Chapter 4
Democratic Experimentation with Responsibility: A Pragmatist Approach to Responsible Research and Innovation

Joshua B. Cohen and Robert Gianni

Abstract Disruptive societal changes following from emerging science and technology have recently led to a growing interest in developing ethical frameworks. Responsible Research and Innovation (RRI) is such a framework that aims to improve the relationship between science and society. Now a decade after its conceptualization, it still seems to suffer from conceptual unclarity and lack of implementation. Since responsibility in research and innovation practice remains as important as ever, we propose to revive the normative potential of RRI by approaching it as a matter of collective democratic experimentation. To further develop this approach, we propose a pragmatist conceptualization inspired by John Dewey, his work on democracy as an ethical way of life and his attention to the contextual nature of responsibility. Furthermore, we show how his interest in social inquiring publics provides a particularly apt foothold from which to operationalize collective democratic experimentation with RRI. We will illustrate the utility of this approach, with specific attention to the social, experimental and public character of social inquiry, by connecting it to the recent call to use social labs methodology to experiment with RRI. From this we draw lessons for future collective democratic experimentation with responsibility in research and innovation practice.

J. B. Cohen (✉)
TwynstraGudde, Amersfoort, The Netherlands
e-mail: jch@tg.nl

R. Gianni
BISS institute of Maastricht University, Maastricht, The Netherlands
e-mail: r.gianni@maastrichtuniversity.nl

4.1   Introduction

Socio-technical innovations and new and emerging technologies constantly generate new challenges and opportunities for our societies. From Artificial Intelligence (AI) to robotics and from mobile devices to smart cities, the growing development and broader impact of science and technology on society require measures to make sure that its resulting processes and products are ethically acceptable, socially desirable and sustainable. The recently adopted European framework of Responsible Research and Innovation (RRI) aims at offering a framework to address these challenges and thus improve the relationship between science and society.

However, there is a growing understanding that RRI suffers from a lack of conceptual clarity, that it misses real-world implementation (Ribeiro et al. 2017), and that it lacks in terms of institutionalization and mainstreaming (Christensen et al. 2020; Novitzky et al. 2020). This combination has arguably led to a waning policy relevance (Fisher 2020). Against the grain of these developments, authors have recently suggested exploring a different approach to RRI. Notably, Nordmann (2019) has argued for treating RRI as a collective experimentation strategy with attention to how the framework may inform experimental processes of social learning around responsibility in concrete research and innovation practices. Timmermans and others (2020) have proposed to use a social lab methodology to experiment with bringing RRI into practice. Treating RRI as a collective experimentation strategy may increase its prospects for practical implementation and thereby provide a practice-oriented pathway out of the current conceptual-, implementation- and policy deadlock.

Even though said authors provide us with some guidance in terms of salvaging RRI from its own shortcomings, it is unclear how especially the *democratic* character of experimentation with RRI may be further philosophically grounded and operationalized for concrete research and innovation practice. In this chapter, we will argue that the pragmatism of John Dewey can provide the necessary philosophical and conceptual grounding for collective democratic experimentation with RRI. The aim of this chapter is thus to provide a normative and conceptual contribution for readers interested in democratic experimentation with RRI by answering the following research question:

> What is, from a pragmatist perspective, a proper way to conceptualize and understand collective democratic experimentation with RRI in social labs?

We will start the chapter by highlighting the challenges of research and innovation and the frameworks that have been introduced in response to this, including RRI. We will describe some current shortcomings of RRI and the formulation of RRI as a collective experimentation strategy as a promising solution to these issues. We will argue that the significance of this strategy for a responsible approach to research and innovation especially lies in its implicit democratic character. Furthermore, we will argue that particularly the pragmatism of John Dewey and his understanding of democracy as an ethical way of life together with the central role of social inquiry

provides a fruitful way forward in further conceptualizing and operationalizing RRI as a collective democratic experimentation strategy. Finally, we will connect these insights to the recent call to use social labs methodology to bring RRI into practice (Timmermans et al. 2020). To conclude, we will end our analysis with some insights on future democratic experimentation with RRI and other related concepts.

4.2 Complex and Disruptive Changes

It would be difficult to deny and hazardous to underestimate the growing influence that research and innovation and resulting technological developments exert on our societies and their functioning.[1] Although the increasing impact of technique (technology) has been a recurring topic of philosophical debate for a long time (Heidegger 1977; Marcuse 2003; Feenberg 1991) it seems evident that its influence is accelerating more than ever.

For one, newly emerging information and communication technologies are redrawing communicative relationships between humans and communities (Floridi 2014). Innovation in the digital age is leading to radical changes in societal relationships including those between labor and capital (Stiegler 2016). On a more radical plane, technology is redrawing individuals' relationships with the material dimensions of existence. To be precise, debates on AI, robotics and human enhancement are questioning main ontological and anthropological assumptions underlying the relationship between humans and nature. Such radical developments entail an enormous impact not only on individuals as laborers, end-users or consumers, but also as citizens of modern society (Schradie 2018; Sunstein 2017).

From a moral perspective, the effects that innovative products and technologies can have on society in terms of inequalities and potential threats to individual freedom call for an integration of broader values and accompanying criteria of assessment into research and innovation practices (Davis and Laas 2014; Jasanoff 2016). From an epistemic point of view, the complex impact that these processes generate for individuals' lives and broader society requires an understanding and competence that is challenging for any single actor. The profound questions raised by certain innovations like AI and their permeability to different sectors, suggests that potential answers will not be easily found in a single domains' technical expertise. Rather, they are bound to emerge from newer forms of interaction between different spheres of society. This may include attention to the role of values at earlier stages of scientific and technological design (Van den Hoven 2013).

From a political point of view finally, the above developments require better institutional frameworks to deal with questions of who gets what, when and how

---

[1] We will use here indistinctly the terms science, technology, research and innovation although we are aware of their differences. The scope of the chapter is to highlight the politics of science, which invests all these different domains despite their supposed different logic. Therefore, we do not see an evident issue in not distinguishing them adequately for the purposes of this chapter.

(Lasswell 1936) through research and innovation in a democratic and accountable way. There is a growing acknowledgement that the complex and disruptive nature of changes resulting from science and technology, together with their increasing impact, requires a multilevel framework which is able to adequately consider the above moral, epistemic and political dimensions. Accordingly, the governance of research and innovation should acknowledge the inherent complexity of socio-technical changes and implement holistic measures to address the uncertainty (Nowotny 2015) or indeterminacy (Gorgoni 2018) stemming from research and innovation and its technological products.

4.3   Ethical Assessment Frameworks and RRI

If different countries in Europe had started to implement ethical assessment schemes since the 1970s (Jasanoff 2016), it is mainly with the beginning of the twenty-first century that we encounter concrete institutional measures adopted at the European level. With the inauguration of the European research and innovation investment Framework Program 5 (FP5), the European Commission (EC) has introduced the question of stakeholder involvement and societal acceptability in research. In the early 2000s (EC 2001), the EC started to solicit the engagement of civil society in the design of research processes, opening the path to more concrete measures. Since then we have seen Framework Programs with a special focus on Science in Society (FP6), Science with Society (FP7), and Science with and for Society (FP8, also known as Horizon 2020).

