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Social labs as temporary intermediary learning organizations to help implement complex normative policies. The case of Responsible Research and Innovation in European science governance

Complex
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Abstract

Purpose – This study aims to discuss science governance in Europe and the network of associated nonprofit institutions. The authors posit that this network, which comprises both (partial) learning

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This paper forms part of a special section “Institutional change for responsible research and innovation (RRI)”, guest edited by René von Schomberg and Nhien Nguyen.

Anne Loeber is co-first author of this paper.

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organizations and non-learning organizations, has been observed to postpone taking up “responsibility” as an issue in science governance and funding decisions.

Design/methodology/approach – This paper discusses the challenge of learning and policy implementation within the European science governance system. By exploring how learning on responsible innovation (RI) in this governance system can be provoked, it addresses the question how Senge’s insights in organizational learning can clarify discourses on and practices of RI and responsibility in research. This study explores the potential of a new organizational form, that of Social Labs, to support learning on Responsible Research and Innovation (RRI) in standing governance organizations.

Findings – This study concludes that Social Labs are a suitable format for enacting the five disciplines as identified by Senge, and a Social Lab may turn into a learning organization, be it a temporary one. Responsibility in research and innovation is conducive for learning in the setting of a Social Lab, and Social Labs act as intermediary organizations, which not merely pass on information among actors but also actively give substantive shape to what they convey from a practice-informed, normative orientation.

Research limitations/implications – This empirical work on RRI-oriented Social Labs therefore suggests that Social Lab-oriented temporary, intermediary learning organizations present a promising form for implementing complex normative policies in a networked, nonhierarchical governance setting.

Practical implications – Based on this research funding and governance organizations in research, policy-makers in other domains may take up and create such intermediary organizations to aid learning in (science) governance.

Social implications – This research suggests that RRI-oriented Social Labs present a promising form for implementing complex normative policies, thus integrate learning on and by responsible practices in various governance settings.

Originality/value – European science governance is characterized by a network of partial Learning Organization (LOs) and Non-Learning Organization (nLOs) who postpone decision-making on topics around “responsibility” and “solving societal challenges” or delegate authority to reviewers and individual actors, filtering possibilities for collaborative transformation toward RRI. social lab (SLs) are spaces that can address social problems or social challenges in an open, action-oriented and creative manner. As such, they may function as temporary, intermediary LOs bringing together diverse actors from a specific context to work on and learn about issues of science and society where standing organizations avoid doing so. Taken together, SLs may offer temporary organizational structures and spaces to move beyond top-down exercise of power or lack of real change to more open, deliberative and creative forms of sociopolitical coordination between multiple actors cutting across realms of state, practitioners of research and innovation and civil society. By taking the role of temporary LOs, they may support existing research and innovation organizations and research governance to become more flexible and adaptive.

Keywords Responsible research and innovation, Non-learning organizations

Paper type Research paper

1. Introduction

The concept of the “learning organization” (Senge, 1990) has recently gained new currency. Örtenblad’s (2019) edited volume has brought together a wide range of stories that convey the topicality of Senge’s conceptualizations in view of understanding and describing organizations’ adaptability to rapid sociotechnical change. Hansen, Jensen, and Nguyen (2020) have drawn attention to the relevance of Senge’s book *The Fifth Discipline* in the context of recent debates on responsible innovation (RI), arguing that “[some of the habits practiced by a learning organization facilitate responsible innovation; some are responsible innovation” (Hansen *et al.*, 2020). Interestingly, with the notable exception of Dixon (2019) in the Örtenblad edited volume, the attention for governing organizations as (potential) learning organizations in this recent work is limited. Hansen *et al.* (2020) focus on for-profit companies in their description of how these may be tempted to become learning organizations to strengthen their competitive position by engaging in RI. They only mention governance when they point out that the notion of RI “enjoys . . . government backing,” referring to the related discourse (Owen, Pansera, Macnaghten, & Randles, 2021a, Owen, von Schomberg, & Macnaghten, 2021b) on Responsible Research and Innovation (RRI).

Indeed, RRI was embraced notably by the European Commission (EC) as a “grand” narrative from 2014 on to bring via research and innovation (R&I) funding policies in line with the values, needs and expectations of society. To the EC, RRI as a policy concept offered an opportunity to juxtapose ambitions in view of Europe’s competitive position with normative considerations about connection between science and citizens (cp Zwart, Landeweerd, & van Rooij, 2014) [1]. These considerations had been put center stage in the Science and Society Action Plan in 2001 and tallied with ideas that were put forward in academic circles from the early 2000s on responsibility in innovation. What emerged from a cross-fertilization between these debates was an understanding of RRI as a dedicated intention to bridge gaps between science, research and innovation communities on the one hand, and society at large on the other.

RRI was defined by the EC as a policy concept in 2013, denoting a:

transparent, interactive process by which societal actors and innovators become mutually responsive to each other with a view on the (ethical) acceptability, sustainability and societal desirability of the innovation process and its marketable products (in order to allow a proper embedding of scientific and technological advances in our society) (Von Schomberg, 2013, p. 2).

Implementation plans were articulated at about that time too: In 2014, the “Rome Declaration on Responsible Research and Innovation in Europe” called for action to promote RRI within European Institutions, Member States, regional authorities and research and innovation funding organizations (EC, 2014). The idea was to build capacity for RRI, review and adapt narratives for research and innovation and implement institutional changes that foster RRI and a more democratic research and innovation ecosystem in the European Research Arena (Braun, 2019, pp. 243–266; Owen *et al.*, 2021a, 2021b).

However, in spite of these efforts, the “backing” that R(R)I enjoyed at EC level in practice appeared to a large extent merely a fictitious reality, as implementation in actual science and innovation governance proved problematic and limited (Griessler, Braun, Wicher, & Yorulmaz, 2022; Novitzky *et al.*, 2020). Thus, RRI and RI seem to devolve into a Catch-22 situation: for governmental arrangements like the EC to provide a stimulus to for-profit organizations to cultivate RI in the way Hansen *et al.* (2020) suggest, they need themselves to endorse and implement the concept. Only if the diverse organizations that together make up the science governance system become learning organizations, in other words, can they actively support companies and research institutes to actively determine what “responsibility” is and how to translate ideas on the subject and associated normative considerations into research and innovation practice (Egeland, Forsberg, & Maximova-Mentzoni, 2019; Loeber & Cohen, 2021).

In the case of EU science and innovation governance, it is however difficult to pinpoint which organizations are required to learn and can qualify as learning organizations. The governance of science and innovation in the European polity is scattered among a network of organizations and intermediary institutions (Hartmann & Kjaer, 2015; van der Meulen & Rip, 1998). Intermediaries such as standard-setting organizations, ethics boards at national or supranational level, research councils, advisory bodies and university organizations work in a relationship with their environment “as a back-and-forth of constructing demands, of localized and idiosyncratic interpretations of policy discourses, and of material and structural constraints in practice” (Åm, 2013, p. 467). As a consequence, learning within the European science governance system is dispersed and scattered among a range of intermediary institutions, and if it takes place, it is hard to pinpoint (Schuijjer, van der Meij, Broerse, & Kupper, 2022).

This paper seeks to address this challenge by exploring how learning on RRI in the EU science and innovation governance system can be provoked and how Senge’s insights can clarify the possibilities. To that end, we hypothesize that settings created for individuals from within the EU science governance system to engage in RRI-related learning can *serve*

as temporary, intermediary learning organizations (and may thus help implement RRI in relevant governance arrangements) if these spaces fit the requirements that [Senge \(1990\)](#); see too [Senge, Scharmer, Jaworski, & Flowers, 2005](#)) identifies as essential for a learning organization. We assume the possibility of a relation between intermediary organizations and RRI drawing on [Åm \(2013\)](#) who showed how the discourse of RI (“responsible development” at the time in the field of nanotechnology) triggered new demands for a multitude of heterogeneous actors involved in science and innovation as well as in the governance of research and development, which were articulated and passed on by intermediary organizations. To explore this line of reasoning empirically, we will draw on the experiences with organizing so-called “Social Labs” as a space for reflection and learning on the subject of RRI. The Labs were set up in the context of the NewHoRRIzon [2] project, funded by the EC within its 8th Framework Program for funding research and innovation “Horizon2020” (H2020), which aimed at promoting the uptake of RRI in that very funding framework. NewHoRRIzon was among the more encompassing of projects to promote RRI, addressing all of H2020’s component parts in 19 Social Labs in total. Of these, for the current purpose, we will select five cases (based on a maximum variation principle) to explore in-depth two interlinked research questions to inquire how Social Labs can play a role in embedding RRI in European science governance. Our first question: *How can Social Labs function as temporary learning organizations?* reflects on the purpose of Social Labs, while the second question: *Under which conditions can Social Labs inform learning about responsibility in research and innovation in European science governance?* concerns their context and framing within a specific governance setting.

