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Published online: 29 Nov 2020.

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RRI legacies: co-creation for responsible, equitable and fair innovation in Horizon Europe

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ABSTRACT
The H2020 framework programme has been a key driver and catalyst of Responsible Research and Innovation, in Europe and beyond. We argue that the new framework programme, Horizon Europe, shifts the focus away from the research and knowledge production emphasis of H2020 to innovation, placing new requirements on RRI and the RRI community. The 'new policy experiment' of Missions and Open Innovation 2.0 can and should be seen an opportunity to leverage the insights gained from the past decade of activities in RRI and to extend and improve, particularly with regards to fair and equitable co-creation activities. With the increase focus on innovation, novel and responsible ways of innovating and co-creating must be embedded in these activities to reinforce the link between science, innovation and society. In this perspective, we argue that co-creation can act as a linking-pin between the open science emphasis of H2020 and the open innovation accent of Horizon Europe.

An RRI legacy for Horizon Europe?

Responsible Research and Innovation (RRI) is a democratization process leading to connecting science to the values and interests of European citizens by mean of participatory processes (Mazzonetto and Simone 2018). In Europe, RRI is exemplified by what has been described as 'the Responsible Research and Innovation policy experiment'[1] in the European Commission, embodied by, but not exclusive to, the Science With and For Society programme (SwafS) in the Horizon2020 framework programme (European Commission 2020). With activities spanning almost 8 years, this *RRI policy experiment* has led to RRI being embedded and integrated in a wide variety of projects, programmes and other activities based on six keys and a number of process requirements,[2] becoming an invoked and needed approach for properly governing potential controversial innovative technologies (i.e. genome editing, AI, nanotechnology), also well beyond the borders of Europe (Simone 2018). Despite its institutionalization in H2020, RRI has not always

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proven to be successfully integrated in all the pieces which composed the Eighth Framework Programme for supporting European Research and Innovation,[3] especially, we argue, in funding lines to grant innovation.

As Horizon2020 draws to a close, and the next programme, Horizon Europe, is preparing to launch in 2021, a key observation is that RRI is no longer a visible distinct element in the funding programme.[4] Rather, RRI is integrated in Horizon Europe as an overarching principle, but without a dedicated funding programme, such as SwafS. With regards to *science, innovation and society*, Horizon Europe seems to replace the 'RRI policy experiment' with a new policy experiment based on the combination of Open innovation 2.0 and Mission-oriented programmes with a stronger focus on innovation and potentially its implications of responsibility, inclusiveness and participation – a topic almost neglected in Horizon 2020, save for a few scattered examples,[5] which placed more emphasis on implementing Open Science and Responsible Research mechanisms, despite the former Commissioner for Research and Innovation's formal policy commitment to the so-called three O's.[6] This 'new policy experiment', has the chance to capture a lot of elements from the H2020 RRI legacy, but also reframes them, we argue particularly with respect to co-creation.

Co-creation has been a recurrent approach in SwafS projects, sometimes labelled as co-construction or co-production, and intended to be applied in public engagement, policy deliberations and participatory research agenda setting and, citizen science. One of the SwafS call topics was specifically aimed at better understanding co-creation approaches and their outcomes. However, SwafS projects have mainly focused on presenting the benefits of this approach (stronger stakeholder involvement, deeper public engagement, enhancing everyone creativity and using a process of deliberative dialogue), investigating the dynamics of the co-creation processes and their usage in policy design or highlighting best practices and failures of different co-creation methods to foster their future scale-up. Instead, the power of co-creation to generate concrete innovative solutions (products, processes and services), and under what circumstances, has been widely overlooked.

The potential of user-led innovation has been extensively studied by researchers such as Eric Von Hippel (2005): users have developed innovative products and services in areas as diverse as software engineering (e.g. the Open Source movement), medical tools, sports equipment or music systems. However, even when led by science engagement institutions, co- creation processes reach their full potential when they lead to a real influence of all stakeholders – including citizens – on the products and services that reach the market.[6.] To what extent co-creation can be considered a trigger for effectively enabling and advancing (Open) Innovation, thus generating concrete and effective outcomes thanks to its potential to better respond to specific socially-driven innovation needs, and not just a 'virtue' in itself which does not need to be legitimized (Voorberg, Bekkers, and Tummers 2015), is still to be explored and definitely not sufficiently addressed in the SwafS context.