Furthermore, since 2011 the notion of RRI has been gaining momentum in academic and policy circles (Stilgoe et al. 2013; Owen et al. 2012; Wickson and Carew 2014; Von Schomberg 2013; Sutcliffe 2011). One of the first broadly cited definitions of RRI was given by Von Schomberg who sees it as "*A transparent, interactive process by which societal actors and innovators become mutually responsive to each other with a view to 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 2011, p. 9). Others have focused more on the process dimensions interpreting that "*Responsible innovation means taking care of the future through collective stewardship of science and innovation in the present*" with attention to dimensions of anticipation, reflexivity, inclusion and responsiveness in research and innovation processes (Stilgoe et al. 2013, p. 1571; cp. Burget et al. 2017, pp. 9–13).[2]

The fact that the EU has adopted RRI as a cross-cutting issue for Horizon 2020 (H2020), can be seen as the result of an increasing awareness about changes and

---

[2] We recognize that Responsible Research and Innovation and Responsible Innovation can be seen as separate but interlinked discourses with specific antecedents (Owen and Pansera 2019). As the scope of this chapter is to provide a pragmatist perspective on (R)RI we will from now on use the abbreviation of RRI to refer to both.

challenges resulting from science and technology even at the European policy level (EC 2012). Exemplary of this attention is the uptake of six keys that are meant to operationalize RRI: public engagement, gender equality, open access, science education, ethics and governance.[3]

Surely there has not been a shortage of attempts to bring the possible impacts of research, technology and innovation within the grasp of governance arrangements. In order to evaluate its novelty and peculiarities, many commentators have compared the current adoption of RRI to previous or concomitant frameworks and approaches. Several scholars have noted the continuity and discontinuity with (Participatory and/or Constructive) Technology Assessment (PTA/CTA) (Grunwald 2011; Rip 2014), the Ethical, Legal and Social Aspects (ELSA) approach (Salvini et al. 2019; Zwart et al. 2014) and Corporate Social Responsibility (CSR) (Pavie et al. 2014). Others have noted the family resemblance to concepts like Bioethics, Risk Analysis, the Precautionary principle, Vision assessment, Co-design, Value Sensitive Design, Backcasting, Foresight exercises, Futuring, Socio-Technical Integration approaches and Anticipatory governance (Burget et al. 2017).

Although it might be difficult to do justice to the different models and their implementation in different contexts, the main differences in all these frameworks stands in the lower or greater extent of societal inclusion that they propose (Jasanoff 2016). Accordingly, we understand that RRI can be conceived as one of the latest moments of a process of inclusionary transition of innovation management in Europe, which passed from a clear division of roles to being "inclusively contingent" (Eizagirre et al. 2017).

4.4 Reframing RRI as a Strategy for Collective Democratic Experimentation

Despite the amount of resources invested in the last 10 years, RRI has not yet found a clear conceptualization that is broadly accepted by all those involved with it and affected by it. It might be argued that amongst all the different understandings of RRI, it is possible to identify a common agreement only with regard to its encouragement to engage a broader public in the development of research and innovation. Other than that, debates are bogged down into divisions about the right framing, the procedures to be followed (Klaassen et al. 2018) and the relationship of RRI to other concepts such as social justice and sustainability (Spaapen et al. 2015; Von Schomberg 2013).

On the practical side of things, some authors have highlighted that operationalization of the RRI concept is still under development (Ribeiro et al. 2017, p. 12). Notably, recent reports on real-world experiences that do exist, paint a stark picture on the actual implementation of RRI. For example, a recent diagnosis of the

---

[3] For an exhaustive overview of EC expenditures in this sense, together with the development of RRI, see https://newhorrizon.eu/wp-content/uploads/2019/02/D-1.3-Current-Status-of-RRI-.pdf

H2020 Framework Programme has shown that the integration of RRI and implementation in European research funding and practice is lacking in terms of consistency and depth (Novitzky et al. 2020). Many research and innovation actors still seem unfamiliar with RRI and there is a general sparseness of institutionalization in research organizations (Christensen et al. 2020). In the private sector, evidence shows even less of an interest in issues of responsibility (Lubberink et al. 2017). Finally, this combination of persistent misalignment of conceptual debates, different proposals and suggestions to implement RRI and a lack of integration in practice has most probably contributed to a loss of relevance at the European policy level (Fisher 2020).

Despite the apparent loss of policy relevance, responsibility in research and innovation practice remains unequivocally important. Therefore, in response to the above issues several authors from different backgrounds are meticulously working on "*recalibrating both the broader framings that underpin responsible innovation and the practical understandings that will guide its implementation*" (Fisher 2020, p. 2). Strikingly, Nordmann has recently suggested that we should start to embrace RRI more as a collective experimentation strategy (Nordmann 2019) with specific attention to using RRI to instigate experimental processes of social learning in practice. Similarly, Timmermans and others (2020) have recently argued for the relevance of bringing RRI into practice through experimental action research by means of a social lab methodology. The perspectives adopted by these authors have the advantage to defend RRI as a more open-ended experimental framework from instrumental, conservative and often technocratic stances (Klaassen et al. 2018).

Beyond the valuable call to experimentation, we argue that its greatest potential lies in refocusing the attention to RRI's underlying *democratic* agenda for inquiry into responsibility in research and innovation (cp. Owen et al. 2012, p. 754). Building on the above developments, we therefore argue that in particular a *collective democratic experimentation* perspective may provide a promising way out of the current problematic situation of the lacking integration and implementation of responsibility in research and innovation practice. We claim that there is still untapped potential in RRI in that it may provide a diversity of individuals and groups the possibility to exercise their personal freedom and responsibility in a democratic and participatory process of experimentation and learning. We will argue that integrating all kinds of actors, including citizens, in such a process will not only improve the robustness of the adopted strategy but can also contribute to the empowerment of individuals as social agents by allowing them to develop and give life to their own conceptualizations of responsibility in practice.

Even though Nordmann, Timmermans and others provide us with an interesting conceptualization and operationalization of RRI as a collective experimentation strategy, it remains unclear how its *democratic* character could both be philosophically grounded and operationalized in concrete research and innovation contexts. To fill this gap, we propose that we can make good use of the conceptual and

methodological tools developed by the American pragmatists. We argue that the work of John Dewey in particular provides a fruitful way to further think of the public operationalization of the project of RRI through strategies of collective democratic experimentation, since the core of his work revolves around creating more productive links between ethics, science and democracy. In the following sections, we will show that especially his understanding of democracy as an ethical way of life, his attention to the contextual nature of responsibility, together with his focus on publics and social inquiry provide a fruitful way to further conceptualize and operationalize the collective democratic experimentation agenda for RRI.

4.5 Learning from Pragmatism and Democracy as a Way of Life

To understand what is meant by democracy as a way of life, we first need to understand a bit more about the central ideas of American pragmatism. In short, American pragmatism is an action-oriented philosophy that is interested in concrete progressive change in the lives of people. The fundamental idea of pragmatism, as Dewey writes is that "*action and opportunity justify themselves only to the degree in which they render life more reasonable and increase its value*" (Dewey 1990, LW 2, p. 19).

