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Marit Hovdal Moan, Lars Ursin, Elsa González-Esteban, Rosana Sanahuja-Sanahuja, Ramón Feenstra, Patrici Calvo, Santiago García-Campá and Martha Rodríguez

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EXECUTIVE SUMMARY

This article provides a review of responsible research and innovation (RRI) literature, with a particular focus on how to provide open and inclusive ethical governance of research and innovation with a sound and solid theoretical foundation. Governance in this context refers to ways of steering processes in a desirable direction, in this case in the direction of responsible research and innovation, that is ethically acceptable and socially desirable. The concept of a meta-governance is subsequently introduced, enabling a mode of governance by procedural ethical principles that set the rules of the game, and provide a common direction to R&I activities. In this article we will draw lessons from the RRI literature on governance and meta-governance relevant for informing ETHNA and similar RRI-initiatives that aim to be open and inclusive. The article is based on the ETHNA report on state of the art and best practices (Moan et al. 2021) and is suitable as a book chapter in anthologies on ethics governance systems for RRI in Higher Education, Funding and Research Centres (HEFRCs).

Open and inclusive ethical governance of research and innovation: a literature review

Marit Hovdal Moan[1], Lars Ursin[2], Elsa González-Esteban[3], Rosana Sanahuja-Sanahuja[4], Ramón Feenstra[5], Patrici Calvo[6], Santiago García-Campá[7] and Martha Rodríguez[8]

Abstract

This article provides a review of responsible research and innovation (RRI) literature, with a particular focus on how to provide open and inclusive ethical governance of research and innovation with a sound and solid theoretical foundation. Governance in this context refers to ways of steering processes in a desirable direction, in this case in the direction of responsible research and innovation, that is ethically acceptable and socially desirable. The concept of a meta-governance enables a mode of governance by procedural ethical principles that set the rules of the game and provides a common direction to R&I activities. In this article we will draw lessons from the RRI literature on governance and meta-governance relevant for informing ETHNA and similar RRI-initiatives that aim to be open and inclusive.

Introduction

The concept of governance expresses a shift in the discourse on how science should be regulated, from internal self-regulation by scientists based on codes of conduct, to external regulation, yet with the ambition of allowing the actors enacting science and technology a greater degree of autonomy and a voice in how the regulation is exercised. Governance is a non-hierarchical mode of governing, in the sense that it entails a move away from attempts at steering research and innovation towards predefined aims (expressed for instance in thematic funding programs), or by stable means, (such as economic incentives and predefined indicators of performance).

Compared to old regulatory models of government, which articulate hierarchical co-ordination mechanisms based on [centralized] authority (Jessop, 1998,p. 32), the concept of governance expresses a mode of external regulation "that is more decentralized and open-

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[1] Norwegian University of Science and Technology, Norway
[2] Norwegian University of Science and Technology, Norway
[3] Universitat Jaume I de Castellón, Spain
[4] Universitat Jaume I de Castellón, Spain
[5] Universitat Jaume I de Castellón, Spain
[6] Universitat Jaume I de Castellón, Spain
[7] Universitat Jaume I de Castellón, Spain
[8] Fundacion ETNOR, Spain

ended"(Stilgoe, Owen, Macnaghten, et al., 2013, p. 1569). Indeed, in contrast to government, "governance is distributed almost by definition" (Rip 2018b).

The literature describes various forms of steering research and innovation (R&I) in the direction of responsibility in a de-centralized, open-ended way. Stilgoe et al. summarize these to include anticipatory or tentative governance models (Kuhlmann et al., 2019), "real-time and other forms of technology assessment" (Rip, Misa, & Schot, 1995), "upstream engagement" (Wynne, 2002), and "value-sensitive design" (Van den Hoven, Lokhorst, & Van de Poel, 2012). Others use the terms network- and interactive modes of governance to capture the essence of governance (Kooiman, 1999).

This article is based on the ETHNA report on state of the art and best practices (Moan et al. 2021). The ETHNA project (ETHNA, 2021) is a contribution to the RRI discourse on the governance of research and innovation (R&I). The proposed system of R&I governance in ETHNA comprise of four tools: an ethics committee, an ethics code, an alert line, and progress indicators. In this article we will draw lessons from the RRI literature relevant for informing ETHNA and similar RRI-initiatives with a sound theoretical background.