Co-creation and open innovation 2.0

There is a wide body of work concerning Open Innovation focused on company management and R&D, and a vast literature detailing the transition to Open Innovation at the

firm level (Chesbrough 2003), often highlighting the cooperation practices between firms. The increasing central role of citizens, non-professionals groups and communities in Open Innovation has also been recognized and is incrementally studied by scholars (West and Lakhani 2008; Bogers et al. 2017). The European Commission has also endorsed the evolution of the concept of Open Innovation, calling it Open Innovation 2.0, aimed at collaboratively developing solutions to socio-economic and business challenges and in which citizens and users play a key role as 'distributed' sources of knowledge. The integration of citizens into the innovation ecosystem has been envisaged as the application of the broader public engagement concept, triggered by Responsible Research and Innovation practices, in the business and commercial realm (European Commission 2016).

In this context, citizens have a triple role: they are not only end-users that can shape and drive the market, creating the demand for innovative products or services, but also as a relevant voice to be heard in terms of values and expectations to be taken into consideration and as an active player that can contribute with innovative ideas.

The specific case of cooperations between citizens and companies for innovation has been growing in the last ten years, with a specific new wave of so-called co-creation approaches. Co-creation is intended as a type of collaboration in which various actors join forces to handle a shared challenge, bringing their own expertise, skills, knowledge and experience. The aim is to collaboratively design and create a solution that would have not been possible without the multi-stakeholder collaboration. Co-creation initiatives in innovation settings have been initiated by end-users (like in the case of many patient groups), by private companies (like in the case of the French sport firm Décathlon, see Daelman and Pirnay 2016), by Universities or by innovation brokers such as incubators or Living Labs.

The SwafS portfolio has included several projects focusing on RRI in industrial settings, co-creation methodologies as novel means of public engagement and new constellations of actors in open innovation settings. Nonetheless, a large part of the analysis on the effects of efficient co-creation approaches – as entry-point of RRI implementation – on the whole innovation ecosystem in the context of open innovation remains widely under-investigated. At the same time, crucial issues and connected elements of open innovation have not been sufficiently explored and deepened yet, such as questions related to whether and how co-creation approaches can trigger innovation, and how to fairly reward citizens taking part in such processes intended to develop marketable products.

Co-creation and missions

The need for European research to address major societal challenges is mentioned in the Green Paper on the European Research Area adopted by the Commission in April 2007 (Commission of the European Communities 2007). During the preparation of the Horizon Europe framework programme, a decision was taken to go one step further in this direction with the design of 'missions'.[7] The Lamy Report proposed a mission-oriented, impact-focused approach to address global challenges (European Commission 2017). Whereas societal challenges may be considered as the broader social problem aim or benefit that is being sought (e.g. fighting climate change), missions represent a more

narrowly defined set of activities that are supposed to deliver a verifiable result on a planned timescale that can be used to measure progress in overcoming the societal challenge.[8]

While missions are at the heart of the future Horizon Europe programme, missions have a long history, there are new requirements and as missions targeted at grand societal challenges require the inclusion of bottom-up and citizen-engaged public-private partnerships (Mazzucato and Robinson 2018; Robinson and Mazzucato 2019).

Missions seem to be an answer to issues that were made visible in the H2020 mid-term review, which emphasized that the next framework programme, Horizon Europe, should make it easier for citizens to understand the value of investments in research and innovation and maximize the impact of investments by setting clearer targets and expected impact when addressing global challenges. Thus, greater involvement of citizens is a key reason for the recent selection of five mission areas.[9]

Whilst Mission Areas are high-level articulations of a desired goal, the way in which mission projects under each Mission Area will be implemented will be dependent on a number of factors, for example the characteristics of the innovation ecosystem that will address the more specifically defined mission, the nature of the technology fields connected to that mission, etc.. Therefore, understanding the mission implementation contexts (mission situations) is necessary to match co-creation activities to the problem context.

