An Introduction to Responsible Research and Innovation

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Introduction

Responsible Research and Innovation (RRI) is a key action of the "Science with and for Society" programme of Horizon 2020 (H2020). The European Commission defines RRI as "an approach that anticipates and assesses potential implications and societal expectations with regard to research and innovation, with the aim to foster the design of inclusive and sustainable research and innovation".[1] This policy brief aims to contribute to a better understanding of this increasingly topical concept, while focusing on one of its core features: Open Access. To achieve this aim, the brief is structured as follows. The following section provides an overview of the concept and its emergence within the policy discourse of the EU and beyond. It then provides an examination of its key components allowing it to support the Innovation Union, while highlighting the central place of Open Access within the RRI framework. It concludes with recommendations for the development of initiatives to further strengthen RRI.

I. RRI in the policy discourse of the EU and beyond: An overview

RRI is not a new concept in the EU policy discourse. Its origins go as far back as the 5th and 6th EU Framework programmes and the discussions that took place on the collaboration between scientific disciplines in addressing the wider dimensions and implications of science and innovation. Nonetheless, RRI has attracted increasing attention and visibility over the past years. Among the key milestones in this process is the reflection group workshop held in 2011 by the Directorate-General for Research aimed at developing a shared understanding of RRI and formulating policy recommendations to support the development and implementation of a policy underpinned by the concept of RRI across the European Research Area (ERA).[2] A working definition was soon after provided by the European Commission whereby it determined RRI as "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)".[3]

More recently, RRI has been identified as a key action of the "Science with and for Society" programme within H2020. According to the European Commission RRI actions will be promoted via:

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1 The EU framework for Responsible Research and Innovation (**link**)

2 Owen, R., Macnaghten, P., and Stilgoe, J. 2012. Responsible research and innovation: From science in society to science for society, with society. Science and Public Policy, 39 (6): 755-760, doi:10.1093/scipol/scs093

3 Von Schonberg. R. 2013. A vision of Responsible Innovation: Managing the Responsible Emergence of Science and Innovation in Society, John Wiley & Sons, Ltd. Chichester: UK.

o Actions on thematic elements of RRI such as public engagement, Open Access, gender, ethics, science and education;
o Integrated actions to foster the uptake of RRI by stakeholders and institutions.[4]

The importance attributed to RRI as a cross-cutting action to be implemented through the H2020 programme is further evidenced by the EU's decision to earmark 0.5% of the budgets of the "Societal Challenges" and "Industrial Leadership" pillars for RRI/Science with and for Society actions. In practice this translates into the funding of actions relating to public engagement, gender equality, science education, ethics and Open Access.[5] Open Access is therefore highlighted as a core component of RRI values in the H2020 programme.

Among national initiatives in EU Member States, the UK Engineering and Physical Sciences Research Council's (EPSRC) formal commitment on a framework for RRI announced in 2013 stands out. As stated by EPSRC "as a public funder of research, we have a responsibility to ensure that our activities and the research we fund, are aligned with the principles of Responsible Innovation, creating value for society in an ethical and responsible way". EPSRC's RRI approach is one that seeks to ***anticipate*** (describing and analyzing the impacts, intended or otherwise), ***reflect*** (reflecting on the purposes of, motivations for and potential implications of research as well as on the associated uncertainties, areas of ignorance, assumptions, framings, questions, dilemmas and social transformations these may raise), ***engage*** (opening up such visions, impacts and questioning the broader deliberation, dialogue, engagement and debate in an inclusive way), and ***act*** (using these processes to influence the direction and trajectory of the research and innovation process itself).[6]

In the Netherlands, the Dutch Responsible Innovation Programme (MVI) is funded by six ministries and undertaken by various departments, including the Netherlands Organization for Scientific Research (NWO). The NWO Responsible Innovation Programme brings together researchers from different disciplines to consider the ethical and societal aspects of new technology from the design phase onwards.[7] As recently announced, the Responsible Innovation Programme (NWO-MVI) with a budget of more than 6 million euros will have a key role in the organization's contribution to the Dutch "Knowledge and Innovation Contract" for the 2016-2017 period.[8]