Despite some differences in their philosophies, the American pragmatists are united in that they more or less share an interest in the following six interconnected themes. First of all, pragmatists share an *anti-foundationalist* understanding of knowledge, in which knowledge develops from experience, preferably through an iterative process of inquiry "*as a self-correcting enterprise that has no fixed absolute beginning or absolute end point*" (Bernstein 2015, p. 31). Second, pragmatists embrace the *fallible* nature of inquiry by supporting the thought that everything can be questioned and that what we conceive to be true now can change tomorrow. Third, to still provide inquirers with a foothold from which to organize inquiry, pragmatists put the *community of inquirers* and *sociality of practices* in center focus (Bernstein 2015, p. 32). Through the intersubjective and the social character of the latter two can we work towards knowledge, understanding and action that increases the substantive value of the lives of the community. Fourth, a logical consequence of this posture is that pragmatist philosophers recognize the *necessary existence of a pluralism of perspectives*. This requires an openness to listen to diverse viewpoints so as "*to cultivate those habits and virtues that can prepare us for unexpected contingencies and conflicts*" (idem, p.34). Fifth, following from this is the idea that we need to embrace the *perspective of agents* and work with both *theory and practice* meaning that knowledge should be gained through "*active experimentation and problem solving*" in conjunction with other inquirers in practice (idem).

Finally, informed by all previous themes, pragmatists, and John Dewey in particular, have an interest in *democracy as an experimental process of social inquiry* in itself. Dewey sees democracy not as a particular form of parliamentary government or as a collection of historically grown practices and institutions but as an "*ethical way of life [...] in which all contribute and participate*" (idem, p. 35). Instead of reducing democracy to elections once every couple of years, Dewey sees it as a cooperative experiment (Campbell 1995, p. 200) which provides human beings the room to meaningfully engage with one another and continuously participate in different social fields to contribute to the formation of values that regulate their lives (Dewey 1990, LW 11, p. 217). Accordingly, Dewey interprets democracy from a moral perspective describing it as "*the idea of community life itself*" (Dewey 1990, LW 2, p. 328).

For him, the fundamental principle of democracy, is that "*the ends of freedom and individuality for all can be attained only by the means which accord with those ends*" (Dewey 1990, LW 11, p. 298). All citizens should in other words be encouraged to actively partake in social associations and collectively exercise their powers of communication, deliberation and experimentation to further their individual growth and therewith the growth of society. An accompanying introduction of forms of democratic experimental inquiry in daily practices would improve the cooperative capacities and awareness of societal issues of the individual experts and citizens involved (Dewey 1991). This could in turn generate a greater circular movement that would bolster the democratization of particular practices and institutions allowing more members of society to participate, to develop themselves and to exercise their own responsibility as members of a social community.

4.6   Sociality of Practices and Contextual Nature of Responsibility

These insights are tightly related to two other aspects of Dewey's pragmatist thought that are of high relevance to our discussion on RRI: the ontological understanding of the social embeddedness of individuals in practices and the relationship to the contextual nature of responsibility. Let us start with a discussion of the former.

Individuals, in Dewey's understanding, are never given but always "*created under the influences of associated life*" (Dewey 1983, MW 12, p. 193), mediated by the sociality of practices. Basing himself on insights from sociology and evolutionary biology and aware of the physical embodiment of human beings as living organisms in a particular environment, Dewey notes that "*association in the sense of connection and combination is a 'law' of everything known to exist*" (Dewey 1990, LW 2, p. 250). However, he notes that there is a crucial difference between

biological forms of association and the social conscious sharing of practices.[4] This difference resides in the fact that the latter also requires shared action and communication to develop shared values and act accordingly in tackling particular societal ills (Campbell 1995, pp. 174–175).

If the social and the individual are intricately connected to one another, we could say that Dewey uses responsibility as a principle that expresses their interdependence. Already in the 1920s, he recurrently analyzed the concept of responsibility as a crucial guidance for action. He was well aware of the existing skepticism around moral responsibility as it is often reduced to judgement on individual action and in terms of moral blame (Dewey 1983, MW 14, p. 220). Dewey too loathed archaic, moralistic responses because he thought that they would form an obstacle to the development of competent methods for collectively dealing with social subject matter (Dewey 1990, LW 12, p. 489) and adequate social responses to new situations (Campbell 1995, p. 156). He lamented how such a fixed posture does not open the possibilities for inquiry, but rather closes them (Dewey 1983, MW 12, p. 188).

Instead, Dewey thinks that principles and concepts must always be revised, adapted, expanded and altered when new conditions emerge so that certain principles will be more effective instruments in judging new cases (Dewey 1983, MW 14, p. 165). In other words, pragmatists like Dewey emphasize "*the importance of novel constructs and hypotheses with which emergent problems can be tackled*" (Keulartz et al. 2004, p. 18). The idea of responsibility and particular operationalizations are then to be regarded as a hypothesis *"to be employed in observation and ordering of phenomena, and hence to be tested by the consequences produced by acting upon them"* and not *"as truths already established and therefore unquestionable*" (Dewey 1990, LW 12, p. 499). A reconstruction (Campbell 1995, p. 151) of our conceptualization of responsibility may thus inform the reconstruction of people's practices and institutions (Campbell 1995, pp. 184–192).

Rather than focusing on the justification of absolute moral principles, Dewey is more interested in active inquiry into morally problematic situations (Kupper and De Cock Buning 2011, p. 435). From an action-oriented perspective, this signifies that morality for Dewey "*is a continuing process and not a fixed achievement*" (Dewey 1983, MW 14, p. 194) meaning that ethical values, just like empirical facts, can be the subject of ongoing inquiry (Norton 1999). Instead of artificially attempting to separate questions on social ills, science and values, he is convinced that the method of inquiry could also be applied to matters of moral valuation and societal issues so as to increase the problem-solving capacity of a society.

Moreover, what is becoming clear throughout Dewey's work, is that the adoption of new conceptualizations, practices and institutions of responsibility with better

---

[4] In prose that one does not find often in contemporary scientific analyses, he notes that *"assemblies of electrons, unions of trees in forests, swarms of insects, herds of sheep, and constellations of stars*" (Dewey 1990, LW 2, p. 250) are both marvels and important facts of life but that "*the social, in its human sense, is the richest, fullest and most delicately subtle of any mode [of association] actually experienced*" (Dewey 1990, LW 3, p. 44).

consequences for those involved and affected, is only possible when a corresponding freedom of cooperative experimentation is guaranteed and promoted in social practices (cp. Gianni 2016). Without this freedom of cooperative experimentation "*moral progress can occur only accidentally and by stealth*" (Dewey 1990, LW 7, p. 231). This positive[5] freedom to participate (Campbell 1995, p. 169) then, can be truly exerted only if individuals are provided with the conditions and means to cooperate with others in future-oriented (Dewey 1983, MW 14, p.215), experimental processes of participation. In other words, without providing the appropriate practical and institutional conditions for participation, individuals cannot grow and therefore cannot realize their full capacity for intelligent judgement and action on which a democratic society thrives (Dewey 1990, LW 14, p. 227). Social responsibility can therefore only be understood and exercised appropriately if individuals are provided with the right conditions so that they can take part in the "*experimental and personal participation in common affairs*" (Dewey 1983, MW 11, p. 57).