The findings of the review take us from top-down governing to bottom-up governance structures, and further to governance by means of *meta-governance*: facilitating the self-governance of networks by the advancement of specific principles that set "the rules of the game".

Methodology

The literature review was developed using the date bases of SCOPUS, Web of Science and Google Scholar with an initial time interval of 2011 to 2020. The preliminary search string has been "RRI", "Responsible Research and Innovation", "RRI AND research integrity", "RRI AND governance", "RRI AND public engagement", "RRI AND science education", "RRI AND Gender", "RRI AND gender AND innovation", "RRI AND open access".

Moreover, 55 EC-funded projects on RRI were screened. 12 of them were used to identify examples of practices in ethical governance and the tools used to institutionalise RRI in higher education funding and research centres (HEFRCs): CIMULACT, JERRI, FIT4RRI, MORRI/SUPER MORRI, RRI Practice, SATORI, SIENNA, STARBIOS2, RES-A-GORA, RRI-Tools, PRO-ETHICS.

Bottom-up governance

Governance can be conceptualized as a mode of governing that entails the exercise of authority by other actors than those at the policy makers level or the top-management, which allows "politics [to be] shaped through several and diverse initiatives and authorities" coming from ... "networks and partnerships consisting of a range of public and private actors (Aars, Fimreite, & Homme, 2004,p.24. Our translation). This conceptualization of governance emphasizes the bottom-up dynamic of governance and points to the fact that while "governance arrangements may be designed to serve a purpose, [they] can also emerge and become forceful when institutionalized" (Rip 2018b, p.76).

As Arie Rip points out, there is an important analytical distinction to be made between the above conceptualization of governance understood as constituted by "bottom-up actions, strategies and interactions", on the one hand, and governance understood as a

mode of governing that "opens[] up an earlier centralized arrangement and make[s] it more distributed, on the other" (Rip 2018b, p. 76).

Landeweerd et al. (2015, pp. 1,2) conceptualize governance in the R&I sector as "the set of processes by which it is taken that stewardship [i.e. management] over ... science and technology practices (research, innovation, etc.) ought to be organized in continuous calibration with those practices". This continuous calibration, or adjustment, must necessarily entail dialogue with those enacting science and technology practices, thereby allowing a range of actors, including "policy makers, researchers, industry and civil society groups and nongovernmental actors" to partake in the shaping of those practices. In this way, decision-making processes are sought embedded within practice itself, rather than centralizing the authority of decision at the policy makers level (Landeweerd et al. 2015, p. 16).

Landeweerd et al.'s definition of governance is an example of what Rip refers to as governance whereby earlier centralized arrangements are made more distributed, in contrast to governance as bottom-up actions and interactions that may in turn become institutionalized. Importantly, the distributed authority that governance entails should not be confused with earlier self-regulatory governing regimes characterized by scientists governing themselves internally, based on codes of conduct (Tancoigne, Randles, & Joly, 2016, p. 44).

Guston's description of anticipatory governance practices at the Center for Nanotechnology in Society at Arizona State University (CNS-ASU) may serve as an example of what a multi-level, non-regulatory approach to steering R&I processes in the direction of responsibility entails in practice, with respect to governance tools (Guston, 2010, p. 432): "CNS-ASU unifies research programs ... across three critical, component activities: foresight (of plausible future scenarios), integration (of social science and humanities research with nano-scale science and engineering), and engagement (of publics in deliberations). CNS-ASU also performs educational and training activities as well as public outreach and informal science education".

Governance in the CNS-ASU case focuses on facilitating the integration of reflexivity in research and innovation activities and coordinating meeting places between scientists form the natural and social sciences and lay citizens. It aims at influencing actors in networks not by top-down steering, but by coordinating and facilitating cooperation, leaving concrete aims of the R&I activity to the networks, and allowing for probing and failing in the process (Kuhlmann et al., 2019).