Below, after elaborating our research methods, we will draw on the work on learning organizations ([Senge, 1990](#); [Senge et al., 2005](#); [Örtenblad, 2019](#)) to conceptualize how a temporary setting can play a role as intermediary learning organization, in view of the first question. First, we describe how we operationalized the Social Lab method in the context of five different cases related to European science governance and funding. We will then discuss the selected Social Labs through the lens of Senge’s five disciplines to assert if and how the Labs functioned as a special case of temporary learning organizations. We will then look at our data to discuss the conditions under which Social Labs inform science governance institutions’ learning about and, potentially, implementing RRI in their organizational processes.

2. Research methods: engaged research

Social labs ([Hassan, 2014](#)) are experimental venues focused on creating solutions to complex societal challenges. Furthermore, they present opportunities for participatory forms of action research ([Timmermans, Blok, Braun, Wesselink, & Nielsen, 2020](#)). The latter is defined as a “participatory process concerned with developing practical knowing in the pursuit of worthwhile human purposes. It seeks to bring together action and reflection, theory and practice, in participation with others, in the pursuit of practical solutions to issues of pressing concern to people” ([Reason & Bradbury, 2008](#), p. 4).

It was with this purpose in mind that we set up, together with a consortium of researchers from all over Europe, a range of Social Labs on RRI. The main aim of the Labs was to:

- create spaces for discussion and reflection on the state of RRI within the specific domain of the European research arena (learning about RRI);
- develop a social challenge that participants felt pressing within their research ambit or context (learning about the social embeddedness of research);
- address the identified challenges by co-designing and implementing experiments called “pilot actions” (experiential learning);

- critically reflect upon both the experiments and critical moments encountered in the pilot action process in a range of dedicated workshops with Lab-participants, notably on particular choices made (reflective learning); and
- discuss and develop evidence-based policy action (policy-oriented learning) to assist RRI uptake in a specific domain.

Among the many “pilot actions” (experiments) to promote the uptake of RRI in research and innovation across the 19 Social labs in total, not all were fully followed through [3]. In real-life settings contextual, resource or human factors hindered experimentation; therefore, researchers made the decision that experiments should not be addressed in binary terms of failure and success. Rather, they were to be seen as part of the process of reflection, learning, planning, re-planning, re-reflecting: sharing experiences and expertise from related but diverging fields, vantage points and positions within the research and innovation environment, starting, stopping and re-starting again, as experiential learning that is key to the process occurs (Kolb, 1984). Experiments that were stopped, merged or radically altered offered additional insights to the context, organizational setup or framework of the specific research domain in which Social Lab participants were engaged.

As concerns our position as researchers, because we were involved in designing and running the Social Labs, but not in developing and implementing the pilot actions, our role in these can be characterized as “engaged researchers”: researchers actively being involved in a social field in the pursuit of solving important problems, while at the same time combining this with a scientific knowledge generation process (Levin & Ravn, 2007). Engaged research involves both researcher(s) and researchee(s) working together on problem definition and problem-solving and through this process develop new knowledge. Yet, like in action research (Susman & Evered, 1978), our work resulted in the joint production of actionable knowledge by acting on the world (Chatterton *et al.*, 2007, p. 218) in which “scholarly theorizing and practitioners’ narratives” are combined (Cicmil, Williams, Thomas, & Hodgson, 2006, p. 677; Loeber & Vermeulen, 2016). Such action and the resulting knowledge is inherently value laden and morally committed (Macdonald, 2012). To guard the validity of our insights and conclusions, we opened up our findings and inferences to probing by Lab organizers and participants (Montuschi, 2014, p. 129). To that end, during the Social Lab workshops (in each Lab, three workshops were organized over the time span of approximately two years), each of the researchers collected written material (flipovers and post-its), and notes were taken of interactions (online) between participants in-between workshops. Reflections and analyses created by the researchers were discussed in the Workshops and at cross-sectional conferences. Key findings in the form of narratives about the process as well as experiments were reflected upon by participants, and consensus was sought to arrive at shared understandings of achievements within the Social Labs. Resulting data was collated into narratives that were used as a basis for reflective interviews with Social Lab managers by the evaluators of the project (Loeber & Cohen, 2018). Findings were fed back to Lab participants during the third workshop by way of member check and were jointly reflected upon and validated during or after the event [4].

For the purposes of this paper, the above materials were subjected to qualitative content analysis (Mayring, 2021) by the authors of this paper to analyze how the experiences in the Social Labs satisfied the “five disciplines” identified by Senge (1990) to characterize a learning organization. Below, we limit the presentation of our empirical material to a selection of five Labs, reflecting H2020 sections that are uniquely governed by a varying set of institutions. These were selected for the purpose of this paper to include maximum

variety in terms of different organizational forms that operate in the fuzzy environment of science governance in the EU.

3. Learning and non-learning organizations in science governance

To consider how our Social Labs could function as temporary learning organizations, let us consider Senge's work (Senge, 1990; Senge *et al.*, 2005) on the subject and relate that to the domain at issue here, that of the science governance network in the domain of the EU. A generic definition of the learning organization is provided by Giesecke and McNeil (2004, p. 55) as:

an organization skilled at creating, acquiring, and transferring knowledge and at modifying its behavior to reflect new knowledge and insights. [...] Learning organizations translate new knowledge into new ways of behaving. In a learning organization, managers and staff encourage work-related learning, the exchange of information between employees to create new ideas and knowledge, and continuous improvement.

Senge famously detailed five prerequisites required for organizations to act in a learning manner, that is, anticipating and successfully adapting to a changing environment through "adaptive" and "generative learning" (Chiva, Grandío, & Alegre, 2010).

According to Senge *et al.* (2005), first, leaders in learning organizations learn to apply tools to create a *shared vision*: forge common meaning/focus and mutually agree what the learning targets, improvement strategies and challenge-goals should be to get there. *System thinking* unravels often hidden subtleties, influences, leverage points and unintended consequences of plans and programs to help map and analyze situations, events, problems and possible causes/courses of action to find better (and often not obvious) change options/solutions. *Personal mastery* is a process of life-long commitment involving passion, inquisitive thinking and resilience while engaging individuals with a heightened ability to produce results they want to achieve in life through generative learning. They also surface deep-seated *mental models*: beliefs, values, mind-sets and assumptions that determine the way people think and act and to challenge assumptions that may help build shared understanding. *Team learning* aims at "thinking together" – sharing experience, insights, knowledge and skills with each other about how to do things better and develop critical reflection skills and conduct more robust, skillful discussions with teams and each other. In our empirical investigation we reflect on how these disciplines may be traced in Social Lab settings when learning revolves around RRI.

In science governance, networks of intermediary institutions outsource (most of) the decision-making to safeguard assumed autonomy. Thus, *non-learning* provides organizational benefits (Brunsson, 1998). Far from being "unintelligent" or "inflexible," non-learning organizations have the following:

- high level of tolerance to contradictions;
- offer organizational and idealistic discretion; and
- are emancipated organizations that do not have to worry about "getting things straight" as compared to a normative ideal or well-defined set of rules or standards.

Procedural characteristics of non-learning organizations foster a "particular distribution of responsibility [that] encourages organizations to pass problems onto somebody else, or to let them remain with somebody else" or "shift problems somewhere else, where it can be argued that they belong" (Brunsson, 1998, p. 429). This may be particularly true of structures in which governance is executed through an informal network of intermediary institutions that create a complex ecosystem (Cosens *et al.*, 2021).