This Deweyan take on responsibility forms an interesting contrast with current approaches to RRI. Until now, the academic and policy debate on RRI often focus on soliciting responsible approaches by individual researchers and innovators and/ or attempts to mainstream the earlier mentioned substantive or procedural ethical frameworks. However, once such frameworks hit the shop floors of research and innovation, individual researchers and innovators find themselves uncertain on how to act responsibly in their existing daily practices and institutions (Sigl et al. 2020). Confronted by this problem, they then may choose to accommodate RRI policies rather than really engage with their spirit in practice (Åm 2019). The risk is that calls to act more responsibly in research and innovation will then amount to nothing more than a mere slogan (Gianni et al. 2018) continuing the interrelated issue of conceptual unclarity and lack of implementation in practice.

Following Dewey, such problems and risks may be overcome by reconceptualizing RRI as a collective *democratic* experimentation strategy that has the potential to bring democracy as an ethical way of life into research and innovation practices. To achieve this, individuals should be provided with the space to democratically experiment with new conceptualizations of responsibility in diverse social practices. From a pragmatist perspective, this aspect is crucial for an ethical and democratic development of responsibility in research and innovation and can only be attained as long as we create the necessary conditions in practice.

---

[5] It is important to underline that the kind of freedom Dewey refers to goes beyond negative, liberal perceptions of freedom that conceive it as individual protection from hindrances (Frega 2019; cf. Berlin 1969). For Dewey it is more about the distribution of power in a particular time and society (Dewey 1990, LW 11, pp. 361–61). Put differently, his goal is no less than the creation of the right conditions in which "*the power of individuals shall not be merely released from mechanical external constraint but shall be fed, sustained and directed*" (Dewey 1990, LW 11, p. 25).

4.7 Publics and Democratic Experimentation Through Social Inquiry

Noting the necessity of collective democratic experimentation with RRI is one thing, but operationalizing it in practice is another. In other words: how can scholars and practitioners operationalize such processes of democratic experimental inquiry in complex modern societies? Who should be involved, what are the required steps and their most important qualities to attend to? For an answer to these questions, we argue that the Dewey's understanding of publics and social inquiry provides a helpful framework. Let us start with the former.

Dewey's most thought-provoking contributions to democratic theory, first summarized in *The Public and its Problems,* came in 1927 as an answer to some of his contemporaries, skeptical about the will and capacity of the public to participate in modern, highly complex societies (Lippmann 1993). The "*omnicompetent citizen*", capable and willing to engage in any process was considered to be diverging from actual reality, not to say simply utopian. Like Lippmann, Dewey too recognized the growing complexity of modern societies (Dewey 1991, p. 165). He noted how the indirect consequences of modern inventions instituted a multitude of new publics (Dewey 1991, pp. 15–16/41).[6] He also recognized that political or institutional forms did not automatically co-evolve with fast-paced developments in science and technology and that new publics indeed had a hard time taking care of new issues following such developments.[7] However, whereas a realist philosopher like Lippmann believed in a more technocratic (Dewey 1990, LW 7, p. 353) control over a growingly complex society, Dewey believes that "*the cure of ailments of democracy is more democracy*" (Dewey 1991, p. 147).

To him, the increasing role of science and technology and the growing complexity of our societies actually requires active experimentation with more refined instruments of democracy. Not merely for the sake of experimentation as such, but to support the fruitful emergence and participation of a diversity of publics. He wants to achieve this through a double movement, by making democracy more like science (as a form of inquiry) while democratizing science itself (by making the

---

[6] He noticed how in determining indirect consequences, these inventions instituted what he called "*publics with different interests*" (idem, p. 44). He defined these publics as consisting "*of all those who are affected by the indirect consequences of transactions to such an extent that it is deemed necessary to have those consequences systematically cared for*" (Dewey 1991, pp. 15–16).

[7] This led to the problematic situation that such newly emerging publics could not inherit political agencies (Dewey 1991, p. 31) and adequately take care of their issues. What is more, the technological transformations led to an eclipse of the public which meant that members of publics affected by the new machine age did not even recognize themselves as such (Dewey 1991, p. 126). Dewey saw this as a problem because in a functioning democratic society, those publics and their individual members and representatives would be the ones who should participate in the formation of society and attend to the growth of its members. If publics were eclipsed and could not recognize themselves as such, they could not effectively participate and therefore not efficiently take care of the consequences of technology and innovation for society.

techniques of science available to all kinds of publics) (Bohman 1999). Recognizing the intrinsic kinship between democracy and scientific experimental methods (Dewey 1990, LW 15, pp. 254/274) he advocates for the spread of the laboratory culture of inquiry into society to encourage the creation of new forms of communication and participation (Sabel 2012, p. 38).

In his later works he further operationalizes this democratic experimentalist agenda by calling for the active organization of cooperative processes of social inquiry (Dewey 1990, LW 12, p. 481). For him, *social inquiry* is the application of a process of transformation to complex social problems.[8] Just like all forms of inquiry, it takes place inside a cultural matrix of existing practices (Campbell 1995, p. 194) and consists of the following five steps.[9] The first step always starts with a situation of perplexity or confusion in which we are *confronted with an indeterminate situation* which makes us stand still and question our usual habits. Things are not working as they should and we are taken aback because our usual practices and routines do not suffice. Existing institutions cannot seem to accommodate the newly emerging issue (Marres 2007, p. 769). On the level of social inquiry, it means that certain social problems are recognized by multiple people and publics form around these issues. The result is a situation of indeterminacy and uncertainty: what do we do now?

The second step in an inquiry is that a public needs to work through this doubt and slowly but surely *transform the situation into a problem statement*. This means it needs to think the situation through and reflect. Social inquiring publics may confront themselves: "what could be the cause of this social ill?" This requires a suspense of immediate judgement and the cognitive ability to entertain multiple problem statements at once before selecting one. Without such an understanding "*there is a blind groping in the dark*" (Dewey 1990, LW 12, p. 112).

The third step consists of the *formulation of ideas and the postulation of hypotheses about possible solutions to the problem*. Such solutions are of course shaped by the diagnosis of the problem (Dewey 1990, LW 8, p.203) and may be elaborated with support of forecasting, backcasting, and imagining the future consequences of a particular line of action (cp. Krabbenborg 2016, p. 910). To find a solution to experienced social problems, publics may propose a new pilot, policy agenda and/or the reconstruction of existing practices and institutions.