Echoing the case described by Guston, Strand et al. observes that "[t]he question of how to govern ... R&I networks from the perspective of funding bodies and/or government ...is rapidly transforming from policy perspectives based on central control and accountability to a perspective where coordination and stimulation are key concepts" (Strand et.al. 2015). Importantly though, governance is not purely about coordinating and facilitating, but may involve a mix of soft and hard(er) governing mechanisms.

Hence, as Stilgoe et al. point out, the governance mechanisms of facilitation, coordination and stimulation are commonly complemented with more traditional "policy instruments such as normative codes of conduct, standards, certifications, and accreditations..." (2013, p.1569). That said, the prerogative of de-centralizing authority contained in the concept of governance means that governance in the area of R&I denotes, as a minimum, the act of "open[ing] up science and innovation" (Stirling, 2008) to a wider

range of inputs. Some would argue that this opening up entails creating new spaces of 'public dialogue'"(Stilgoe, Owen, & Macnaghten, 2013, p. 1569) , which in turn seems to point to governance mechanisms that encourage and enable networking, broad inclusion and deliberation.

Why involve citizens in R&I governance?

Moving to a more representative co-construction means that responsibility in R&I entails democratizing research and innovation, by involving those affected by the new technologies in the future in debating the shaping of that future, notably by participating in the framing of the problems and questions to be researched (Randels et al. 2016, p. 34). The focus here is on the process, where democratic procedures are thought to contribute among other things to "the awareness of a more local, historically and socially contingent knowledge production", and in this sense a more reflexive, "socially robust", knowledge and technology (Nowotny, 1999; see also Jasanoff 2007). Inclusion is an end, and not just a means to achieve a given end.

From a governance perspective, a belief in the power of deliberation "would entail …bringing in a range of stakeholders, citizens, and social actors in upstream engagement exercises to cancel the tunnel vision of STEM [science, technology, engineering and mathematics] practitioners. This form of democratic governance model of R&I, which promotes the interaction of a diversity of agents in R&I processes, with a view to integrating heterogeneous values, concerns, intentions and purposes would contribute not only to making STEM more anticipatory but also align research agendas with society (Owen, Macnaghten, & Stilgoe, 2012; Strand, 2019).

Importantly, as Randles et al. emphasize (2016, p. 34), the demand for inclusion "is not just about inclusivity of a wider and more diverse range of perspectives, but that inclusion follows a co-construction ambition … [where] wider interests participate in the framing of research, innovation and responsibility "problems"; it is about how the processes of inclusion are constructed. A governance structure that aims at promoting and facilitating "upstream engagement" echoes the assumption that an inclusive, deliberative approach to science and innovation practices is an efficient mechanism for making R&I more reflexive, and - as a result - more anticipatory, and thus responsible.

The belief in the efficiency of upstream engagement as a mechanism to achieve more reflexive R&I practices has been justified with reference to the observation that "… insight in the diversity of those participating in social-political interactions can only be gained by involving them in the governing process, considering them necessary sources of information …" (Kooiman 1999, p. 76). In a similar vein, Sykes and Macnaughten suggest that "choices concerning the nature and trajectory of [science and] innovation can be co-produced with publics in ways that authentically embody diverse sources of social knowledge, values and meanings" (Owen et al. 2013, p. 38. Emphasis added).

It has also been argued that research and innovation must engage with the public to serve the public (Braun & Griessler, 2018; von Schomberg, 2013), and that "dialogue is the right thing to do for reasons of democracy, equity and justice (Owen et al. 2013, p. 38). Others, however, have criticized the belief in public participation as an efficient mechanism for making R&I more reflexive, arguing that there is a lack of empirical evidence supporting its assumed quality and impact (Rowe & Frewer, 2000).

As pointed out by Landeweerd et al. above, (Landeweerd et al. 2015), responsibility in R&I is a matter of aligning science with the needs and expectations of society at large; that is, the goal of creating technologies that not only are not harmful, but also good, in the sense that they can be said to be socially, ethically and environmentally desirable, and therefore also socially acceptable.

If the main purpose of an R&I governance system is to ensure broad involvement in R&I processes, a relevant governance mechanism would be that of constructing good processes for involvement or rigging meeting places fit for that purpose; if, by comparison, the main purpose is to ensure that R&I contribute to solve the grand challenges of our time, a main governance mechanism may rather be that of facilitating transdisciplinary collaboration, where involvement of lay citizens could be one element, but not necessarily so.