Compared with previous 'missions' such as the Apollo programme or the Manhattan project, contemporary missions will be designed and implemented by a range of stakeholders, and thus are an example of open innovation occurring in a complex ecosystem of actors contributing to the creation and eventual success (or not) of innovations. Since 'Mission Areas' are central to the future Horizon Europe framework programme, missions are not only an interesting context in which to locate co-creation development and application, but also promise to be useful for future European priorities.[10]

Challenges ahead and a call to arms

SwafS has built up an evidence base on the implementation of co-creation processes in concrete innovation ecosystems. What this evidence base needs now is stronger theoretical apparatus, more widespread know – how of the methodological approaches that can facilitate such processes, as well as examples leading to concrete changes in terms of innovation policies and innovative solutions to specific and clearly articulated challenges. A sound approach to impact assessment of quadruple-helix engagement in Open Innovation is also lacking. The framework of reference for impact assessment in SwafS projects are the MoRRI indicators, composed of 36 RRI indicators that are strongly focused on research settings such as Research Performing Organisations (RPO) and Research Funding Organisations (RFO). Institutional changes, namely actions that *contribute towards changing the governance of research and innovation, thereby bringing it closer to society* are one of the key units of measurement of successful achievements of SwafS actions (European Commission 2020). While institutional changes and MoRRI indicators represent a strong tool to assess engagement in Open Science, they need to be integrated with other impact assessment approaches when evaluating Open Innovation settings. The measurement of Open Innovation processes is a long-term process that

requires observing both overall transformative changes happening within the innovation ecosystem, as well as individual changes of the stakeholders involved.

Moreover, after almost a decade of RRI, an open question remains concerning the role and rewards for citizen innovators. Increasingly, citizens are becoming key actors in innovation pathways. From makerspaces to patient-innovator initiatives and data-collecting platforms, innovation pipelines have been transformed through ideas and creativity from engaged citizens. In doing so, citizens in meaningful collaboration for responsible innovation (Jarmai and Vogel-Pöschl 2020) are influential actors of the innovation ecosystem, thus shifting the economical dynamics as well as the relevance and ethos of new products and services. At the same time, critiques have been raised on the exploitation of grassroots initiatives and citizen science by innovation entrepreneurs, start-up impresarios and venture capitalists, depicted as 'the public donating its unpaid work and data to privately owned, online entities' and 'extension of the sharing economy into the heart of scientific research'.[11] In innovation contexts, where the final aim is to reach the market with new products, services and processes for profit, how to ensure that citizens' contributions in co-creation approaches can be properly recognized and rewarded is still an open question which needs to stem from a more profound reflection on how the citizen participation is enacted in these realms and the reasons behind it, so to avoid perpetuating the narrative of public engagement as an empty box without both a clear understanding of the role of citizens in such processes and the search of effective and fair mechanisms for their activation and mobilization (European Commission 2007).

There is no doubt that the H2020 framework programme has been a key driver and catalyst of Responsible Research and Innovation, in Europe and beyond. We argue that the new framework programme, Horizon Europe, shifts the focus away from research and knowledge production to innovation, placing new requirements on RRI and the RRI community. The 'new policy experiment' of Missions and Open Innovation 2.0 can and should be seen an opportunity to leverage the insights gained from the past decade of activities in RRI and to extend and improve, particularly with regards to fair and equitable co-creation activities. With the increase focus on innovation, novel and responsible ways of innovating and co-creating must be embedded in these activities to reinforce the link between science, innovation and society.

Notes

1. Van Oudheusden and Shelley-Egan (2020) Call for proposals: Special Issue: RRI Futures - Learning from a decade of Responsible Research and Innovation. Journal of Responsible Innovation.
2. Implementing RRI requires the collaboration of various stakeholders in order to achieve solutions (both products and processes) which are ethically acceptable, sustainable and socially desirable (Von Schomberg 2013). The EC has adopted key thematic elements (ethics, gender, public engagement, open access, science education - and governance as overarching sixth key) and acknowledged the existence of process requirements - among which anticipation, reflexivity, inclusiveness and responsiveness (Stilgoe, Owen, and Macnaghten 2013) are often emphasized. RRI indicators to guide science governance have also evolved since the beginning of the Horizon 2020 Framework Programme, resulting in a set of RRI performance indicators (MORRI indicators) which are currently under revision and refinement by the Horizon 2020 funded SwafS project called SUPER MoRRI.
3. "Improve alignment of research policy and societal values" (Novitzky et al. 2020).