Fourth, a public then needs to *reason about these solutions* so as to sharpen them in the mind. How detailed and elaborate such analyses may be depends on personal and social resources: past experience and education, the contemporary culture and level of technology (Campbell 1995, p. 50). Finally, the public needs to *test*

---

[8] Inquiry, Dewey defines as *"the controlled or directed transformation of an indeterminate situation in one that is so determinate in its constituent distinctions and relations as to convert the elements of the original situation in a unified whole"* (Dewey 1990, LW 12, p. 108). With an indeterminate situation he means a situation which is deemed problematic by the observer.

[9] Or four phases if one sees the confrontation with an indeterminate situation as a separate occasion (Krabbenborg 2016, p. 910).

hypotheses in real life i.e. implementing pilots, changing practices or institutional set-ups and subsequently *collectively evaluate the consequences of the actions* that follow from this.

Moreover, for democratic experimentation through social inquiry and following solutions, the quality hangs tightly together with their *social*, *experimental* and *public* character. Starting with the *social*, Dewey recognizes that the rationality of solutions depends on whether all those who are affected are actively involved in the research process (Honneth 1998, p. 775). The willingness to listen to diverse viewpoints is therefore central in its success (Campbell 1995, p. 199). Experts are not disregarded as they can provide useful epistemic guidance to map the terms of a problem and lay-out possible alternatives. However, Dewey believed that to construct a path towards situated solutions, a cooperative judgment should also attend to the ideas and narratives of publics affected by the social problem and subsequent social inquiry. This in turn requires communication and deliberation between experts and citizens from different backgrounds to evaluate the different perspectives, to integrate potential conflict (Follett 2003), to enrich the available epistemic toolbox and prevent absolutism. Furthermore, one should pay crucial attention to the perspective of 'minorities' (Frega 2015).

Second, the value of social inquiry lies in its inherently *experimental* nature. To be sure, to experiment is not about "*just messing around nor doing a little of this and a little of that in the hope that things will improve*" (Dewey 1990, LW 11, pp. 292–93; cp. Dewey 1990, LW 8, p. 206). Neither is it based on a positivistic, verificationist idea of a randomized controlled experiment (Ansell 2012) in which one tries to control the environment as much as possible. No, the experimental character lies in the idea that hypotheses are methodically formulated and tested and evaluated on their results in concrete practices. In other words, the experimental aspect refers to the fact that social inquiry is about trying out different ideas with reference to real life social contexts. Thus, social inquiry, when appropriately and methodically applied, can invite participants to learn from failure so as to lead to better insights into the problematic state and/or future improved hypotheses and solutions for societal problems in reality.

Third, just as in ideal scientific inquiry, the *public* character of the democratic experiment is of prime importance (Campbell 1995, p. 103). This means that both the process as well as the results of social inquiry should be made as public and intelligible as possible, including for those who did not directly participate in the process (Dewey 1991, pp. 176–178). Dewey especially emphasizes the role of art and (local) communication in guaranteeing this aspect (Dewey 1991, p. 184). The resulting publicity could then help to assess the acceptability of the adopted solution on a larger scale and inspire further future social inquiries.

By following these different steps, and with specific attention to its experimental, social and public character, social inquiry can help publics to become more acquainted with an 'intelligent' democratic way of addressing problems in different fields. Thus citizens, as members of diverse publics, may become motivated to participate in the social and political formation of technological society and meaningfully take part in a process where their input is valued (Honneth 1998). As a result,

the process of social inquiry can then become a virtuous circle with experts, policy-makers and a diversity of publics ideally being able to establish recurrent democratic dialogue and action on societal problems. The "end in view" is then to make such processes of social inquiry a normative element in citizens' habits (Honneth 1998) and institutions.

4.8   Towards Collective Democratic Experimentation with RRI in Social Labs

To show the concrete value of this Deweyan view on democratic experimentation for RRI through social inquiry, we will now finally connect above insights to the recent call to operationalize RRI through social labs (Timmermans et al. 2020).

In response to the dual issue of conceptual unclarity and lacking practical implementation of RRI, Timmermans and others recently proposed to use a social labs methodology (idem). Originally coined by Hassan, social labs are platforms that aim to address complex social challenges in a social, experimental and systemic fashion (Hassan 2014, p. 3). Timmermans and others (2020) have provided a further theoretical underpinning of social labs by (re)conceptualizing them as a form of participatory action research (Reason and Bradbury 2001, p. 1). They posit that social labs are well fit to experiment with RRI since they understand RRI as an emerging social phenomenon of which the properties gradually come into existence during and resulting from the interaction of different actors involved with theorizing and implementing RRI (Timmermans et al. 2020, p. 4).

Furthermore, in laying the connection between RRI and social labs and providing the necessary theoretical and methodological grounding, Timmermans and others discern six features of social labs. First, they point at their experimental nature, meaning that social labs provide room for concrete action and the development of prototypes and interventions. Second, they are intently part of the real world by developing and testing solutions in a particular social context (idem, p. 5). Third, they require the active participation of a wide range of societal stakeholders such as policymakers, businesses, government and civil society. Fourth, they involve experts from a wide range of expertise and backgrounds. Fifth, instead of merely focusing on the symptoms of certain social problems, they aim to achieve systemic change. Sixth and finally, they are an inherently iterative and agile approach. By making many iterations and closely monitoring the process, social labs can take in emerging information and work with unplanned events to allow the evolution of particular solutions to complex social challenges over time (idem, p. 6). To increase the relevance and uptake of this process, the empowerment of social lab participants through processes of experiential learning (Kolb 1984; Moon 2004) is deemed crucial.

Timmermans and others thus provide an interesting first grounding of the social lab methodology and its connection to RRI on which others can profitably build. It is clear that their understanding of social labs as socially embedded platforms that can experiment in real life may indeed provide a way of the current RRI deadlock.

Also, all six features seem to fit naturally with a Deweyan emphasis on building up knowledge through recurrent, experimental processes of social inquiry in particular contexts. However, if social lab organizers wish to use such platforms as a vehicle to promote collective *democratic* experimentation with responsibility in research and innovation practices, we think it is apt to emphasize that they pay attention to the following (complementary) Deweyan insights.

In line with Dewey's understanding of democracy as an ethical way of life, taking note of the inherent social embeddedness of individuals in practices and the contextual nature of responsibility, collective *democratic* experimentation with responsibility ought to be organized as a process of *social inquiry* with the involvement of diverse *publics*. Publics affected by and recognizing certain morally problematic situations around research and innovation should be allowed to democratically experiment with ways to deal with such issues. Concretely, this means social labs should provide support to diverse groups of people to use the principle of RRI to alleviate experienced problematic situations in concrete research and innovation practices and institutions.

This process requires specific attention to the social, experimental and public dimensions of social inquiry. Its *social* character should allow all those affected by the issues to deliberate and cooperate with experts. This includes listening to diverse viewpoints, including those of minorities in a certain context, since what may be experienced as responsible research and innovation by one stakeholder group in one context may differ from other experiences. By remaining open to different interpretations of responsibility as they arise from the midst of diverse stakeholders affected by an issue, social labs can thus provide a venue for them to co-create their own, new contextualized understandings of responsibility in research and innovation, fit for practice.