Fine-tuning citizen involvement in R&I

Public engagement governance tools have been criticized, among other reasons, for framing the participation exercises in ways that are useful to particular interests (Felt, Fochler, Müller, & Strassnig, 2009), for downplaying the low political status of the outputs of these exercises, and for serving as an "efficient tool of de-politicizing science and technology, in much the same way as ethics expert reviews (Landeweerd et al. 2015, p. 14.)

An ethics of involvement thus concerns not just the question of who should be involved in R&I processes and why, but the question of how the persons involved should be involved, which includes questions such as how those involved can participate on an equal footing with researchers, and how their contribution should be weighed in with that of researchers. These are questions that relate to the critique of public engagement exercises concerning the low political status of the outputs of these exercises.

Landeweerd et al. (2016, p. 19) criticize the public participation model for taking a top-down regulatory form when put into practice, and for sharing the pitfalls of either frustrating the voice of "societal views and opinions or becom[ing] a scapegoat for pre-existing agendas". Landeweerd et al. argue that RRI as a mode of governance should link the governance of R&I to what von Schomberg has called "normative anchor points", such as sustainable development and social progress (Von Schomberg, 2012).

This move involves that the governance of R&I should no longer be restricted to "the definition and implementation of regulation in the form of negative constraints for science and technology but also of positive aims in a societal setting" (Landeweerd et al. 2015, p.19. Emphasis added), thereby broadening up the governance of science "to include topics and issues addressing community values and collective behavior" (Landeweerd et al. 2015, p. 15).

Moreover, the whole process of science - and not just its products – should be subject to transdisciplinary dialogue, meaning deliberation across disciplinary divides as well as with a variety of stakeholders, including the non-expert public. Assessment should thus take place from the outset of R&I processes, when problems are framed, rather than at the stage when a project is defined, or a product is ready to be introduced to the market. These assessments should take place at various stages throughout the process, and should involve a broad range of stakeholders, rather than being constricted to scientific and ethical expertise.

RRI as governance tool can be understood to move beyond the participatory governance approach "that merely emphasizes the inclusion of different actors", to designate "the type of engagement that actors should exhibit in the process of doing … research and innovation" in a responsible way (Burget et al. 2017, p.14. Emphasis in original). The type of engagement that doing RRI entails can be summed up in the RRI-dimensions articulated by Stilgoe et al. (2013) as that of anticipative, reflexive, and responsive.

On Landeweerd et al.'s account, RRI as a mode of governing entails opening up science and innovation in a way that allows for it being "shaped through several and diverse initiatives and authorities" through "a range of public and private actors" (Aars et al., 2004,p.24. Our translation). The move towards a governance of R&I activities can thus be understood as one way of responding to the normative prerogative inherent in the concept of RRI of opening up the shaping of science and innovation to society; to reduce – and even collapse, the social – science divide that informs, and is upheld by, the self-governing, technocratic and ethics expertise modes of governing R&I.

Meta-governance of R&I
The concept of RRI as concept holds in it both a dimension that designates responsibility as process, as well as a one that connects responsibility to particular outcomes (Von Schomberg, 2013). Von Schomberg stresses that the process and product dimension of RRI are interrelated. The innovation process should thus be "responsive, adaptive, and integrated" and products developed through the innovation processes should "be evaluated and designed with a view to [the] normative anchor points [of environmental protection] … human health, sustainability, and societal desirability" (von Schomberg, 2013).

Owen et al. (2013, p. 32, 33) argue that a framework for what they refer to as "responsible innovation" must include consideration not only of the products of research and innovation, but more profoundly of the purposes and underlying motivations of R&I, by which they mean "not just what we do not want science and innovation to do, but what we do want them to do". This involves reflecting on "what sort of futures(s) we want science and technology to bring into the world, what futures we care about, what challenges we want to meet, what values these are anchored in….". A core question here is "how can the "right impacts" be democratically defined?" (Ibid, p. 28). One possible answer to that question is by constructing a procedural framework that ensures fair deliberation on right impact.