For example, when it comes to taking care of “responsibility” and “resolving problems,” decision-making in science governance is delegated to reviewers, to ethics committees, to advisers, to bibliometric scientific impact assessment data and other indirect measures. Applying organizational non-learning, instead of learning specific new ways or modes of operation, enables research and innovation intermediary actors to accept contradictions (of methods, of disciplines, of worldviews, of epistemologies and so forth) while accomplishing their specific governance tasks (providing funding, resolving an ethical dilemma, organizing a policy conference) (Brunsson, 1998, p. 430). This tolerance of contradictions within the ecosystem of research and innovation offers science governance institutions a certain freedom: objectives (e.g.: “make the world better by science” or “be accountable to the public”) may be disconnected from actual operational behavior (e.g.: “provide funding” or “make a decision on research integrity”).

The “no-change [by learning] option” of non-learning organizations helps these organizations “postpone change” and accomplish slow and imprecise learning that is deemed important for organizations to conduct themselves in hectic, contradictory *and* power-laden environments (Brunsson, 1998, p. 431) such as research and innovation. However, non-learning to preserve autonomy may be detrimental for research and innovation that aims at “proper embedding of scientific and technological advances in our society” (Von Schomberg, 2013, p. 2) especially in a world that is characterized by increased sociotechnical change. Among these changes was the gradually shifting emphasis from science communication, with scientists *informing* the scientifically illiterate public, to public *engagement*, implying the active involvement (Conceição *et al.*, 2020) of non-scientists. This eventually amounted to the idea that “societal actors work together during the whole research and innovation process in order to better align both the process and its outcomes, with the values, needs and expectations of European society” (EC, 2012). It was this line of reasoning that the EC’s *H2020* funding program was captured with the label RRI. While RRI was made a cross-cutting issue in the program, which ran from 2014 to 2020, and 0.6% of the total R&D budget was earmarked to further RRI, that did not imply its smooth uptake in the aforementioned network of intermediary institutions and (supra-)national funding organizations that regulate science (Novitzky *et al.*, 2020). It is in view of this understanding of possible benefits that non-learning – i.e. non-adoption of RRI – might bring, that we hypothesize that Social Labs may function as temporary, intermediary (Kjaer, 2015) learning organizations in European science governance by serving as venues for reflective, experimental and real-world informed learning.

4. Social Labs as temporary learning organizations

In this section, we explore how the Social Labs we created functioned as intermediary learning organizations by looking at the specific characteristics Senge identified, as described above: systems thinking, personal mastery, mental models, shared vision building and team learning. Before we do so, we present an overview, first, of how we operationalized the Social Lab method in the context of European science governance and, second, of the selected Labs and their outset for working with RRI, which was investigated in a “diagnosis phase.”

4.1 Operationalization of the Social Lab method

As observed in Section 2, Social Labs are settings that enable participants to co-develop and test practical solutions in a real-life context and apply them on an experimental basis to the social realities that make up that context (Hassan, 2014; Marschalek *et al.*, 2022). Such settings offer space for collective and contextual deliberation, and for the iteration and

mutual learning that is required, we argued, for the uptake of RRI in research and innovation governance. To design the Labs in that view, we elaborated these in line with what [Timmermans *et al.* \(2020\)](#) describe as quintessential for Social Labs, arguing they should:

- offer a space for experimentation, which is;
- not closed off from the outside world, but are intently a part of the real world; that;
- enables and requires active participation of a wide range of societal actors that are of relevance to or have an interest in the social challenge; including;
- a wide range of expertise and backgrounds as well as multi- and interdisciplinary approaches; so as to;
- support solutions and prototypes on a systemic level; and that therefore; and
- have an iterative, agile approach [5].

This requires a partnership between the actors that builds on cooperation, openness toward new voices, sensitivity and adaptivity ([Blok, 2019](#)) and who make the Social Lab part of the real world.

To put this in practice, each Social Lab was organized by a manager and a facilitator, operating as a team, sometimes with the support of a Social Lab research assistant ([Griessler, Hönigsmayer, Braun, & Frankus, 2021](#)). The Social Lab manager was responsible for:

- setting up, managing and maintaining the Lab during its lifetime;
- stimulating discussions among participants and between them and outsiders relevant to the Lab and the “pilot actions” developed there; and
- ensuring that work in the Social Lab was carried out effectively and efficiently.

Social Lab managers were recruited across the NewHoRRIZon Consortium partners mostly based on their expertise on the topic of a specific Lab or because of their interest in the research being done in that domain. Furthermore, their expertise in participatory processes helped to engage participants and to anchor pilots and findings beyond the project.

The Social Lab facilitator took care of the planning and realization of Social Lab workshops activities in close collaboration with the Social Lab manager. Facilitators were recruited from inside the consortium and with an open call based on the following criteria:

- long standing experience in organizing and facilitating small and large group processes, experiential learning and co-creative group processes;
- being acquainted with innovative methods in this area that promote outcome oriented and creative thinking (art of hosting, dialogical methods, etc.);
- familiarity with the R&I processes; and
- profound knowledge of and first-hand experience with processes of research and technological innovation.

In terms of their concrete design, Social Labs followed a standardized process which could be adapted according to specific needs of participants and contexts ([Marschalek *et al.*, 2022](#)). They started with a diagnosis phase ([Griessler *et al.*, 2021](#)) to get an in-depth insight on the status quo of RRI in the specific domain under scrutiny, a sub-set of the *H2020* funding program ([Akca Prill *et al.*, 2018](#); [Bernstein *et al.*, 2018](#); [Griessler *et al.*, 2018](#); [Novitzky *et al.*, 2018](#)). To this end, desktop research (literature reviews and document analysis) and semi-

structured expert interviews were conducted with diverse stakeholders across a domain (policymakers, researchers, educators, innovators and members of civil society organizations [CSOs]). In addition, a quantitative assessment of RRI-flagged research projects funded by the EC was done which helped to provide insight into RRI application on the project level.

Taking the results from the diagnosis as a point of departure, each Social Lab then started to organize the series of three workshops. Candidate participants for the first Social Lab workshop were approached during the interviews, selected based on their knowledge of a Lab's specific topic and domain and via snowballing. Criteria for the eventual selection of Workshop participants included considerations of gender diversity and diversity in organizational and hierarchical position, geographical spread and quadruple helix aspects (Carayannis & Campbell, 2014; Cavallini, Soldi, Friedl, & Volpe, 2016). In the first workshop participants were invited to reflect on their own sense of responsibility, the results from the diagnosis and to think of RRI-related issues that they would like to experiment with in their own context. The second and the third workshop were used for reflecting on the progress of the pilot actions, on exchanging experiences and for discussing the lessons learnt while embedding RRI into R&I policies and funding programs [6].

4.2 Overview of selected Social Labs

Our analysis focuses on five Social Labs carried out in different organizational contexts of *H2020*: The European Institute for Innovation and Technology (EIT), The European Research Council (ERC), European Atomic Energy Community (EURATOM), The Joint Research Center (JRC) and Marie Skłodowska-Curie Actions (MSCA). We have selected these specifically out of the 19 Social Labs that have been created in the NewHoRRIZon project as they provide a cross-section of the different organizational types that were applied within the research funding framework of *H2020*.

EIT is an EU body, which funds Knowledge and Innovation Communities (KICs): networks and physical innovation hubs between researchers, teachers and innovators, to strengthen innovation capacity in Europe. At the time the Social Lab started, EIT had six operating KICs addressing their respective societal challenge. Open Innovation, inherent in the KIC-model itself, was the strongest RRI aspect in EIT, though, the RRI concept itself was not traceable as a consistent priority.

ERC is a funding and governing institution that funds applied and basic research in all disciplines based on the main criterion of "scientific excellence." The ERC was not open to interviews and further engagement into the project. A non-systematic literature review of ERC related documents and expert interviews showed the concept of RRI in conflict with the ERC's core values, i.e. the bottom-up principle, the 'excellence-only' criterion and its perception of autonomy from the EC (Konig, 2017; Nowotny, 2017). Nevertheless, the diagnosis of the state of RRI in the ERC showed that the funding body addressed certain keys (e.g. Open Access, gender and ethics), though often in a restricted way (e.g. gender in terms of equal chances for researchers and less an element in the content of research; ethics as following rules and guidelines and not as reflection of research) and not as a main criterion for funding decisions.