Its *experimental* and fallible nature should be guaranteed by testing the consequences of particular hypotheses in concrete practices and remaining open to learn from failure. In other words, experimentation with RRI in social labs should provide a way for diverse publics embedded in and affected by particular research and innovation practices to bring their own interpretations of responsibility into practice. This entails providing them with the right methodological support, for example by discussing a diagnosis of problematic situations related to their own research and innovation practices with them. Consequently, it should also provide them with the support and means to formulate concrete problem statements and possible responsible solutions as hypotheses through processes of backcasting and imagining future consequences of particular lines of action. They should be provided the support to test and evaluate such pilot solutions with reference to their concrete results in practice. This also means that space should be provided for specific normative outcomes per context.

Finally, the experimentation with RRI in social labs should be organized as *public* as possible. This last aspect is as yet relatively underexplored in the social labs literature, but crucial if one wants to realize the *democratic* potential of collective experimentation with RRI in social labs. Concretely, it means that social lab organizers should attend to the publicness of both the social lab process as well as the publicity of its outcomes. Organizing a public social lab process may entail

informing and involving (representatives of) diverse groups of actors affected by a certain RRI issue, preferably beyond those representing vested interests and from the start. One can particularly publicize the social lab process by connecting to existing (bottom-up) citizen communities and networks during the process. The important criterion to focus on is that it provides (representatives) of groups of people who can reasonably be expected to be affected by a certain issue of RRI in practice, the possibility to provide their input into the process and resulting solutions.

To further spur this development beyond the direct social lab process, social lab organizers can also attend to the publicity of the outcomes of the process. This means translating the findings and insights with an eye to re-usability and communicability. In particular, it is of interest to experiment with the creation of communicable narratives (Constant and Roberts 2017) about social lab experiences and outcomes to increase the chances that insights may find their way into existing practices and institutions. With the right attention to publicness and publicity during and after the process, collective democratic experimentation with RRI in social labs may thus inspire future iterative processes of social inquiry that can contribute to responsibility in research and innovation practice.

4.9 Conclusion

We started this chapter by highlighting the salient challenges of research and innovation and the frameworks that have been introduced in response to this, including RRI. Although we recognized some of the main current shortcomings of RRI, like conceptual unclarity, problems of implementation and institutionalization and accompanying waning policy relevance, we believe that it would be a mistake to dismiss the ethical and democratic spirit characterizing the RRI agenda. Therefore, we sided with Nordmann (2019) in his call to (re)conceptualize RRI as a collective experimentation strategy. As existing literature in the field does not seem to address sufficiently the implicit *democratic* character of such a reconceptualization of the project of RRI, we noted that John Dewey's pragmatist philosophy could provide those interested in collective democratic experimentation with RRI a fruitful toolkit and way forward. To explore this further on a conceptual and normative level, especially in connection to recent calls to use social labs for RRI, we asked the following research question:

> What is, from a pragmatist perspective, a proper way to conceptualize and understand collective democratic experimentation with RRI in social labs?

To answer this question, we delved into the central tenets of the pragmatist philosophy. Specifically, we noted how Dewey understood democracy not as a particular governmental form, but rather conceived it as an ethical way of life in which members of communities are able to develop their potentiality through cooperative processes of experimental social inquiry embedded in social practices.

Basing ourselves on Dewey's insights, we suggested that democratic experimentation with RRI should be organized as a process of *social inquiry* involving a diversity of *publics*. Concretely, this entails that the concept of RRI and/or the principle of responsibility in research and innovation should be used to support the alleviation of problematic situations around research and innovation in concrete practices and institutions. This means it should support publics to formulate concrete problem statements and possible solutions as hypotheses to be tested and evaluated by reference to their concrete results in practice. Specifically, attention should be paid to guaranteeing the *social*, *experimental* and *public* nature of such a process by, respectively, involving citizens and experts in a cooperative process from the start, experimenting methodically and making both the process as well as the results as public as possible. The latter is deemed especially important to increase the chance that insights may find their way into existing practices and institutions and may in a circular fashion inspire future democratic and experimental forms of social inquiry in different contexts.

To further show the value of this pragmatist democratic experimentation agenda for RRI, we connected Dewey's ideas to the current call for experimentation with RRI through social labs. From this, we learned that experimentation with RRI in concrete practices by means of a social labs methodology provides a platform to integrate democracy as an ethical way of life into research and innovation practices. Especially with enough attention to the publicness of the process (i.e. by connecting to existing (bottom-up) citizen communities and networks), and publicity of the outcomes (i.e. by communicating the insights and outcomes in an accessible and engaging way), democratic experimentation with RRI in social labs may contribute to integration of RRI in practice.

Still, if we want to integrate RRI sustainably, we also need to pay further attention to the role of institutional conditions and to enlarging the room for maneuver (Krabbenborg 2016, p. 918) that participants possess in implementing RRI insights in existing institutions. Given their systemic ambition (Timmermans et al. 2020, p. 6), we believe that it would be fruitful to conduct further research into the role that action research platforms such as social labs and their respective publics can play in changing institutional conditions. Future research should specifically pay attention to further developing the conceptual and methodological toolkit and empirical arguments as to how such venues for social inquiry may transform existing institutions (cp. Van Oudheusden 2014) in the research and innovation system.

Furthermore, we believe that the democratic experimental reading of social inquiry through social labs could profitably be taken up by proponents of Open Science, Citizen Science, Open Innovation and co-creation paradigms to foster inclusion of a diversity of publics and aid the democratization of science and innovation. Such research should be open to learn from engaging with concrete practices, communities and their issues and challenges. For, in line with Dewey, we think it is better for research and philosophy "*to err in active participation in the living struggles and issues of its own age and times, than to maintain an immune monastic impeccability, without relevancy and bearing in the generating ideas of its contemporary present*" (Dewey 1983, MW 4, p. 142).

References

Åm, Heidrun. 2019. Limits of Decentered Governance in Science-Society Policies. *Journal of Responsible Innovation* 6 (2): 163–178. https://doi.org/10.1080/23299460.2019.1605483.

Ansell, Chris. 2012. What is a "Democratic Experiment"? *Contemporary Pragmatism* 9 (2): 159–180. https://doi.org/10.1163/18758185-90000235.

Berlin, Isaiah. 1969. *Four Essays on Liberty*. London: Oxford University Press.

Bernstein, Richard. 2015. *Pragmatic Encounters*. New York: Routledge.

Bohman, James. 1999. Democracy as Inquiry, Inquiry as Democratic: Pragmatism, Social Science, and the Cognitive Division of Labor. *American Journal of Political Science* 43 (3): 590–607. https://doi.org/10.2307/2991808.

Burget, Mirjam, Emanuele Bardone, and Margus Pedaste. 2017. Definitions and Conceptual Dimensions of Responsible Research And Innovation: A Literature Review. *Science and Engineering Ethics* 23 (1): 1–19. https://doi.org/10.1007/s11948-016-9782-1.

Campbell, James. 1995. *Understanding John Dewey*. Chicago: Open Court.

