Responsible Research & Innovation: The developing role of interdisciplinarity

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ABSTRACT

Responsible Research and Innovation (RRI) represents an emerging policy framework for supporting science and technology to enhance both their internal processes and their relations with society. Interdisciplinarity within, and between, SSH and STEM could strongly contribute to boosting this process of change and, in turn, is strongly supported by RRI-oriented policies. However, in addition to the numerous factors (social, epistemological, institutional, and professional) that hinder interdisciplinarity, some obstacles specifically concern how RRI is interpreted and managed. Despite this, new forms of interdisciplinary collaboration through RRI programs are emerging and spreading. In this sense, RRI can be viewed as an opportunity to enhance and enlarge the scope of the interdisciplinary work within and between SSH and STEM, through specific strategies and the active involvement of key R&I actors.

SUMMARY

- Responsible Research and Innovation (RRI) has been proposed by the European Commission as a policy framework to make Research and Innovation (R&I) actors more responsible for the social, ethical, and legal implications of science and innovation.
- Interdisciplinarity within, and between, SSH and STEM could greatly contribute to enhancing RRI. It helps scientists identify and anticipate the societal implications of their research and enhances the contribution of science to understanding and solving the societal challenges Europe and the world are facing. In turn, RRI offers motivation and opportunities to promote interdisciplinary work.
- However, several factors, both general in nature and related to the way RRI is interpreted and implemented, are hampering or limiting the role of interdisciplinarity in the construction of responsible research.
- These factors notwithstanding, new RRI-oriented collaborative practices are also emerging, moving towards three main directions: 1) creating new collaborative spaces (like living labs and citizen science platforms), 2) promoting institutional changes in research organisations, and 3) establishing new RRI-based interdisciplinary institutions and programmes.
- Three priorities for SSH are identified: 1) grounding RRI on a genuine interdisciplinary perspective, 2) reinforcing research on RRI in innovation, and 3) creating support services to research organisations to favour RRI mainstreaming across Europe

KEY DEFINITIONS

Responsible Research and Innovation (RRI): Taking care of the future through collective stewardship of science and innovation in the present [1, p. 1517]. 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 (...) society. [2, p.1]

Interdisciplinarity: Integration of tools, methods, and theories from various disciplines (within the academia) to answer a question, solve a problem or address a topic that is too broad or complex to be dealt with adequately by a single discipline or profession [3, p. 36]

Transdisciplinarity: Opening of academic disciplines to players outside the academic world to include and integrate knowledge produced outside the academic system [3, p. 36]

Introduction

Starting from the EU's Horizon 2020 research and innovation Framework Programme (2014-2020), RRI has been proposed as a policy framework to respond to a series of demands for change in research and innovation governance that emerged from the 1990s onwards [5]. These demands concern changes to be promoted both in research organisations and the research process. The CE's approach to RRI [2] is more focused on institutional change in specific sectors of the life of research organisations (engagement of the public, gender equality, open access to scientific data and products, research ethics and integrity, and scientific education), dealing with the research process only marginally. On the contrary, researchers and experts [1] are more focused on how to embed RRI in the research process to make it more inclusive (open to the contribution of external stakeholders from its early stage), self-reflective (holding "a mirror up to one's activities, commitments and assumptions"[1, p. 1571]), responsive (identifying and managing potential risks related to research and innovation activities), and anticipatory (making research taking into consideration the future of research, innovation, and society) [6].

This literature brief intends to explore interdisciplinarity from an RRI perspective, considering obstacles and limitations and tools and strategies to strengthen it.

Current Understandings

Significant Findings to Date

There is agreement among scholars on how much RRI could benefit from the implementation of interdisciplinary collaborations.