Randles et. al argue (2016, p. 11) that the inherent normativity of RRI raises the question of "how to deal with the inevitable tensions, conflicts and related power games that arise when a heterogeneous, pluralistic actor landscape with diverging interests is confronted by norms and values intended to change behavior". Given the complexity of R&I networks that RRI as governance mechanism aims to facilitate, accommodate and strengthen (be it as a normative claim or a pragmatic move), the question is how best to deal with the inevitable conflicts and tensions that will arise in any "collective search for and foundation of normative direction" (Ibid, p. 10).

Randles et al. suggest that rather than contributing to this collective search for normative foundation, one should construct governance mechanisms "able to address contestation and facilitate the capacities and capabilities of the relevant actors to engage in

constructive negotiations", allowing the actors involved in R&I networks to negotiate the normative substance of the R&I activity themselves (ibid pp. 11 and 12).

In a somewhat similar vein, Landeweerd et al. (2015, p. 17) argue that "acknowledging complexity means that governance should be less about defining clear-cut solutions and more about making explicit the political issues that are at stake in science and technology. In this sense governance becomes a process in which the political nature of science and technology is made explicit, where concerned actors express that there is de facto not one, single answer … This means focusing less on decision-making and more on identifying the shared values and interests we have in the issues on the table; [the focus should be] on collaboration and dialogue, and on empowering participants".

RRI as governance approach on this procedural account "do not focus on what RRI is …but on the processes and mechanisms by which it is thought to be realized" (Lindner et al 2016, p. 51); it is about providing an institutional framework that facilitates collective processes of cooperation, deliberation and negotiation, through a mixture of governance mechanisms. These include overarching principles for legitimate procedures and codes of conduct setting the rules of the game, the establishment of spaces for debate and negotiation, and policy instruments "helping to achieve legitimate agreements (Lindner et al. 2016, p. 48).

Owen et. al (2013, p. 35) propose that a prospective conception of responsibility suggests an evaluative framework for what kind of processes qualify as legitimate in the governance of R&I, given the aim of steering R&I in the direction of responsible practices. The evaluative framework suggested by Owen et al. is composed of the four principles anticipatory, reflective, deliberative, and responsive.

The philosophical foundation of the ETHNA system - Habermas's theory of communicative action (Habermas, 1981) - presumes a procedural approach to governing research and innovation. The overarching aim is to steer R&I processes towards responsibility understood in a prospective, or forward-looking way. Governance theorists tend to agree that in order to enhance networks' alignment with and contribution to a public good there is a need for "… a system of meta-governance to stabilize key players' orientations, expectations, and rules of conduct" (Jessop, 1998, p. 37. Emphasis added;Jessop 2002; Kooiman & Jentoft, 2009; Sørensen, 2014; Sørensen & Torfing, 2016).

As Jessop explains, "[m]eta-governance [is] the 'organization of self-organization'. It involves … the design of institutions and generation of visions which can facilitate not only self-organization in different fields but also the relative coherence of the diverse objectives, spatial and temporal horizons, actions, and outcomes of various self-organizing arrangements … [Institutions] have a major role here as the primary organizer of the dialogue among (policy) communities, as an institutional ensemble charged with ensuring some coherence among all subsystems, as the source of a regulatory order in and through which they can pursue their aims…" (Jessop 1998, p. 42. Emphasis added).

The four principles of Owen et al. can provide a common RRI vision, and a common understanding of the rules of the game, in a given organization. As Sørensen argues, a meta-governance structure is needed to ensure that self-governing networks follow the rules of the game. If R&I networks are to contribute to solving societal grand challenges in a just and effective manner "they must be meta-governed with that purpose in mind", to paraphrase Eva Sørensen (Sørensen, 2014).

Conclusion

The concept of a meta-governance structure succinctly captures the function that Owen et al.'s four procedural principles can have in the governance of R&I in the direction of RRI, namely that of setting the 'rules of the game' and providing a common direction to R&I activities. In this sense the principles can be understood as constitutive of the regulatory order of R&I activities. The ETHNA system and similar systems of ethical governance of R&I can involve citizens based on a meta-structure in this sense. The four principles of Owen et al. could for instance inform the design and use of the four tools of the ETHNA System to involve citizens in the governance of R&I in a good way.

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