Christensen, Malene Vinther, Mika Nieminen, Marlene Althofer, Elise Tancoigne, Niels Meljgaard, Erich Griessler, and Adolf Filacek. 2020. What's in a Name? Perceptions and Promotion of Responsible Research and Innovation Practices across Europe. *Science and Public Policy* 47 (3): 360–370. https://doi.org/10.1093/scipol/scaa018.

Constant, Natasha, and Liz Roberts. 2017. Narratives as a Mode of Research Evaluation in Citizen Science: Understanding Broader Science Communication Impacts. *Journal of Science Communication* 16 (4): 1–18. https://doi.org/10.1063/1.2756072.

Davis, Michael, and Kelly Laas. 2014. 'Broader Impacts' or 'Responsible Research and Innovation'? A Comparison of Two Criteria for Funding Research in Science and Engineering. *Science and Engineering Ethics* 20 (4): 963–983. https://doi.org/10.1007/s11948-013-9480-1.

Dewey, John. 1983. *The Middle Works of John Dewey, 1899-1924*. Carbondale: Southern Illinois University Press.

———. 1990. *The Later Works of John Dewey, 1924-1953*. Carbondale: Southern Illinois University Press.

———. 1991. *The Public and its Problems*. Athens: Swallow Press.

Eizagirre, Andoni, Hannot Rodriguez, and Andoni Ibarra. 2017. Politicizing Responsible Innovation: Responsibility as Inclusive Governance. *International Journal of Innovation Studies* 1 (1): 20–36. https://doi.org/10.3724/SP.J.1440.101003.

European Commission (EC). 2001. *Science and Society: Action Plan*. COM (2001) 714 final, European Commission, Brussels. https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52001DC0714&from=EN. Accessed 7 May 2021.

———. 2012. *Responsible Research and Innovation. Europe's Ability to Respond to Societal Challenges*. https://ec.europa.eu/research/swafs/pdf/pub_public_engagement/responsible-research-and-innovation-leaflet_en.pdf. Accessed 30 April 2018.

Feenberg, Andrew. 1991. *Critical Theory of Technology*. New York: Oxford University Press.

Fisher, Erik. 2020. Reinventing Responsible Innovation. *Journal of Responsible Innovation* 7 (1): 1–5. https://doi.org/10.1080/23299460.2020.1712537.

Floridi, Luciano. 2014. *The Fourth Revolution: How the Infosphere is Reshaping Human Reality*. Oxford: Oxford University Press.

Follett, Marie Parker. 2003. *Dynamic Administration: The Collected Papers of Mary Parker Follett*. Oxford: Routledge.

Frega, Roberto. 2015. John Dewey's Social Philosophy. *European Journal of Pragmatism and American Philosophy VII* 2: 0–27. https://doi.org/10.4000/ejpap.410.

———. 2019. *Pragmatism and the Wide View of Democracy*. Cham: Palgrave Macmillan. https://doi.org/10.1007/978-3-030-18561-9.

Gianni, Robert. 2016. *Responsibility and Freedom – The Ethical Realm of RRI*. London: Wiley-ISTE.

Gianni, Robert, John Pearson, and Bernard Reber. 2018. *Responsible Research and Innovation. From Concept to Practices*. Oxford: Routledge.

Gorgoni, Guido. 2018. Responsible Research and Innovation and the Governance of Human Enhancement. *NanoEthics* 12 (3): 257–267. https://doi.org/10.1007/s11569-018-0326-9.

Grunwald, Armin. 2011. Responsible Innovation: Bringing Together Technology Assessment, Applied Ethics, and STS Research. *Enterprise and Work Innovation Studies* 7: 9–31. https://run.unl.pt/handle/10362/7944.

Hassan, Zaid. 2014. *The Social Labs Revolution*. San Francisco: Berrett-Koehler Publishers.

Heidegger, Martin. 1977. The Question Concerning Technology. In *The Question Concerning Technology and Other Essays* (trans: W. Lovitt), 3–35. New York: Garland Publishing.

Honneth, Axel. 1998. Democracy as Reflexive Cooperation: John Dewey and the Theory of Democracy Today. *Political Theory* 26 (6): 763–783. https://doi.org/10.1177/0090591798026006001.

Jasanoff, Sheila. 2016. *The Ethics of Invention*. New York: Norton.

Keulartz, Jozef, Maartje Schermer, Michiel Korthals, and Tsjalling Swierstra. 2004. Ethics in Technological Culture: A Programmatic Proposal for a Pragmatist Approach. *Science Technology and Human Values* 29 (1): 3–29. https://doi.org/10.1177/0162243903259188.

Klaassen, Pim, Michelle Rijnen, Sara Vermeulen, Frank Kupper, and Jacqueline Broerse. 2018. Technocracy vs Experimental Learning in RRI. On Making the Most of RRI's Interpretative Flexibility. In *Responsible Research and Innovation. From Concept to Practices*, ed. Robert Gianni, John Pearson, and Bernard Reber, 77–98. Oxford: Routledge.

Kolb, David. 1984. *Experiential Learning: Experience as the Source of Learning and Development*. Eaglewood Cliffs, NJ: Prentice Hall.

Krabbenborg, Lotte. 2016. Creating Inquiry Between Technology Developers and Civil Society Actors: Learning from Experiences Around Nanotechnology. *Science and Engineering Ethics* 22 (3): 907–922. https://doi.org/10.1007/s11948-015-9660-2.

Kupper, Frank, and Tjard De Cock Buning. 2011. Deliberating Animal Values: A Pragmatic-Pluralistic Approach to Animal Ethics. *Journal of Agricultural and Environmental Ethics* 24 (5): 431–450. https://doi.org/10.1007/s10806-010-9260-8.

Lasswell, Harold. 1936. *Politics: Who Gets What, When and How*. Cleveland: Meridian Books.

Lippmann, Walter. 1993. *The Phantom Public*. New York: Routledge.

Lubberink, Rob, Vincent Blok, Johan van Ophem, and Onno Omta. 2017. Lessons for Responsible Innovation in the Business Context: A Systematic Literature Review of Responsible, Social and Sustainable Innovation Practices. *Sustainability* 9 (721): 1–31. https://doi.org/10.3390/su9050721.

Marcuse, Herbert. 2003. *One-Dimensional Man: Studies in the Ideology of Advanced Industrial Society*. London: Routledge.

Marres, Noortje. 2007. The Issues Deserve More Credit: Pragmatist Contributions to the Study of Public Involvement in Controversy. *Social Studies of Science* 37 (5): 759–780. https://doi.org/10.1177/0306312706077367.

Moon, Jennifer. 2004. *A Handbook of Reflective and Experiential Learning: Theory and Practice*. London: Routledge.

Nordmann, Alfred. 2019. The Ties that Bind: Collective Experimentation and Participatory Design as Paradigms for Responsible Innovation. In *International Handbook on Responsible Innovation*, ed. René von Schomberg and Jonathan Hankins. Cheltenham: Edward Elgar Publishing.

Norton, Bryan G. 1999. Pragmatism, Adaptive Management, and Sustainability. *Environmental Values* 8 (4): 451–466. https://doi.org/10.3197/096327199129341914.