Interdisciplinary work is argued to be essential for RRI based on **two main arguments**. On the one hand, RRI urges scientists to focus on the **"societal challenges"** that Europe and the world are facing [17], the complexity of which is largely due to the continuous intertwining of natural, technological, social, cultural, ethical, psychological, symbolic, and regulatory dynamics. Hence the need for more robust interdisciplinary and transdisciplinary perspectives to address them. On the other hand, RRI calls for better management of **far-reaching downstream implications** of research [6] which cannot be properly managed without solid cooperation between disciplines and the involvement of non-scientific knowledge.

On the reverse side, since RRI urges disciplines and social actors to cooperate during the whole research and innovation process, it can be also seen as a **powerful tool to promote interdisciplinarity and SSH-STEM collaborations** [6]; and, indeed, in many RRI projects implemented in this last decade, numerous innovative collaborative practices have been developed and disseminated.

However, the interdisciplinary and transdisciplinary work explicitly connected to RRI is still unsatisfactory because of many (social, epistemological, institutional, and professional) factors [4], some of which are specifically related to how RRI is interpreted and managed. These factors can be organised into three main groups.

RRI as a weak policy framework. RRI is still a weak policy framework to promote interdisciplinarity. It is a buzzword [18], an umbrella word [19], susceptible to different interpretations, and a concept too ambiguous to be comprehensible for STEM researchers and policymakers and too abstract to be attractive for SSH researchers [7]. Different interpretations of RRI are also given within SSH disciplines (for example, Science and Society Studies researchers are more focused on RRI governance-related mechanisms while other SSH researchers are more interested in the RRI keys) [EF]. Moreover, the research communities based on the different RRI keys (public engagement, gender equality in science, research ethics and integrity, science education, and open access) tend to remain isolated from each other and not recognise themselves as part of the larger RRI community. All this often limits the weight and impact of interdisciplinary work or makes it a simple tokenistic exercise [7].

Narratives on RRI. Some dominant and somehow distorting narratives exist about the collaboration between SSH and STEM in the RRI field, hampering effective cooperation. Policymakers and the same researchers tend to see SSH disciplines as inherently reflexive and STEM disciplines as poorly or not at all reflexive. Thus, interdisciplinarity appears to be a one-way process, in which SSH knowledge and practices contribute to making STEM more reflexive and more focused on the societal aspects of their research [7, EF, DR]. Although this assumption, shared by not a few researchers, is false and biased [EF, DR], its consequences on SSH-STEM collaborations can be remarkable. In particular, It leads SSH researchers to perceive themselves as the sole ones responsible for activating RRI in STEM areas [9], to see themselves as bringing much value and knowledge without receiving much in return [10] and even to feel not being welcomed and taken seriously by STEM researchers as if they are trespassing on land which is not theirs [7]. Consequently, SSH researchers are also inclined to attribute failures in interdisciplinary work to STEM researchers' attitudes and lack of commitment [11]. On the other side, STEM researchers tend not to see SSH researchers as real partners in interdisciplinary work, but as facilitators to assist them in, e.g., recognising the social implications of their own work or as communicators facilitating the relations with stakeholders and the public [12].

Role of practitioners. Another factor to consider is the increasing role played by RRI practitioners, i.e., professionals with specific skills and capacities to design and implement RRI-oriented programmes. On the one side, their presence helps better define the contribution SSH disciplines can give to RRI and counter the perception that SSH researchers are RRI facilitators [EF], even though RRI practitioners' know-how (related to, e.g., communication, knowledge brokerage, co-creation, or participatory processes) is based on SSH disciplines. On the other hand, the growing role of practitioners makes it more challenging to identify the areas in which collaboration between disciplines is useful or necessary [EF] and their own position and policy role in the RRI context remains poorly defined and ambiguous [20].

Emerging Practices

The above picture describes a contradictory situation. Interdisciplinary work within and across SSH and STEM disciplines is invoked as essential to support responsible research and innovation and is therefore promoted in RRI-inspired

initiatives. At the same time, however, RRI seems to be a still weak policy framework to adequately support inter- and trans-disciplinary cooperation and there is not always a convergence on how to interpret RRI. Perhaps the most effective way to overcome this situation is to recognise, strengthen and disseminate the interdisciplinary practices that RRI is nevertheless helping to bring to the fore. Overall, they are moving in three main directions.