The European Foundation Centre, an association of foundations and corporate funders of international character launched a call for the European Foundations Award for RRI in 2015. The award is offered to a research project or programme addressing a responsible research practice. Assessment criteria have included the integration of RRI elements such as diversity and inclusion, anticipation and reflection, openness and transparency and responsiveness and adaptive change at various stages of the research process.[9]

And yet, RRI is not only on the agenda of the EU and of some of EU member states. While the US does not have a RRI programme, various legal, ethical and social implications have been raised in various programmes. These have been usually referred to by the acronym ELSI (ethical, legal and social implications). For example, implications that would fall under the term RRI have been included in the Human Genome Initiative and the

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4 The EU framework for Responsible Research and Innovation (**link**)
5 Commission EC (2013) Fact Sheet: Science with and for Society in Horizon 2020, 9 December 2013 (**link**)
6 EPSRC Framework for Responsible Innovation (**link**). More on the development of the EPSRC's RRI approach: Owen, R. 2014. The UK Engineering and Physical Sciences Research Council's commitment to a framework for responsible innovation, Journal of Responsible Innovation. 1(1): 113-117, doi: 10.1080/23299460.2014.882065
7 NWO Responsible Innovation Programme (**link**)
8 NWO-MVI Call for Responsible Innovation in 2016 (**link**)
9 The European Foundations Award for Responsible Research and Innovation (**link**)

National Nanotechnology Initiative.[10] The Ethical, Legal and Social Implications (ELSI) Research Programme of the National Human Genome Research Institute in the US, established in 1990, funds and supports a broad range of activities related to the above topics.[11]

More recently President Barack Obama charged the Commission for the Study of Bioethical issues to review issues that may arise from conducting neuroscience research and the application of neuroscience research findings. The Bioethics Commission in its Report "Gray Matters: Integrative Approaches for Neuroscience, Ethics, and Society" produced a set of 4 recommendations for the integration of ethics and neuroscience research. The Commission recommends in particular integrating ethics early and explicitly throughout research. It also recommends that sufficient resources are dedicated to RRI, the evaluation of existing and innovative approaches to ethics integration, the integration of ethics and science through education at all levels, and the inclusion of topics on ethical perspectives in the agendas of advisory and review bodies.[12]

In Australia, the National Health and Medical Research Council (NHMRC) developed the Australian Code for the Responsible Conduct of Research in partnership with the Australian Research Council and Universities Australia following a public consultation. The Code replaces the Joint NHMRC/AVCC Statement and Guidelines on Research Practice (1997). It aims to guide researchers and institutions in responsible research practices and also serves as a reference to people outside the research community. In addition to providing practical guidance to researchers and institutions, the Code provides guidance on how to deal with breaches and with research misconduct.[13] The Code is currently under review and a Code Review Committee has been appointed for that purpose.

As RRI framings have been predominantly developed in Europe, the USA and Australia some scholars have raised concerns on the extent to which the RRI discourse could be relevant for other parts of the world and its relevance in other contexts beyond the more research-intensive countries.[14]

II. Open Access as a key component of the RRI approach

Overall, RRI has been a rapidly evolving concept. This has in turn resulted in the emergence of some confusion with regard to its motivation, conceptualization and translation into practice. While the goals of RRI may seem at first sight as being narrowly limited to support economic growth, the strategy does indeed have a wider focus.

Highlighting "RRI as an ambitious challenge for the creation of a Research and Innovation policy driven by the needs of society and engaging all societal actors via inclusive participatory approaches" the European Commission has identified 6 key areas of the RRI framework:
  o **Engagement** of all societal actors (researchers, industry, policy makers and civil society) and their joint participation in the RRI process;
  o **Gender Equality** which highlights the need to integrate the gender dimension in research and innovation content;

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10 Guston, D.H. 2014. Giving content to responsible innovation, Journal of Responsible Innovation, 1(3): 251-253, doi: 10.1080/23299460.2014.972085

11 The Ethical, Legal and Social Implications (ELSI) Research Program (**link**)

12 Gray Matters: Integrative Approaches for Neuroscience, Ethics and Society, Presidential Commission for the Study of Bioethical Issues, Volume 1, Washington DC, May 2014 (**link**)