4. This lack of visibility initiated a critical response from scholars and practitioners of RRI (Gerber et al. 2020)

5. A very few SwafS calls for proposals – and thus stemmed projects – have been devoted to Responsible Innovation and industrial actors.

6. https://ec.europa.eu/digital-single-market/en/news/open-innovation-open-science-open-world-vision-europe

7. In the past, missions were often related to a well-defined outcome, such as putting a man on the moon, which mostly entailed technological challenges. However, modern missions, ranging from the demographic/ageing problem being faced by Western nations to the global challenges concerning climate change, are more complex because there are fewer clear technological challenges and outcomes are less clearly defined (Foray, Mowery, and Nelson 2012). Grand societal challenges concern the socio-economic system as a whole, which often implies large-scale transformations with multiple actors and elements (Kuhlmann and Rip 2018).

8. The expert group "Economic and Societal Impact of Research and innovation (ESIR)" which was created in 2017 to advise the R&I Commissioner Carlos Moedas played a key role in the elaboration of the Mission-oriented R&I policy. ESIR (2018) ESIR Memorandum II: implementing EU missions. EC DG R&I.

9. The first five Mission Areas have already been selected during the negotiation of Horizon Europe: (1) Adaptation to climate change including societal transformation, (2) Cancer, (3) Climate Neutral and Smart Cities, (4) Healthy Oceans, Seas, Coastal and Inland Waters and (5) Soil Health and Food. Each Mission Area has its own Mission Board, composed of 15 experts selected by a public call for interest launched in 2019, and a Mission Assembly.

10. It is important to make a distinction between Mission Area (the broad domain identified by the European Commission and represented by its mission boards) and specific missions. For example, a Mission Area (EC) would be Soil Health and Food, whereas a concrete mission would be Zero Pesticide in Agriculture, for example as defined by the French Agricultural Research Institute INRAE (it has a concrete and specific aim to guide activities).

11. "Against citizen science", P. Mirowski –Aeon Magazine, Nov 2017. Retrievable here: https://aeon.co/essays/is-grassroots-citizen-sciencea-front-for-big-business

Disclosure statement

No potential conflict of interest was reported by the author(s).

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Angela Simone is a public engagement professional, experienced in EU projects and is currently coordinator of the EU H2020 TRANSFORM project and sits on the Advisory Board of the EU H2020 SUPER_MoRRI project. Since 2010 she has been collaborating with Fondazione Giannino Bassetti, designing and managing several national and international EU projects on RRI and cutting edge science, technology, medicine and innovation and their related impacts on society.

She regularly lectures on science communication, public engagement, RRI, open science, open innovation and open data in national and international workshops. She is author of several publications on RRI and hundreds of journalistic articles on science, technology and open culture. She is peer-reviewer of 'JCom – The Journal of Public Communication'. She is also partner of Formicablu ltd, Italian science communication SME.

Marzia Mazzonetto is co-founder of Stickydot, Brussels' first community space for science engagement professionals. Her main areas of expertise are public engagement with S&T and methodologies supporting multi-stakeholder engagement in RRI processes. She is deputy-coordinator of the SwafS project TRANSFORM and also collaborates with ECSA (the European Citizen Science Association) as Project Manager for the EU-Citizen.Science project. Marzia has worked for five years as Senior Project Manager at Ecsite, the European Network of Science Centers and Museums, where she has been coordinator of the VOICES project and managed other EU-funded projects in the field of Public Engagement with S&T. Marzia holds a degree in Communication Studies and a Master in Science Communication from SISSA – International School of Advanced Studies of Trieste (Italy).

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