EURATOM is a European organization covering nuclear research activities of the European Union, funding research programs as well as contributing to the International Fusion Reactor ITER for experimental and research purposes. The concept of RRI was unknown to those in the organization engaged in the Social Lab, during which only gender issues, in terms of numbers of employees and managers and Open Access were considered.

JRC is a Directorate-General of the EC. Many of its activities are guided by requests from respective departments of the Commission, and JRC mainly provides research-based knowledge to the Commission. When we started the Social Lab, the concept of RRI was not applied in JRC, though several strategy documents and actions embraced concepts similar to key elements of RRI, such as transdisciplinary research, Open Science or gender. JRC thus incorporated many elements in line with RRI.

The MSCA is a funding instrument, which supports young and emerging researchers to carry out research and facilitate exchanges and travel. MSCA follows the principle of excellence. It addresses specific RRI keys (open access, gender equality and ethics). Furthermore, some of the funded individual young researchers promote change in how they do research, often by using participative methods to involve citizens in research through co-creation and co-design.

All these five organizations are part of the network of intermediary organizations in the science governance scheme of the European Union, some more hierarchical (JRC, EURATOM, EIT) and some more loosely formed (ERC, MSCA). They specifically mediate between different actors within the research and innovation ecosystem and do much more than only distribute funds to perform research: they set standards (ERC, JRC), create knowledge for policy (JRC), convey legitimacy and status (ERC), self-regulate processes (EURATOM, ERC), offer ethical and integrity guidance (ERC, JRC, MSCA) and operate alumni networks (ERC, MSCA, EIT). From an RRI point of view the organizations are also differently attuned to learning. The mission of ERC revolves around “scientific excellence” as its sole guiding principle (Nowotny, 2017) therefore, RRI is seen as compromising its mission; uptake is not warranted. In the JRC institutional learning is an ambition: to this end it has created a “Scientific Development Unit” that hosts a Centre for Advanced Studies, an exploratory research program, several Art and Science pilots and a Collaborative Doctoral Partnership Programme. RRI was seen as having the potential to address scientific development challenges. Other selected organizations (EURATOM, MSCA, EIT) have engaged with RRI on different organizational levels, but no specific institutional learning instruments have been created or, specifically, RRI learning has not been institutionally ambitioned (Bernstein *et al.*, 2017).

In the table below, the specific number of attendees for the five social labs (SLs), which were implemented in these organizational settings, are presented. It also indicates that the number of participants varied considerably during the processes: Some participants dropped-out and new ones were recruited along the way, typically only a smaller group of people were part of the whole process from beginning to end (Table 1).

4.3 Five disciplines of learning organization

Throughout the Social Lab workshops, we reflected on responsibility in the practices of the individual participants and their organizational context and developed ideas on how to change these toward a more desirable future. In the following, we describe these processes along the five disciplines of learning organizations.

4.4 System thinking

All Social Labs addressed the research system writ large, focusing particularly on how the systems’ particularities impact individual researchers and their organizations. Social Labs provided spaces to critically reflect on and develop ideas that may have challenged the essentials of the system. For this project, far-reaching changes to the organizations or the research system more widely were not sought or achieved. In the MSCA Social Lab process, participants reflected on the MSCA funding as part of a wider R&I system with different

No. of workshop attendees	EIT			ERC			EURATOM			JRC			MSCA		
	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd
17	17	10	6	18	14	14	9	7	6	-	14	11	21	17	21
Mediated stakeholder groups	KIC staff members, representatives of KIC project partners and the EIT headquarter. There was an overweigh of KIC staff members			ERC management rejected participation in the Social Lab which then included ERC grantees and researchers in ERC projects, evaluators as well as RFO and CSO representatives			Participants were from the nuclear research and innovation field but also one policymaker and one representative of a CSO participated			Mainly JRC staff members from management and fields like strategy and mobility. Some external researchers have been engaged			Participants had diverse disciplinary backgrounds and institutional settings. Some of them were currently MSCA funded or alumni		

Table 1.
Overview of social
lab participants

actors and dominant discourses, such as “publish-or-perish.” During the first workshop, some participants remarked that “the system” did not allow them to act responsibly in their daily practices. Similarly, in the EIT Social Lab, there was an awareness that the institute is caught up in the “EU bureaucratic system” with certain demands and that the (political) pressure on EIT to perform financially has taken away focus from the original aim of solving societal challenges. There was an understanding that elevating RRI on the research agenda of EIT, by collecting RRI examples across KICs, was only a small part of a solution to a rather complex problem about the position, aims and priorities of EIT externally defined.

In case of the JRC, the Social Lab was designed to foster a critical perspective on the status quo in research and in the JRC specifically. Participants challenged hegemonic research approaches that prioritize technological solutions related to connected and automated mobility. Participants also discussed the need to increase collaboration across JRC-units and beyond the JRC to diversify perspectives, in line with trends for open science. By the time the NewHoRRizon project engaged with the JRC there was an ongoing restructuring process initiated by the former Commissioner, which was very much in line with the ideas of system thinking.

In the EURATOM Social Lab, most participants had a shared understanding of the challenges EURATOM and nuclear energy in general faces: negative perceptions of the wider public. The single opposing voice, an NGO representative, dropped out after the first workshop due to frustration of not being able to challenge this dominant view and initiate a non-nuclear option change. After that, a unified narrative of the “system” soon emerged: the false belief that alternative sources of energy will satisfy growing energy demands and nuclear is not needed. This led to a suggested need for a more general acceptance of nuclear and scientists to (better) engage the public in discussions and knowledge transfer. Still, participants only partially engaged in system thinking, as they were not able to change perspective and to see concerns of others.

In the ERC Social lab, a diverse group of academics and representatives of CSOs and research performing organizations appreciated the merits of RRI and its potential uptake by the ERC that focuses entirely on curiosity driven research; but they also recognized institutional barriers for researchers to do RRI such as a lack of time, funding and having already too much work to do. The absence of ERC representatives and lack of cooperation from the ERC inhibited systems thinking; the Social Lab lacked *vis-à-vis* from the institution to whom it could address questions, concerns and ideas for change.

4.5 Personal mastery

Social labs were successful in procuring personal mastery as we experienced, in all of them, an increased interest in, reflection on and motivation to work with RRI among the participants who were part of the whole process. This said, barriers also surfaced. In the first MSCA workshop, personal mastery was supported in a World Café exercise where participants discussed perceptions and practices of responsibility in their professional context. In subsequent workshops and meetings, they have presented and discussed progress with the RRI initiatives and the obstacles they had encountered to learn from it and improve their ideas and actions further.

In the context of the JRC one participant, a JRC scientist who engaged in all three workshops said that (s)he “was doing research in a totally different sense” and that (s)he “thought that research on [public] “perceptions” is [only] for other [social science] researchers” not researchers in engineering.

In the EIT Social lab, one of the participants was quite skeptical toward RRI in the beginning but kept coming back for workshops and meetings and, like several other participants, eventually embraced its importance for the organization to change. They were increasingly willing to share opinions and discuss difficult questions as the Social Lab progressed, but participants also expressed difficulties to implement RRI initiatives, such as a lack of time and resources.

In some cases, personal mastery was limited by the impacts of system thinking. While personal mastery also emerged within the EURATOM setting, as pilot owners were enthusiastic about their planned initiatives, continuous support from the Social Lab team was necessary to develop the pilot action. Participants mentioned a lack of resources and lack of influence within their own organization as hindrances to engage more in the learning process and become change agents within their organizations.

Similarly, the ERC Social Lab observed that some participants perceived the financial support from NewHoRRIzon for pilot action activities as insufficient. Thus, the limited time resources available in their everyday work and/or the perceived small chance to push through their pilot actions against institutional barriers made several participants stop attending workshops.

4.6 Mental models

Throughout the Social labs, we observed dominant mental models within the five organizations which were often in line with aspects of system thinking. A number of participants expressed a desire to challenge these but at the same time it was acknowledged that this is difficult in practice. Participants challenged the dominant mental model in the MSCA; “excellent research” revolving around publishing work in high impact journals and garnering many citations. It seemed that the principles of RRI allowed different actors working in the system to discuss problems with the existing dominant model and develop alternatives. Participants shared different ideas of excellence, which involved being more responsible to early career grantees and operationalizing responsibility toward society through public engagement.

