators

Table 1. Knowledge Exchange:

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Appendix 5: ENRIITCyourcoffee Season 2, Episode 9[2]

This episode was devoted to "Training Challenges and Opportunities for Industry Contact Officers." The episode was hosted by Marco Galeotti from EMSO and partner to the ENRIITC project, and the guest speakers were Iulianna Van der Lek, Training and Education Officer at CLARIN[3] and Shridhar Jawak, Remote Sensing Officer at SIOS (Svalbard Integrated Arctic Earth Observing System).

During the episode, the two speakers presented the challenges in building and managing the relationship with the industry highlighting the status of play within an SSH RI, such as CLARIN, and a STEM RI, as SIOS is.

From the discussion, it emerged that in the effort of envisaging a strategy for training the next generation of ICOs, it is necessary to take into account the differences between SSH and STEAM RIs, and investigate more thoroughly the peculiarities of each sector of research, quite well represented by the ESFRI clusters.

In this respect, Iulianna pointed out that:

> "An ICO working in the context of an SSH Research Infrastructure needs to know how to translate the value of the RI to the industry and other non-academic partners. For example, CLARIN collaborates not only with companies from the data industry but also with galleries, libraries, archives, and museums (GLAM sector)."
> *Iulianna Van der Lek, Training and Education Officer at CLARIN*

The comment shows that each type of Research Infrastructure may have different needs in terms of procurement and/or innovation boosters and should be treated appropriately.

Another point that Iulianna van der Lek underlined is the importance of putting in place strong mechanisms to guarantee a closer collaboration among the ICOs at the European level to achieve this goal, ENRIITC D3.1 proposes to set up a permanent network supervised by a central HUB to facilitate ongoing dialogue and knowledge exchange among the ICOs.

> "I think for a distributed RI, it is very important that we develop an effective model for collaboration between the central ICO and similar roles in the different EU nodes of the infrastructure. We hope that ENRIITC and also other European partners will help us develop such a model."
>
> *Iulianna Van der Lek, Training and Education Officer at CLARIN*

In contrast, Shridhar reported that SIOS tries to engage with the industry through conferences, workshops, trainings with experts, and other events that bring researchers, policymakers, and industry together. A big driver for innovation in SIOS' perspective is the changing climate and the global need to adapt to it in the future. This is especially sharply felt in Svalbard.

In terms of challenges, Shridhar emphasised the different funding models available for RIs and industry. He felt like connecting these two models would lead to the most success in facilitating

[2] https://enriitc.eu/enriitcyourcoffee-season-2-episode-9-on-training-challenges-and-opportunities-for-icos/
[3] www.clarin.eu

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dialogue between the parties. Similarly, to other partners in the ENRIITC project, Shridhar stressed that workshops and conferences are very effective platforms to bring industry and researchers together, but a well-crafted theme and topics are needed to ensure the success of the events. Finally, it was pointed out that access to the research facilities is important to drive collaboration. To this end, SIOS plans to launch the Science Innovation Award, which will be open for both the industry and research community and will provide new opportunities for industries to prove their technologies in Arctic scenarios and vice versa.

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Appendix 6: ENRIITCyourcoffee Season 2, Episode 8

The eighth instalment of #ENRIITCyourCoffee Season 2 was hosted by Sylwia Wójtowicz, ILO for the European Organisation for Nuclear Research (CERN) and Fusion for Energy (F4E). In this session, she had a great opportunity to ask directly from Cristina Lara Arnaud, Deputy Head of the Procurement Service at CERN, about their ILO training.[4]

She presented the new ILO training that CERN hosts every year, which starts with an introduction of available tools such as an e-procurement web page and a tour of resources in the facility regarding available statistics and technical support to name a few. Next, the training topics are CERN procurement rules, procedures, and legal vocabulary and framework, which is essential knowledge for an ILO. The current setup at CERN is that the training is held via Zoom and open to everyone who showed interest in CERN. Training covers 'ILO info,' which entails current and past tendering processes and an overview of the annual procurement report and its resources. Cristina also mentioned that they used the training to also introduce the documents for the quarterly Finance Committee meeting.

> "We can say who we are and that we are here to help you. If you understand what we do and how we do our job, it's going to be much easier. If we speak the same language then we can communicate better." – Cristina Lara

Anne-Charlotte Joubert from ESS kicked off the discussion with an excellent question regarding the materials needed for the training. Cristina was happy to share that the CERN web page is multifaceted with sections for ILOs, external companies, and the CERN personnel.

Sylwia continued with a question on the training setup outside of the pandemic: "The last training was delivered online because of the situation, but usually there are trainings on site. What do you think is the more effective way of training?" Cristina expressed the need to come onsite to CERN to experience the scale of the facilities and also to meet not only the procurement officers, but also the technical officers.