- **RRI-oriented spaces for interdisciplinarity and transdisciplinarity.** The first direction is creating RRI-oriented spaces to practice interdisciplinary relationships, often outside or at the boundaries of the academy. This is the case of living and social labs or citizen science platforms involving all stakeholders (industry, policymakers, public administrations) [13, 14] or even light but regular forms of SSH-STEM cooperation within long-term research environmental programmes [DR]. For example, the Universitat Autònoma de Barcelona established a living lab serving as a physical space to practice interdisciplinarity and transdisciplinarity[1]. Similarly, Mistra Urban Futures[2] has created Local Interaction Platforms to facilitate the co-creation, design and development of research and development projects.
- **RRI-oriented institutional change.** The second direction is supporting the institutionalisation of RRI practices in research organisations, thus also favouring interdisciplinary within and between SSH and STEM researchers. Research organisations have increasingly promoted institutional change plans on RRI-related issues (e.g., gender equality plans, open access procedures and infrastructures, and new ethics assessment procedures), favouring closer interactions among researchers with different disciplinary backgrounds. More rarely, new methodologies have been developed to embed interdisciplinary cooperation into the research process. An example is the Midstream modulation approach [21], aimed at including humanists and social researchers in laboratory work to orient decisions and reflection.
- **Interdisciplinary research centres and programmes.** The third direction is creating new interdisciplinary research centres or programmes [16] explicitly incorporating RRI practices and principles or addressing societal challenges where SSH and STEM researchers can share common goals [DR]. One example is the University of Manchester Synthetic Biology Research Centre for Fine and Specialty Chemicals (Synbiochem)[3] which includes an RRI platform for developing major programmes on the ethical and regulatory aspects of research, also including real-time assessment and anticipation of research and innovation trajectories, deliberation and reflection, and collaborative development…

Future SSH Priorities

With the start of the Horizon Europe Framework Programme, the policy context with regard to RRI has changed considerably. Indeed, whereas in the Horizon 2020 Framework Programme, the focus was mainly on supporting research organisations to adopt measures to foster RRI, in Horizon Europe the attempt is to implement, although separately, both the mainstreaming of RRI and the integration of SSH in STEM projects. Consequently, an autonomous programme on RRI (e.g. Horizon 2020's SwafS programme) no longer exists.

This is a delicate step, which could lead to a marginalisation of RRI in European research policies. In this context, SSH disciplines could have a vital role to play in maintaining and strengthening the link between interdisciplinarity and RRI. In this respect, some priorities for SSH can be identified.

- **Grounding RRI on a genuine interdisciplinary perspective.** As pointed out above, RRI is often considered the 'stuff' of SSH. This risks distancing STEM disciplines from RRI. Hence the need for SSH researchers to cooperate with their STEM colleagues to build an interdisciplinary view of RRI, starting by recognising that SSH disciplines are not so much inclusive, anticipatory, reflexive, and responsive as often are supposed to be [11]. This can be done by promoting projects that foster the dialogue within and between SSH and STEM on RRI (an example is given by the INTREPID COST Project[4]) and urging natural scientists and SSH scholars to co-research RRI in an experimental mode by developing common projects [17].
- **Reinforcing research on RRI in innovation.** Although RRI in origin was much about emerging technologies, it is now more focused on research than innovation. This represents a serious limitation to the expansion of RRI. SSH should have a key role in enhancing RRI-related research in the field of innovation processes [EF, DR] and in building trust and legitimacy conditions necessary for RRI to be taken seriously by market players [DR]. Different projects have been promoted by the European Commission (like PRISMA[5], RRI-START[6], COMPASS[7], and RESPONSIBLE-INDUSTRY[8]) to explore how to facilitate this process. This effort should continue also under the Horizon Europe Framework Programme.
- **Creating support services for research organisations across Europe.** In order to make RRI mainstreaming policies concrete, interdisciplinary infrastructures for RRI should be created at European and national levels (such as self-organised hubs and learning platforms, communities of practice, reference centres, training centres or RRI-oriented programmes promoted by scientific societies) with the support of SSH, so that individual research organisations are not left alone [DR]. A good example of how this can be promoted is the Global Interdisciplinary Research Hubs promoted by UKRI and the GCRF in developing countries[9].