Similarly, in the JRC Social lab, participants did challenge mental models of doing research within a traditional epistemic frame and RRI offered a platform of reflection on such frames. However, critical voices to such challenge were also present; they preferred a more traditional understanding of science and expertise. This was referred to not as “excellence” but as providing evidence base to European policy; participants were proud to work in the JRC and their mental models, although challenging traditional ways of doing science, revolved around creating quantifiable scientific evidence to support decision-makers in “influencing the lives of five hundred thousand European citizens” as one participant expressed.

In the ERC Social lab, methods such as a plenary dialogue on how RRI could enrich but also burden the participants’ daily work, small groups about the potentials, visions and benefits of RRI for the work in the ERC, presentations about RRI and the results of the RRI diagnosis of RRI, stimulated participants to explore and express mental models of their work in research and innovation. These included the meaning of “excellence,” the question of social responsibility of researchers, working conditions and assessment criteria of research that hinder RRI uptake.

In the EIT Social lab, most participants expressed that they would not be able to achieve any profound change without involving the EIT headquarters and getting them to actively promote and prioritize the RRI agenda top-down. In the EIT KIC staffers are mostly research managers and organizers, while actual research is taking place in partner organizations. By

the third workshop, eight RRI stories were ready for publication, and it was discussed how to proceed. It was then suggested by one of the Social Lab participants to publish them in a scientific paper instead of directly on the EIT website, probably to achieve more visibility of the work done but also to gain “legitimacy” as an outside actor would then recognize the importance and quality. Other Social Lab participants supported a position paper as a more practical and perhaps also more activist, bottom-up approach. The workshop facilitator explicitly asked people to reflect on and express their assumptions; mental models were both identified and challenged but no consensus was made, ultimately stifling the publication of the RRI stories.

Participants in the EURATOM Social Lab had a shared narrative that the primary issue they face is the negative public understanding and perception of a nuclear based energy system. Their mental models were deeply ingrained in both the need for nuclear in the energy mix, but also their constant lack of public understanding and a world that did not value their simple message: “nuclear is the future” as one of the participants expressed. This mental model was not sufficiently challenged.

4.7 Shared vision

Social labs revealed that visions may differ and achieving consensus is challenging, often because organizational settings were perceived as too powerful or complex. In some cases, shared visions could be developed once broader institutional support was given or through dedicated methods.

In the EIT Social Lab participants did not fully agree on the status of RRI in EIT and where they wanted to be in the future. Upon reflection, the management team suggested that the facilitative questions posed in the first workshop and used to generate creative tension between reality and vision, were too fluffy, confusing and at times seen as pointless by participants, thus creative tension was not sufficiently established. Participants requested more structure, more RRI examples from the beginning, more time to work on and elaborate their plans and more management and leadership in the direction they should be headed. In hindsight, this may have been a hindrance to the process and the facilitative approach should perhaps have been better adapted to the specific participants.

Generating a shared vision was not straightforward in the ERC Social Lab either. Participants had different opinion about what role RRI should have in the ERC. Some acknowledged and valued the ERC’s unique role of solely funding curiosity driven, bottom-up research. Others emphasized institutional barriers, which hinder them from doing RRI as researchers. Some participants were not convinced about RRI and advocated other concepts, such as science communication, but those who stayed on in the Social Lab developed a shared vision of doing RRI in their work by operating the specific pilot actions. Drop-out of disinterested or openly opposing participants had the effect of offering a more straightforward trajectory to build shared vision by and for those who remained; however, it was clearly a hindrance to challenging mental models or engaging in system thinking.

In the EURATOM Social Lab, a shared vision was present from the outset, shared by most participants. However, participants also felt that concepts and problems behind the challenge would have required more discussion, such as addressing the questions of “why is there no awareness”; “by whom” and “what is meant by awareness.” For this reason, the frustration of participants did not turn into creative energy for change.

Throughout the MSCA Social Lab, participants succeeded in creating shared visions and a crucial part of this was a visioning exercise at the first workshop. After the first day, during a working dinner, participants were asked to reflect on what their work would look like if RRI was realized according to their own vision in 2027. They wrote this down on a

postcard and discussed it with their neighbors over food and drinks. This exercise proved to be fun and fruitful. The following day they were asked to present their vision to the group and in a back casting exercise, made their visions more concrete and clustered the steps necessary to reach their vision.

In the JRC Social Lab, which at the time was undergoing a restructuring process very much in line with ideas of RRI, the ongoing change process and discussions that were ongoing aided the establishment of a shared vision in the Social Lab workshops that included, for example, stakeholder engagement, governance and gender aspects to be taken up in the daily work of researchers.

4.8 Team learning

Establishing team learning was at the core of the Social Lab method [7] as participants were to take actions, learn from them and adapt them along the way in and between workshops. This worked well in most cases, including in the ERC, JRC and MSCA where some pilot groups took a journey together to implement the actions and find ways to overcome challenges and realize their shared vision. Yet, participants in the JRC Social Lab also reported that there was too little exchange within groups working together on different aspects of the pilot action. Other groups, in EURATOM or EIT, dissolved over time; team learning did not happen and facilitation and assistance for sharing knowledge and work toward change in heterogeneous teams came short of creating actual learning. In the case of EURATOM, pilot actions were implemented mainly by one organization (responsible for the pilot action), this meant that only in the preparation and mainly in the reflection phase team learning occurred. In the EIT Social Lab, team learning was never sufficiently established as experimentation was never truly initiated, most likely because of the lack of a clear shared vision and the opposing mental models described earlier (Table 2).

4.9 Outcome of the Social Labs

4.9.1 Pilot actions. The five Social labs produced 11 pilot actions of different scope. Table 3 provides an overview. In general, the Social Lab process and its ambition for experimental outcomes oriented toward systemic change had been challenging for participants. The format of the Social Lab was unfamiliar to most participants, and the experimental and deliberative process was not without disputes (especially in the case of EURATOM, EIT or the JRC). Some of the participants found that the Social Lab process was too generic and too much focused on conversation and reflection as well as concepts rather than specific examples, actions and guidance or directions and management than practitioners would have expected.

From an organizational perspective, participants found RRI a good vehicle to question the organizational structures and top-down mode of operation (in the case of the EIT) and non-inclusive, non-participatory ways of doing research (in the case of the JRC). The pilot in the case of the JRC focused on this challenge: how to include stakeholder's and citizens' knowledge in research (in autonomous mobility futures). The pilot also included interviews to challenge technology focus in transport research within the JRC and ambitioned to include learnings from alternative, less technology-fix focused narratives. This resulted in creating an RRI toolkit for research within the JRC, a clear ambition to challenge existing operational principles in line with the mandate of the unit leading the Social Lab process within the JRC tasked to foster change.

In the case of the MSCA, Social Lab pilots were designed to and experimented with questioning and ambitioning change in operating principles: workshops to involve citizens from the start through co-creation and co-design or briefing MSCA policymakers to go beyond bibliometrics and focus on open, responsible and societally engaged research.