The discussion moved more on the topic of ILO skills and most important competencies. For example, if there was a difference in the training needs of ILOs with a scientific vs. business background, but Cristina pointed out how the job of an ILO is not too dependent on the person's background while retaining that diversity itself is always good.

Belén Del Cerro Gordo from CDTI took the floor next to share her experience in the institution that hosts all Spanish ILOs. At CDTI, they benefit from using common tools such as companies' databases and Spanish industry capacities catalogues. Belén emphasised that besides the training provided by the facility, a national and international network of ILOs and colleagues experiences are an important part of knowledge and establishing good practices.

The next audience member drew attention to other skills that are not only CERN-specific such as soft skills, competencies, best practices, which are acquired by working together and sharing. The question for Cristina was about the most important skills for an ILO in her opinion. Cristina replied with "the core being communication." More specifically being a good middle between the ILO's home

[4] *Source: https://enriitc.eu/enriitcyourcoffee-episode-on-ilo-training-and-skills/*

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organisation and understanding the company's needs. Further, Cristina believes that a good ILO can add their own value, meaning that an ILO for example identifies an interesting company to work with CERN, but the company is missing a requirement. The ILO should be able to help to fill this requirement and thus help this great business opportunity come to life.

> "[ILOs] can certainly give advice and see why some companies have not provided a good service in some organisation while they have provided an excellent service in another organisation. Why some of them work, why some of them do not work?"

Sylwia asked about onsite ILOs and if that is of importance. Cristina was happy to reply in the example of Spain where they have a dedicated ILO and there is a significant positive difference in Spain in comparison to perhaps other ILOs that are dedicated to more than one organization, and thus have to navigate between many sets of rules and regulations.

The topic reverted to skills, and Jorge Lopez from CDTI asked if an ILO should have more technical skills in the case of CERN as it is more related to co-development with industry. In that way, an ILO needs more to identify when and how CERN needs to be involved. Cristina pointed out that while technical officers would feel more comfortable talking to other technical officers, it comes down to communication and networking skills since the technologies vary a lot and no one person can be an expert on all.

When asked what training a newly appointed ILO would need, Cristina answered: "ILOs need continuous training. I've been in CERN for 26 years and I learn something new every day."

Moving from ILO training to ILO impact measuring, Alan Silverman, UK ILO for CERN, asked how Cristina would do that since measuring the sales would not be a good way to assess ILOs since the companies often dictate that. Cristina approached ILO impact from an angle of overall companies they provide for procurement.

"Not about how many contracts you get, but at least how many offers you get." She followed up with the importance of ILOs not per se to secure a contract, but also that ILOs bring in companies to get to know CERN. It's important since there could be future collaboration and overall better knowledge on CERN and a better relationship between CERN, industry and a country.

Anna Hall from Big Science Sweden, the Swedish ILO network, ended with a truly ENRIITC thought: "Why not have an ILO training together with different facilities so that the differences in procurement can be compared and understood better?" Paolo Acunzo followed Anna up with the Big Science Business Forum and its dedicated plenary session on procurement.

Appendix 7: Results from the works of Focus Group 1

Purpose

The ENRIITC Focus Group #1 was established to discuss what ILOs and ICOs can learn from each other and where it makes sense to collaborate. This focus group also explored how to improve the interaction that ILOs and ICOs have with industry, trying to learn from each other and analyze common tools. Another matter of interest was how ILOs and ICOs are trained to fulfill their respective objectives, trying to analyze potential collaboration in future training programmes. Finally, future ILOs and ICOs organisations models were investigated, having in mind how to improve the mutual benefit,

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training opportunities, and enhance the collaboration. The following tasks of the Focus Group were considered:

1. Discuss what ILOs and ICOs can learn from each other and where it makes sense to collaborate;
2. Explore how to improve the interaction that ILOs and ICOs have with industry, trying to learn from each other and analyze common tools;
3. Training activities looking at collaboration opportunities;
4. Organisational models will be investigated, having in mind how to improve the mutual benefit and enhance the collaboration.

During the meetings within Focus Group N#1 the participants managed to discuss the following topics:

- What ILOs and ICOs can learn from each other
- Where it makes sense to improve the collaboration
- Good examples of effective collaboration between ILO and ICO
- How to build space for ILO-ICO collaboration
- Common ways of engaging industry, tools used, etc.
- How to improve the collaboration with industry from both perspectives ILOs and ICOs? Learned lessons from each other
- Training Programmes for ILOs and ICOs
- Future organisations of ILOs and ICOs: PERIIA, ENRIITC or other
- Proposals of common projects, actions.

As the result of the meeting, we may propose the scope of training set that was indicated by the members of Focus Group #1.