1 https://www.ucitylab.eu/tag/universitat-autonoma-de-barcelona-uab/
2 https://www.mistraurbanfutures.org/en
3 https://synbiochem.co.uk/responsible-research-and-innovation/
4 http://intrepid-cost.ics.ulisboa.pt/
5 https://www.rri-prisma.eu/
6 https://rristart.eu/
7 https://innovation-compass.eu/
8 http://www.responsible-industry.eu/
9 https://www.ukri.org/wp-content/uploads/2021/08/UKRI-190821-GlobalChallengesResearchFundHubBooklet-June2019.pdf

Takeaways

Takeaways for the European Commission

- Actions should be taken to foster interdisciplinary collaboration to increase the quality of RRI actions in predominantly STEM projects. RRI-interdisciplinary nexus should be better defined in the work programmes and individual calls. The private sector and innovation actors should be more involved in RRI and interdisciplinary projects.
- To support RRI mainstreaming, European RRI infrastructures should be established to provide training, resources, and consultancy services and favour knowledge transfer across disciplines.
- EC evaluation panels should include both interdisciplinary and RRI expertise to ensure these aspects are duly considered in the evaluation process. EC science policy officers should also be trained to become more familiar with RRI and interdisciplinarity, especially in STEM-prevalent research areas.
- RRI measures in interdisciplinary projects deserve to be made visible and treated as research topics. Interdisciplinary practices should be disseminated through reports and publications.

Takeaways for Stakeholders and Businesses

- Both RRI and interdisciplinarity still need to be institutionalised in universities and research centres. Various tools can be used, e.g., introducing interdisciplinary training courses on RRI at multiple levels (master students, PhD students, postdoc researchers, PIs), establishing RRI-inspired interdisciplinary research departments, promoting the application of RRI practices and evaluation criteria and supporting the integration of SSH researchers in STEM research areas.
- General and sectoral business organisations should foster corporate involvement in CSR by taking up, strengthening and expanding approaches to Corporate Social Responsibility.
- SSH disciplines should be more involved in innovation programmes, especially where the private sector, academia, and governmental authorities meet (science parks, environmental programmes, etc.). This could be essential to sustain both interdisciplinary practices and RRI mainstreaming.
- RRI-oriented SSH-STEM collaborations should be promoted in the research environment. Scientific societies should be engaged in overcoming disciplinary barriers, scientific publishers should enlarge the spaces devoted to RRI-oriented interdisciplinary articles, and research funding organisations should include criteria related to RRI and interdisciplinarity in evaluating research proposals, and results.

Takeaways for the SSH CENTRE project

- The project should include the RRI perspective in the novel SSH-STEM collaborations and interdisciplinary and transdisciplinary activities it will promote. RRI concepts and practices should be referred to in training activities (e.g., WP3, WP5), collaborative work initiatives (e.g., WP2) and project products (e.g., the Research and Innovation Agenda for the EC or the plan of the SSH Centre in WP5).
- The activities conducted under the project could be used, through specific research protocols, to generate new knowledge on practical, cultural, and institutional barriers to interdisciplinary and transdisciplinary activities from the angle of the creation of an RRI ecosystem. Reference can be made to, e.g., the SSH brokerage initiatives (WP3), the epistemic experiments (WP5), and the four series of virtual focus groups on Horizon Europe Missions engagement activities (WP4)

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