Table 2.
Summary of the
characteristics of the
learning organization
in the five selected
social labs

Disciplines	ERC	MSCA	EIT	JRC	EURATOM
System thinking	<i>Partly activated.</i> ERCs refused to participate on institutional and systemic barriers for RRI	<i>Activated.</i> Participants challenged the performance-oriented research and innovation system	<i>Activated.</i> Participants reflected EIT's role in balancing EC (system) and the KICs (bottom-up) priorities	<i>Activated.</i> Participants challenged established research to automated mobility and governance at the JRC	<i>Not activated.</i> Participants shared critique of public perception of the energy system, alternative point of views were disregarded <i>Partly activated.</i> Openness toward addressing problems even though they seem challenging <i>Not activated.</i> The dominant mental model of 'the public's lack of understanding of nuclear energy' was hardly challenged <i>Partly activated.</i> A shared vision for developing strategies to raise awareness about energy-use was partly established <i>Partly activated.</i> Pilot group engaged in team learning as collaboration was needed to prepare the pilot action, feedback to
Personal mastery	<i>Partly activated.</i> Participants who developed pilot actions became committed to learning	<i>Activated.</i> Participants critically reflected on ideas of responsibility e.g., through a World Café exercise	<i>Activated.</i> Participants became interested in RRI and willing to share and challenge ideas	<i>Activated.</i> Participants critically reflected on research and innovation as well as stakeholder engagement	<i>Partly activated.</i> Participants engaged in team learning as collaboration was needed to prepare the pilot action, feedback to
Mental models	<i>Activated.</i> Participants critically reflected on ERC and institutional enablers and barriers of RRI	<i>Activated.</i> Participants challenged excellence as key aspect of publishing	<i>Partly activated.</i> That the dominant top-down approach to RRI was only partly challenged by a minority who favored a bottom-up approach	<i>Activated.</i> Discussions on more reflexive and collaborative approaches in research and innovation and at the JRC	<i>Not activated.</i> A shared vision for developing strategies to raise awareness about energy-use was partly established <i>Partly activated.</i> Pilot group engaged in team learning as collaboration was needed to prepare the pilot action, feedback to
Shared vision	<i>Partly activated.</i> Participants who engaged in a pilot action developed a shared vision of RRI and their action	<i>Activated.</i> Vision building and back-casting made visions and necessary steps toward these more concrete	<i>Not activated.</i> No clear and shared vision for the pilot actions was established	<i>Activated.</i> Participants developed a shared vision of RRI as 'tool' for institutional change	<i>Partly activated.</i> A shared vision for developing strategies to raise awareness about energy-use was partly established <i>Partly activated.</i> Pilot group engaged in team learning as collaboration was needed to prepare the pilot action, feedback to
Team learning	<i>Activated.</i> Team learning happened in and in-between workshops, particularly in the pilot action teams	<i>Activated.</i> Pilot groups taking a journey together to implement actions	<i>Not activated.</i> Hardly any team learning because of opposing mental models and diverse visions	<i>Activated.</i> Opportunity to engage with and learn from other people at JRC around aspects of RRI	<i>Partly activated.</i> Pilot group engaged in team learning as collaboration was needed to prepare the pilot action, feedback to

EIT	<i>RRI show</i> A collection of eight RRI case stories across EIT KICs to demonstrate the feasibility and the benefit of RRI in the KICs and elevate RRI on the research agenda in the EIT
ERC	<i>Euroexpert and RRI</i> An RRI-inspired website to communicate research findings to the interested public and practitioners. It includes blog-posts, podcasts, a course outline and the open database <i>Quadralogue</i> A game that brings together researchers, community members, students and research administrators to share their perspectives on the impact of research to learn from each other
JRC	<i>JRC RRI and connected and automated mobility</i> The pilot action was linked to an ongoing project on connected and automated vehicles at the JRC. It included a literature review, analysis of (expert) narratives, qualitative interviews, focus groups, a Eurobarometer survey and co-creation workshops using mobility mockups. Major aim was to complement technology-oriented research by reflexive and participatory measures
EURATOM	<i>Teach the teacher</i> Workshop training for high school teachers in nuclear research <i>Nuclear dating</i> Event in which emerging social scientists discussed opportunities and challenges related to nuclear energy with physicists working in the field <i>EURATOM proposal AI ENEN+</i> A joint research proposal to attract young talent for nuclear research by adapting the RRI framework in education and training
MSCA	<i>Knowledge Kiosk</i> A series of workshops to develop a dialogic engagement tool in which citizens are involved from the start through co-creation and co-design <i>RRI Career Assessment Matrix</i> A policy brief in which MSCA policymakers were asked to update current career evaluation criteria to go beyond bibliometric and focus on open, responsible and societally engaged research <i>RRI Manifesto</i> A comic about Marie: an early career researcher who is lacking RRI capacity building in training and a session at ESOF on the importance of RRI and OS for developing transferable skills with researchers <i>RRI Training</i> An NCP training on RRI in advice giving to prospective MSCA applicants

Table 3.
Pilot actions
developed in the
selected social labs

The EIT Social Lab participants, all of which have been engaged in EIT KICs, have learned about RRI and started reflecting on some of their own and their organizations' practices, and for some of them, this process has spurred a genuine interest and concern about RRI and a motivation to do something about it. Emanating from this new knowledge about and interest in RRI, one of the Social Lab participants planned and executed a training workshop on RRI and public engagement for post-docs in food sciences (EIT Food). The Social Lab also brought the discussions about RRI to higher levels within the EIT, at least to some degree. The Social Lab participant from the EIT headquarters talked about starting a permanent working group on RRI in EIT, though, the initiative should come from the KICs. S(h)e also invited the pilot driver to present the RRI stories at a meeting to other EIT stakeholders in Brussels.

In EURATOM Social Lab participants, researchers and research managers engaged in nuclear research and being fearful of a growing sentiment against nuclear in the energy mix, have learned about and appreciated RRI as an instrument to engage stakeholders in a

dialogue to discuss benefits and pitfalls of nuclear energy. This however, led to a research project only and other pilot actions were aborted or not even begun.

In general, almost all participants in the Social Labs were hindered in learning by external pressures, lack of resources and “the system” that inhibited RRI uptake and change. The “disciplines” in most cases, as seen from [Table 2](#) were mobilized to do the learning work required for change. Learning about RRI and its potential was embodied in the pilot experiments, some of which were scaled up, as in the case formally in the JRC and more informally in the case of EIT and MSCA, to foster higher order change within the ecosystem of the research domain. However, organizational and mundane everyday limitations – workloads, hierarchies and a general lack of felt agency – prohibited Social Lab participants to transform learning into organizational agency of change.

5. Discussion

In science governance, intermediary organizations serve a variety of goals, by gathering and conveying information, by engaging, convening and supporting constituencies, developing quality standards, leveraging resources, preparing policy-oriented documents and so on ([Anthony & Austin, 2008](#)). While doing so, some intermediary organizations function merely as a channel for conveying knowledge without altering the content of what is transferred, while others function as change agents, with a clear normative orientation, acting as “champions” for some cause ([Martiskainen & Kivimaa, 2018](#); [Kivimaa, Boon, Hyysalo, & Klerkx, 2019](#)). In our case, the Social Labs were intended to take that latter role in view of RRI, to which end they should enable learning on the subject. Let us consider how both aspired roles for the Social Labs – learning and intermediating – worked out in practice.

Our data show that the *context* in which Social Labs were set up was of crucial importance to the role they played in terms of learning and mediation. Learning occurred in the context of institutions that were open to change, either by top-down organizational push as in the case of the JRC or bottom-up individual pull as was the case with MSCA. Representatives of EURATOM saw the opportunity to discuss change and use the intermediary nature of the Social Lab to further their agenda: pushing awareness of the need for including nuclear power in the energy mix of the future. In general, we found that Social Labs became venues for exchange and mediation between representatives of different institutions of science, and a wider network of social actors and institutions of policy, either in a context in which institutions were prone to change (such as in the case of JRC) or where stakeholders felt empowered to articulate their own role as change agents (in the case of the MSCA). In Social Labs operating in a context that was more closed toward change, as the ERC or EIT, the intermediary functions were mostly directed toward creating some momentum or, by convening and engaging critical constituencies (as in the case of the ERC), creating framework conditions for potential change. However, without clear links or institutional openings to mediate between the permanent organization and diverse groups of stakeholders, the possibilities for inciting learning – on RRI and on engaging with societal challenges – fell short. This was the case with the ERC which declined participation in the Social Lab [\[8\]](#), and EURATOM where only the supervisory representative from the EC participated. This confirms what was observed in [Section 3](#), that some organizations in the science governance system in Europe deliberately present themselves as non-learning organizations, while blocking access too to those temporary intermediary settings that could challenge their collective mental models toward learning and change.