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Methodology

The FG1 has count on the participation of 15 people with a good balance of ILOs/ICOs (7/8). Three meetings were organised. In the first two meetings, the participants discussed the proposed topics and in the last one it was discussed the outcome of the FGs and the conclusions included in this report. In the first meeting, the discussion was focused on the first two topics and the pending topics were address during the second meeting.

The outcome and discussion of the meetings can be consulted in the FG1 Mentimeter slides-First meeting (9-02-2021) Focus on what ILOs and ICOs can learn from each other and how to improve the interaction with industry, FG1 Mentimeter slides-Second meeting (24-02-2021), Focus on training activities and organisational models.

Conclusions

Discuss what ILOs and ICOs can learn from each other and where it makes sense to collaborate
Most of the participants think that the relationship among ILOs & ICOs have room for improvement. What ILOs can learn in the interaction with ICOs, is mainly related to funding opportunities or how RI works. Conversely, ICOs could understand better: the problems of the industry, how other RIs work, or improving their relationship with the industry.

One conclusion on the table was that there are **differences in the understanding** about the roles of each of them, and usually it seems that the tasks of ILOs are more well-known and in most of the RI are established in terms of reference. In addition to this, should be desirable to have a deep insight about what are the common objectives of ICOs and ILOs.

From an ICO point of view, the skills most valued by an ILO is experience with other RIs, honesty, communication, and discretion. In addition, from an ILO point of view, the skills most valued by an ICO are proper knowledge, specific country, knowledge-sharing motivation, responsiveness, openness, and tech-aware SMEs.

The collaboration needs to be improved in the following areas:

- best practices transmitted from larger or most experienced RI to others (frequent meetings, knowledge sharing, structured communication channels, etc.),
- sharing experiences and resources on interacting with industry,
- make RI more savvy of ILOs need, make RIs know that industry liaison is important,
- joint industry meetings: BSBF,
- establishing ILOs networks at national and international level such as PERIIA,
- common training activities,
- ILOs to focus on the industry as user, etc.

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Some good examples of collaboration can be found on Big Science national networks of some countries (DK, Sweden…), BSBF, joint meetings hosted by RIs (ex. F4E)

The FG has also analysed how to create space for collaboration between ILOs and ICOs worlds. The following measures could help in this task:

- events such as BSBF,
- projects such as ENRIITC,
- newsletters,
- regular meetings,
- agreed best practices,
- FGs such as the ones that originated under the ENRIITC umbrella,
- wiki or other platforms,
- Joint industry webinars, etc.
- Contact points.

But in the creation of that space for collaboration some barriers have been identified:

- different goals,
- need of resources,
- RI in operation,
- RI management doesn't care,
- procurement constraints,
- user role & supplier,
- Not knowing who the ICOs are,
- user role & supplier.

Explore how to improve the interaction that ILOs and ICOs have with industry, try to learn from each other, and analyze common tools.

In general, ILOs and ICOs value their interaction with industry as quite good.

ILOs & ICOs have common ways of engaging the industry:

- infodays,
- databases, mailing list,
- pre-procurement interaction, tender information,
- joint projects,
- news at websites,
- branch association,
- knowledge of SMEs skills,

The main tools that ILOs & ICOs use to interact with companies are:

- newsletters,
- industry portal,
- industry databases,
- BSBF,

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- infodays,
- mailing,
- online survey,
- government contacts,
- industry association,
- personal contacts

Although most of the RIs represented, have an industrial portal, it should be desirable to create this kind of tool in the case of the ones that don´t have it. In particular, a common RI procurement portal should be appreciated by the majority of the participants.

From the ICO's perspective, the collaboration with industry could be improved by offering the following measures: workshops, and put the ICOs contact details on website.

From the ILO's point of view, the collaboration with industry could be improved with the following actions: straight BSBF function, budget on ILOs, meetings and workshops, national ILOs network or build a common platform, national roadmaps, long-term approach, end of COVID-19 pandemic.

According to the FGs ILOs participants, the most efficient channels for interaction with industry are: face to face meetings, info days, visits, ILOs, and an industrial portal. In contrast, according to the FGs ICOs participants, the most efficient channels for interaction with industry are: info days, industrial portal, ILOs, face to face meetings, research cooperation, etc.

According to the FGs ICOs participants, the main obstacles in the relationship with industry are: internal communication and contact points. From the ILO's point of view, the obstacles in the relationship with industry could be: long time until contracts or opportunities, lack of interest, lack of strategy, difficult market, contacting key persons, bureaucracy, internal resources, and a lack of RI feedback.

Training activities looking at collaboration opportunities

The majority of the FG1 participants have received training for performing their job as ILO/ICO. In most of the cases the RIs facilitates those trainings, but sometimes the ILOs' host institution has also provided specific training. In this sense, national networks of ILOs could be very useful for the newcomers.