13 Australian Code for the Responsible Conduct of Research-Summary (**link**)

14 P. Macnaghten, R. Owen, J. Stilgoe, B. Wynne, A. Azevedo, A. de Campos, J. Chilvers, R. Dagnino, G. di Giulio, E. Frow, B. Garvey, C. Groves, S. Hartley, M. Knobel, E. Kobayashi, M. Lehtonen, J. Lezaun, L. Mello, M. Monteiro, J. Pamplona da Costa, C. Rigolin, B. Rondani, M. Staykova, R. Taddei, C. Till, D. Tyfield, S. Wilford & L. Velho. 2014. Responsible innovation across borders: tensions, paradoxes and possibilities, Journal of Responsible Innovation, 1(2): 191-199, doi: 10.1080/23299460.2014.922249

o **Science Education** as a means to make change happen;
o **Open Access** (i.e. providing free online access to the results of publicly funded research: publications and data) as a means to boost innovation and increase the use of scientific results;
o **Ethics** aimed at increasing societal relevance and acceptability of research and innovation outcomes;
o **Governance** aimed at developing a framework that integrates the aforementioned five elements.[15]

Within this framework Open Access constitutes a core component and a basic pillar of RRI. Open Access and the gradual shift to the wider concept of Open Science is expected to feed into the RRI policy and thus contribute to the two flagship initiatives for research and innovation: the European Research Area and the Innovation Union. This is further evidenced in the H2020 work programme for Science with and for Society for 2016-2017 where Open Science (Open Access being a key pillar of Open Science) is included under the themes "institutional change to support RRI in research performing organisations" and "embedding RRI in H2020 research and innovation". The latter theme supports Open Science as a transition within the sciences towards Open Access to publications and data and the online sharing of data, research findings and scientific outcomes among researchers and research communities prior to publication.

With Open Access being identified as a key aspect of the RRI approach and with RRI becoming an integral part of research practices, both research funders and research performing organisations will face an increasing pressure to open up their research findings in a responsible manner.

III. Initiatives to further strengthen responsible research

The 2014 Rome Declaration on Responsible Research and Innovation outlines where the focus of future initiatives should be placed. In particular, the declaration calls European institutions, member states, regional authorities and research and innovation performing organisations to focus on:
- Building capacity for RRI through a variety of tools such as securing available resources and supporting global initiatives;
- Reviewing and adapting metrics by providing guidelines for the implementation and assessment of RRI;
- Implementing institutional changes that foster RRI in research and innovation performing organizations by reviewing their own procedures and practices to identify opportunities and obstacles, engaging civil society, developing and implementing strategies and guidelines, adapting curricula and providing training, and including RRI criteria in the evaluation and assessment of research staff.[16]

The declaration also states that "decisions in research and innovation must consider the principles on which the European Union is founded: i.e. respect of human dignity, freedom, democracy, equality, the rule of law and the respect of human rights, including the rights of persons belonging to minorities". To make RRI a central objective across all related policies and activities the declaration stressed the need for early and continuous engagement with all stakeholders as science should not only be regarded in terms of conducting ground-breaking research, but should also encompass principles of openness, responsibility and co-production of knowledge.[17]

With regards to engagement, it is important to highlight international endeavours to promote the development and adoption of RRI guidelines. One such example is the San Francisco Declaration on Research Assessment (DORA) behind which is the American Society for Cell Biology. Another example is the Committee on

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15 Commission EC (2012) Responsible Research and Innovation. Europe's ability to respond to societal challenges (**link**)
16 Italian Presidency of the Council of the European Union (2014) Rome Declaration on Responsible Research and Innovation, 21 November 2014 (**link**)
17 Ibid.

Publications Ethics (COPE) which brings together editors and publishers of peer-reviewed journals to discuss publication ethics issues. With regards to training, training on responsible research and its core principles, such as Open Access, should form a central element of scientific curricula in a formal and structured way. Training should not only focus on awareness-raising, but should also highlight best practice examples. Such courses should either be more general, i.e. focusing on science ethics from a broader perspective, or be more discipline specific.[18]

The above initiatives should be at the heart of the efforts to foster a culture of responsible research, with Open Access as a key component. Creating a culture for responsible research also means staying informed about new issues and topics that may arise.

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18 Tachibana, C. 2016. Responsibly conducting research (**link**)