In addition to context, also the *temporary status* of the Social Lab had an impact, notably on the Labs’ potential as learning organization. The Social Labs were designed as temporary

settings, as they were part of a project with a limited timeframe. While the limited timeframe had been a baseline condition, because of the voluntary basis of participation, it was often seen as an impediment: participants in some Labs for instance felt unsure about how their pilot action outcomes were to be continued or embedded in permanent institutions, if at all. Another implication of the temporary status was that those participants who were delegated by permanent formal organizations participated through-out the Social Lab process, as they had the resources to do so. Researchers or other actors who were engaged without pay and on top of other duties saw participation and pilot experimentation as challenging to manage, even if they were interested or willing to commit. This clearly hindered living up to the learning ambitions, especially that of *team learning* which required committed engagement throughout the process.

Another effect of the temporary dimension was that in some cases, a narrative on RRI emerged in haste that thereupon became dominant, pushing the Social Lab in a particular direction while foreclosing alternative narratives built on different visions. That in turn hindered team learning too because of the speed in which pilot actions were to be designed and executed. In other cases, a Social Lab did not come up with an energizing *shared vision*, a prerequisite for determining targets, improvement strategies and goals for learning. This was especially evident in the case of EIT and EURATOM, in the Labs on which members felt that a shared vision was not possible to achieve. In the latter case, as a result, the CSO participant who was critical of the nuclear-enthusiastic approach of those organizationally attached to EURATOM or working within nuclear research, opted out of the Social Lab process. This in turn limited the participants from actually learning toward change, as mental models were moored firmly within the status-quo frame.

The substantive focus on RRI proved a trigger for *reflection on mental models* and *personal mastery*: the idea of doing research from a responsibility perspective called for self-awareness and reflections on research relationships. Discussions on what RRI might entail invited participants to learn more about the topic as an EC policy construct, but also about what it could entail in their respective domains of research; designing pilots necessitated to understand RRI on the praxis level, translating abstract principles into action in real life. Pilots, such as the “Quadrologue,” “Nuclear dating” or the “RRI manifesto” stemmed from learning and personal mastery and resulted in tools that other, non-participating researchers could use to reflect their research practice and learn about the potential of RRI in their own professional context [9]. In other words, the Social Lab process of planning, designing, reflecting, re-planning, re-designing, re-reflecting and so forth was conducive to enhancing personal mastery of the skills involved in “doing” RRI.

In most cases, a sense of “success” among Lab participants and Social Lab teams implied that the disciplines were performed tacitly. Notably in those moments when Labs were found to be challenged – with participants dropping out, pilot actions being abandoned etc. – facilitators assisted participants to do “the work” involved in learning, e.g. of building shared visions and enabling team learning. Solutions usually in such cases were made the topic of co-design efforts together with participants.

The self-reflection required in the articulation and implementation of practice-based RRI challenged participants to scrutinize their mental models in terms of RRI. Discussions in the Social Labs often upended traditional research and innovation beliefs, mind-sets and assumptions. This was for instance evident in the case of the JRC: a revision of mental models led to a complete overhaul of an already planned project, toward including citizens, accommodating alternative narratives and ways of addressing the problem of autonomous driving. Reflections on science and innovation practice in terms of social engagement, science education and gender led to the joint preparation of an unexpected proposal for a

research project in EURATOM, which focused on nuclear education and training in an RRI framework. The planning of and reflection on the pilots challenged the way participants thought about ambitions of research and innovation as well as their own motivations for working in research or innovation. Some of the experiments proved to be transformational: physics PhD students who engaged in “Nuclear dating” were overwhelmed by the interdisciplinary discussions (de Villafranca *et al.*, 2022); JRC researchers were surprised to see how ordinary citizens in interviews brought up completely different points of views related to autonomous driving than researchers had assumed. In other words, discussing research agendas and projects in terms of RRI challenged deeply embedded assumptions regarding thinking about and doing science.

The joint reflections in most cases resulted in *building shared understandings and a joint vision* on responsibility in science and innovation in almost all Social Labs, with the notable (partial) exceptions of the EURATOM and EIT Labs. The experiences with EURATOM and EIT underscored Senge’s point that building a shared vision is a prerequisite for group formation and group learning. In the Labs where building a shared vision succeeded, the Social Lab can be argued to have turned into a temporary *organization*: the action orientation, the joint learning and the experimentation/reflection process transformed a group of heterogenous people into an organization, albeit temporary, working toward a shared goal or purpose in view of mainstreaming RRI in the European Research Arena. They have members with specific qualifications that are assigned with tasks; they are not closed systems, but interact with their environment; have shared, informal and formal, goals and purpose; have their own rationality and structure (Abels, 2018; Mandl & Mandl, 2021).

System thinking in the Social Labs was enhanced because of the heterogeneity in participant selection: participants from “all over” a science governance domain formed a group to discuss mutually shared challenges and perspectives beyond individual experiences and preferences. More importantly, experimentation with RRI in practice and reflection on mental models, explicated how “non-RRI-informed” characteristics of the science (governance and funding) system influenced research and innovation practices. Individual self-awareness as a consequence amounted to system awareness. The Labs thus provided a setting in which participants came to realize that “the system resides in everyone,” as Senge explains in Reese (2020, p. 13): “People think the learning organization is a system and the system lives outside of me,” a common view which he posits can change under particular circumstances that produce “an ‘ah ha’ moment.” Experiences in the Social Labs discussed here underscore this claim. For instance, such an “ah ha-moment” was witnessed in MSCA, where Lab participants on day one of the first workshop sighed that it was “the system” that kept them from engaging in RRI-informed research practice, while on day two, after dedicated facilitation, a participant enthusiastically blurted out: “Oh, but it is really us [researchers] then, who are at the wheel, we make up the system” (pers. communication MSCA WS1).

Reflecting on and discussing RRI in relation to their respective research areas led participants to address issues of system embeddedness. Some pilot actions that were co-created in the Social Labs under scrutiny, like the “RRI show” and “RRI training for NCPs” explicitly aimed to address system level change and suggest participants’ engagement with systems thinking. Such pilot action experimentation contributed to the realization that, while working as individuals or on discrete projects, they are part of the European Research Arena (ERA) and became aware of the limitations that this embeddedness presented, for instance, because of ERA’s bureaucracy or its bibliometric framing of the reference for “research excellence.”

The Social Labs' intermediating role critically hinges on a combination of the conditions created within the Labs to foster learning and the conditions under which Social Labs may inform learning about responsibility in research and innovation in European science governance. Because the Labs were set up as temporary organizations, they were not seen as posing a bureaucratic challenge (with the possible exception of the ERC) to permanent science governance organizations. This arguably created favorable conditions for learning transfer: because the Social Labs would eventually dissolve, permanent organizations were offered the opportunity to take up what they were open to and ignore what they experienced as threats to "getting their job done." Considering that most science governance organizations are non-learning organizations (by choice), the temporary Social Labs presented a suitable format to inform the governance system about RRI, more so than if permanent governance organization were coerced into learning on the topic. This might strongly benefit the uptake of what they perceived as required for RRI suiting their context and drop what did not fit these criteria.

The temporary nature of the Labs proved beneficial for the Labs to perform their intermediary function. This worked well notably in the Labs which were explicitly endorsed by the respective *H2020* lead organization. But even if that was not the case, participants themselves were able to establish exchanges between their Lab and relevant organizations in their respective domain, such as in the case of MSCA. If the environment was less supportive, as in ERC and EIT, managers and facilitators made efforts to turn their Labs into intermediating organizations. This was possible in the case of the ERC, while less so in the case of the EIT. As observed above, this proved to be detrimental for the Social Lab: no shared vision and team learning emerged, with little potential impact for the uptake of RRI in the EIT ecosystem.

The intermediating role differed among the Social Labs. In some Labs, participants saw RRI uptake limited by system-wide barriers, such as the publish-or-perish logic dominating the entire science system. In other Social Labs, the lack of institutional feedback-loops was considered limiting. Regardless of such differences, all Labs presented deliberative and creative forums for sociopolitical coordination between multiple actors, cutting across realms of state, research and innovation and civil society.

6. Conclusion

Even though it was to varying degrees that the five selected Social Labs succeeded in enacting all five disciplines as identified by Senge, our research and experiments suggest that Social Labs as organizational form *can function as learning organizations*, because in principle, they present a setting in which these disciplines can be enacted. Furthermore, we found that the substantive focus of the learning involved, on responsibility in research and innovation, proved conducive to system thinking. The space which Labs offered individuals brought to the fore, with variations, how the science (governance and funding) system influenced their thinking and acting as researchers. Because participants addressed aspects of the system which they considered problematic or ill-informed from an RRI-perspective and based on their own normative position or the diagnoses produced in the NewHoRRIZon project in preparation of the Social Lab process, they addressed system level issues in a learning-by-doing manner on the level of practice, questioning the conditions that govern (their part of the) science governance system.