Novitzky, Peter, Michael J. Bernstein, Vincent Blok, Robert Braun, Tung Tung Chan, Wout Lamers, Anne Loeber, Ingeborg Meijer, Ralf Lindner, and Erich Griessler. 2020. Improve Alignment of Research Policy and Societal Values. *Science* 369 (6499): 39–42. https://doi.org/10.1126/science.abb3415.

Nowotny, Helga. 2015. *The Cunning of Uncertainty*. New York: Wiley.

Owen, R., & Pansera, M. (2019). Responsible Innovation and Responsible Research and Innovation. In *Handbook on Science and Public Policy*, (eds.), D. Simon, S. Kuhlmann, J. Stamm, and W. Canzler, 26–48. Edward Elgar Publishing. https://doi.org/10.4337/9781784715946.00010

Owen, Richard, Phil Macnaghten, and Jack Stilgoe. 2012. Responsible Research And Innovation: From Science in Society to Science for Society, With Society. *Science And Public Policy* 39 (6): 751–760. https://doi.org/10.1093/scipol/scs093.

Pavie, Xavier, Victor Scholten, and Daphne Carthy. 2014. *Responsible Innovation: From Concept to Practice*. Singapore: World Scientific.

Reason, Peter, and Hilary Bradbury. 2001. *Handbook of Action Research: Participative Inquiry and Practice*. London: Sage.

Ribeiro, Barbara E., Robert D.J. Smith, and Kate Millar. 2017. A Mobilising Concept? Unpacking Academic Representations of Responsible Research and Innovation. *Science and Engineering Ethics* 23 (1): 81–103. https://doi.org/10.1007/s11948-016-9761-6.

Rip, Arie. 2014. The Past and Future of RRI. *Life Sciences, Society and Policy* 10 (17): 1–15. https://doi.org/10.1186/s40504-014-0017-4.

Sabel, Charles. 2012. Dewey, Democracy, and Democratic Experimentalism. *Contemporary Pragmatism* 9 (2): 35–55. https://doi.org/10.1163/18758185-90000229.

Salvini, Pericle, Erica Palmerini, and Bert-Jaap Koops. 2019. Robotics and Responsible Research and Innovation. In *International Handbook on Responsible Innovation*, ed. René von Schomberg and Jonathan Hankins. Cheltenham: Edward Elgar Publishing.

Schradie, Jen. 2018. The Digital Activism Gap: How Class and Costs Shape Online Collective Action. *Social Problems* 65 (1): 51–74. https://doi.org/10.1093/socpro/spx042.

Sigl, Lisa, Ulrike Felt, and Maximilian Fochler. 2020. "I am Primarily Paid for Publishing…": The Narrative Framing of Societal Responsibilities in Academic Life Science Research. *Science and Engineering Ethics* 26 (3): 1569–1593. https://doi.org/10.1007/s11948-020-00191-8.

Spaapen, Jack (Rapporteur), Roger Strand (Chair), Martin Bauer, Ela Hogan, Gema Revuelta, and Sigrid Stagl (Members), and Lino Paula, Ângela Guimarã es Pereira. (Contributors). 2015. *Indicators for Promoting and Monitoring Responsible Research and Innovation. Report from the Expert Group on Policy Indicators for Responsible Research and Innovation*. European Commission. Available at http://ec.europa.eu/research/swafs/pdf/pub_rri/rri_indicators_final_version.pdf

Stiegler, Bernard. 2016. *The Future of Work*. Cambridge: Polity Press.

Stilgoe, Jack, Richard Owen, and Phil Macnaghten. 2013. Developing A Framework for Responsible Innovation. *Research Policy* 42 (9): 1568–1580. https://doi.org/10.1016/j.respol.2013.05.008.

Sunstein, Cass R. 2017. *#Republic. Divided Democracy in the Age of Social Media*. Princeton: Princeton University Press.

Sutcliffe, Hillary. 2011. *A Report on Responsible Research & Innovation*. DG Research and Innovation of the European Commission.

Timmermans, Job, Vincent Blok, Robert Braun, Renate Wesselink, and Rasmus Øjvind Nielsen. 2020. Social Labs as an Inclusive Methodology to Implement and Study Social Change: The Case of Responsible Research and Innovation. *Journal of Responsible Innovation* 7 (3): 1–17. https://doi.org/10.1080/23299460.2020.1787751.

Van den Hoven, Jeroen. 2013. Value Sensitive Design and Responsible Innovation. In *Responsible Innovation: Managing the Responsible Emergence of Science and Innovation in Society*, ed. Richard Owen, John Bessant, and Maggy Heintz. London: Wiley.

Van Oudheusden, Michiel. 2014. Where are the Politics in Responsible Innovation? European Governance, Technology Assessments, and Beyond. *Journal of Responsible Innovation* 1 (1): 67–86. https://doi.org/10.1080/23299460.2014.882097.

Von Schomberg, René. 2011. *Towards Responsible Research and Innovation in the Information and Communication Technologies and Security Technologies Fields*. Luxembourg: Publication Office of the European Union.

Von Schomberg, Rene. 2013. A Vision of Responsible Innovation. In *Responsible Innovation: Managing the Responsible Emergence of Science and Innovation in Society*, ed. Richard Owen, John Bessant, and Maggy Heintz. London: Wiley.

Wickson, Fern, and Anna L. Carew. 2014. Quality Criteria and Indicators for Responsible Research and Innovation: Learning from Transdisciplinarity. *Journal of Responsible Innovation* 1 (3): 254–273. https://doi.org/10.1080/23299460.2014.963004.

Zwart, Hub, Laurens Landeweerd, and Arjan van Rooij. 2014. Adapt or Perish? Assessing the Recent Shift in the European Research Funding Arena from 'ELSA' to 'RRI'. *Life Sciences, Society and Policy* 10 (11): 1–19. https://doi.org/10.1186/s40504-014-0011-x.

Joshua B. Cohen contributed to this book as part of his PhD candidacy at the Political Science department of the University of Amsterdam. His (action) research focused on making research and innovation public from a pragmatist perspective with a particular interest in using experimental and participatory forms of action research to instigate institutional changes. He has been involved with the NewHoRRIzon project that focused on promoting attention to RRI and public engagement across the European funding system. Next to a PhD he holds an MSc in Political Science and an MA in Philosophy for which he researched room for citizen participation in local youth care policy and smart city development. He currently works as a researcher, advisor and trainer on the topic of public cooperation and participation at TwynstraGudde.

Robert Gianni is a researcher at the BISS institute of Maastricht University. He holds a PhD in Social and Theoretical Philosophy from SUM/Scuola Normale Superiore. His research focuses on the relationship between the emergence of innovative technologies and the related democratic regulatory frameworks. By studying democratic principles and methodologies on the one hand, and the development of technologies with a strong societal impact on the other, Robert aims to establish a democratic framework for the management of social claims through technology. He has been working on several European projects investigating the different approaches to design and implement regulatory frameworks of research and innovation. Amongst his publications summarising his investigations in the field, see *Responsible Research and Innovation: From Concepts to Practices,* (Routledge 2018).