In particular the training activities were related to:

- Negotiation skills,

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- Training for newcomers
- Brokerage events
- Knowledge transfer
- Contacting companies
- RI info on procurements
- Organisations´overview

The most appreciated were the ones related to national ILOs networks, experiences of other ILOs, PERIIA exchanges, and contacts to specialists for understanding the complexity. Regarding the training expectations of the FGs participants, it would be very much appreciated to receive training in the following areas:

- Technology transfer (ILO/ICO)
- Procurement rules (ILO)
- Internal RI communication (ICO)
- Interaction with industry (ICO)
- Soft skills (ILO/ICO)
- Technical knowledge (ILO).

In some cases, its considered that there would be an added value in organizing common training activities between ILOS/ICOS, for instance on technology transfer.
Specific training should be organised for newcomers, in particular:

- Procurement rules(ILO)
- Discover the ecosystem (ILO/ICO)
- RIs ways of working (ILO/ICO)
- Technical knowledge (ILO)
- Join PERIIA and ENRIITC, talk to peers, other ILOs exchange
- Databases(ILO/ICO)

FGs participants would appreciate developing the following skills:

- Interpersonal skills(ILO/ICO)
- Business culture(ILO/ICO)
- Brokerage events(ILO/ICO)
- Lobbying (ILO)
- Marketing(ILO/ICO)
- Soft skills(ILO/ICO)
- Negotiation(ILO/ICO)
- Know the correct RIs people (ILO/ICO)

In some cases, it should be appreciated the organisation of common training activities with industry for better understanding the needs, and what is more relevant for trying to succeed in the convergence of needs.

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In principle, the FGs participants showed interest in participating in knowledge exchange meetings with other ILOS/ICOs, either informally or formally organised. Another matter analyzed was how to enhance collaboration between companies from different countries; in this sense, events such as BSBF, info days are very much appreciated, and also some kind of e-platform or match-making tool. Organisational models will be investigated, having in mind how to improve the mutual benefit and enhance the collaboration.

A vast majority of the FGs participants were aware of the PERIIA activities. On the contrary, most of the ILOs and some ICOs were not aware of the EIROforum activities, but for those involved, this is a very useful forum. In the Big Science market, most of the ILOs are organised on national ILO networks. But in contrast, most of the ICOs are not internationally organised into networks. The organisational networks of ILOs & ICOs are PERIIA and ENRIITC.

Regarding the desirable organisational models between ILOs & ICOs, the FGs have the following suggestions:

- ENRIITC community
- International contacts mapping
- Joint meetings on common topics
- The creation of a network with some formal meetings and exchange forum; also informal meetings would help to establish topics of mutual interest. In this network, it needs a clear definition of where an ILO's work ends and the ICO's starts as a ground rule

It seems that the pandemic has also contributed to a reduction in the monthly hours dedicated to networking; most of participants dedicated around 3–4 hrs./month to networking activities.

As a final outcome of the discussion, below you can find the Summary table with the final list of recommendations regarding ILO & ICO training activities.

R2	***Creation of a network of ILOS & ICOs for exchanging best practices and analysing common goals, giving continuity to the ENRIITC community***
R5	*ILOS&ICOs common training days*
R14	*With some specific funding, PERIIA could organise training activities focused on the ILOs side, according to the general ILOS needs*
R15	*Common ILO & ICO training could be provided in the framework of an ILO & ICO network*
R18	*Keep updated "Procurement Handbook" edited under the umbrella of BSBF*

Table 2 List of recommendations

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Appendix 8: Results from the works of Focus Group 3

After the first meeting, the topics approved to be addressed are:

- Impact of communication of strategies and outcomes of ENRIITC project:
    a. A survey is planned to be sent out.
- Engagement with national/EU policy stakeholders:
    a. Ongoing discussion on how to proceed.
- The link between RIs and the mission-oriented structure of EUs innovation efforts, including EU funding mechanisms and ambitions.
- FG #3 could be to have ENRIITC/Big Science represented at one policy-oriented high-level EU conference and have EU Industry Days 2021.

Regarding the second meeting, the agenda approved included the following topics to be addressed:

1. Brokerage Events:
    - How to promote brokerage events?
    - How to follow up on brokerage events?
    - How to promote policy dialogue from brokerage events? (Introduction by Nigel Wagstaff, EATRIS)
2. Discussion of ENRIITC WP 3 deliverables:
    - Strategy to exploit the innovation potential of RIs (D 3.1)
    - Strategy for innovation and industry-RI cooperation (D 3.2) (Introduction by Nikolaj Zangenberg, DTI)
3. Best practices & challenges for communicating RI/Industry collaboration (Bring forward your own experience).

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