The fact that Social Labs by design were temporary organizations offered advantages and disadvantages for learning on RRI. It brought about a sense of urgency among participants to address the issue of responsibility. Yet the temporary nature of the Labs also detracted from the learning potential. Challenging across the board was the establishment of

a shared vision among participants, while instigating individual reflection on mental models and personal mastery proved particularly feasible. Haste hampered shared vision building even further.

We conclude, in view of our first research question that, overall, the Social Labs functioned as temporary organizations. The specific characteristics of a Social Lab: such as their orientation toward RRI, experimentation and reflection on the topic produced the conditions that in principle foster learning. The format of the Social Lab, notably in view of the focus on responsibility in research or innovation, is well-suited to enacting the five disciplines as identified by Senge, in particular system thinking, shared vision building and team learning. If these are in place, Social Labs *turn into* learning organizations – a group of people collaborating and being managed for a specific purpose. If this is not the case, because of Lab-internal and contextual dynamics, learning takes place among individuals within the organizational setting, as Social Labs explicitly aim for personal mastery and challenging existing mental models. The Social Lab format induces participants to explicate often tacitly held images and assumptions, to open these up to the scrutiny of themselves and others and, because of the heterogeneity of the participant group, to revise these to develop a joint understanding of a desirable future that fosters genuine commitment and engagement.

This brings us to our second point of attention, the conditions under which Social Labs can inform learning about responsibility in research and innovation in European science governance. Our findings show that the Social Labs presented intermediary spaces that enabled exchanges on the perspectives, ambitions and visions of a wide range of stakeholders from across the science (governance and funding) system. Because of their temporary nature Social Labs created the potentiality of learning on RRI *between Labs and their context*. Because they did not pose a bureaucratic challenge to permanent organizations within the science governance system, they opened the possibility for those organizations to engage in learning on, or at least be informed about, RRI in a way that suited their interests and concerns (also to those which choose to act as non-learning organizations).

To which extent the Social Labs actually assisted in transferring insights about responsibility in research and innovation to permanent organizations and system level is beyond the scope of our present research and requires further investigation. Having said this we conclude from our cases that, given the limitations due to context and the temporary nature of the settings, *Social Labs can act as intermediary organizations*, which not merely pass on information among actors (in our case about RRI as a policy construct), but also actively give substantive shape to what they convey. In our case, this refers to what RRI might entail in practice from a normative orientation (cp. Åm, 2013; Kivimaa *et al.*, 2019). In other words, the studied Social Labs served, because they were so designed and enacted, as *temporary, intermediary learning organizations* on RRI. As such, they themselves contributed to creating the conditions under which they could inform learning about responsibility in research and innovation in European science governance system.

By serving as forums for deliberation, they offered opportunities for exchanging information and sociopolitical coordination between multiple actors cutting across realms of state, research and innovation and civil society. The extent to which they were actually able to perform these functions was strongly contingent on contextual dynamics. Furthermore, because of their embeddedness in a networked system they are by definition limited in their ability to foster transformative change even if they function as learning organizations. The transformative change that is involved in moving toward a more democratic research and innovation system (Braun & Griessler, 2018) requires complex modes of learning that go beyond the scope of the pilot actions experimented with on a Social Lab level.

Still, within the confinements of their design and setting, our data show that Social Labs are well suited to address emerging, complex, contestable challenges and normative ideas that require processes of cooperative and contextual discussion and mutual learning. More importantly, they present a useful form for learning in settings “where people continually expand their capacity to create results they truly desire, where new and expansive patterns of thinking are nurtured, where collective aspiration is set free, and where people are continually learning to see the whole together” (Senge, 1990, p. 3). Our results support Hansen *et al.* (2020) in their claim that RI and RRI on the one hand and habits practiced by a learning organization – in our case, a Social Lab – on the other hand, reinforce one another. What our findings add to their insights is that this relation holds true also for non-for-profit organizations, and notably one in a transient, intermediating role, in a networked governance setting.

It is in view of the governance of science and innovation, that our experiences with Social Labs seem to hold a promise for the future in view of supporting the endorsement of notions around responsibility in innovation and science. Conceived as vehicles to address “wicked” and “non-solutionist” governance challenges and designed to offer input and create knowledge to better govern science, Social Labs are especially suitable to present the collaborative spaces and intermediary organizational arrangements that are called for in view of RRI for reflection, anticipation and engagement. Consequently, Social Labs may well provide the foundations for an experimental governance frame that may be referred to as participatory action governance, that may better fit the implementation of RRI and other critically and democratically inclined areas of operation into the policy fabric of the ERA. A range of Social Labs as intermediary institutions could be knit into a patchy framework of non-hierarchical, experimental settings serving as a coordination structure as opposed to the more hierarchical frame of multi-level governance based on centralized reporting and adaptation. Applying such an approach in respect to RRI may offer a coherent and convincing policy approach for appealing to both policy-makers and science practitioners.

Notes

1. Concerns about science in relation to citizens had been expressed earlier, under a variety of labels, in view of democratizing science and in response to public controversies over science or technological development.
2. The NewHoRRizon project ran from May 2017 to September 2021. Coordinated by Erich Griessler, it involved 20 organizations from research, research funding and civil society. Project partners were Institute for Advanced Studies, Aarhus University, Teknologian tutkimuskeskus VTT Oy, FFG, Fraunhofer Gesellschaft, Wageningen University, Fondation Nationale des Sciences Politiques, Fundacion Tecnalia Research & Innovation, Universiteit Van Amsterdam, GENOK, Euroscience Association, Sihtasutus Eesti Teadusagentuur, Technologicka Agentura Ceske Republiky, Zentrum fur Soziale Innovation, Vereinigung Deutscher Wissenschaftler, Universiteit Leiden, Ministerie van Economische Zaken en Klimaat, The University of the West Indies, Colegio Mayor De Nuestra Senora Delrosario Corporacion Sin Animo De Lucro, Education and Youth Board, Universiteit Maastricht. Information about the project and its results are available on the project website www.newhorizon.eu and on CORDIS <https://cordis.europa.eu/project/id/741402>.
3. The Social Labs developed altogether 59 pilot actions that covered all five RRI keys and were directed at researchers, research funders, policymakers, representatives from business, civil society, and citizens. The pilot actions can be explored in the virtual exhibition “RRI.Ex” (<https://newhorizon.eu/ri-ex/>) as well as in a Pilot Action Booklet (NewHoRRizon, 2021).

4. E.g. by reflecting on their combined roles of reflective scientist, process facilitator, change agent, knowledge broker, self-reflexive scientist and how this affected the work (Wittmayer and Schöpke, 2014).
5. Experiences, both cognitive and emotional, may generate further ideas and are reflected upon in learning cycles by Social Lab participants. Such experiments and iterative reflections through presencing serve to bridge narratives with potential material or semiotic accessibility for other stakeholders (Senge *et al.*, 2005). As Social Labs are iterative and agile, they are particularly well suited to address the specific temporalities that are reflected in the phenomenological causality and implication, as well as the diachronicity of experience, its evolution in memory and the reflection (Wilde, 2021). Trauma: phenomenological causality and implication. *Phenomenology and the Cognitive Sciences*. <https://doi.org/10.1007/s11097-020-09725-8>. These may provide especially important opportunities for learning about ambiguous and value-laden orientations.
6. The pilot action process for each Social Lab is documented in individual reports (<https://cordis.europa.eu/project/id/741402/results>), and a Guide to Good Practice is available for practitioners (<https://cordis.europa.eu/project/id/741402/results>).
7. Cf. <https://ec.europa.eu/research/participants/documents/downloadPublic?documentIds=080166e5db5346d6&appId=PPGMS>
8. Only in the last workshop a ERCEA representative participated in the Social Lab.
9. Cf. <https://cordis.europa.eu/project/id/741402/results>

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