# 1. Introduction to the *International Handbook on Responsible Innovation**

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Responsible innovation (RI) has become the subject matter of a broad array of dedicated research and innovation actions over the past ten years, with several national research funding bodies having designed programmes to support research and innovation action. Examples include the Netherlands Council for Research (NWO), which has a dedicated internationally orientated programme on RI,[1] the UK Engineering and Physical Sciences Research Council (EPSRC) whose interest in the subject matter can be traced back as early as 2008,[2] the US National Science Foundation (NSF) which among other projects supported the creation of the Virtual Institute of Responsible Innovation (VIRI)[3] and the Research Council of Norway's creation of the responsible innovation and corporate social responsibility (SAMANSVAR) funding programme.[4]

Since 2014, responsible research and innovation (RRI) has been a cross-cutting issue under the European Union's (EU's) Framework Programme for research and innovation, Horizon 2020, the world largest research and innovation programme. Important features of responsible innovation, for example, open collaboration and the co-design of research and innovation agendas for mission-orientated research and innovation targeted at delivering on societal desirable outcomes (notably on the global sustainable development goals), are an integral part of the European Commission's proposal for Horizon Europe, the new Framework Programme that will run from 2020 to 2027. China has made responsible innovation a formal policy of the state by including it in the thirteenth five-year plan on science, technology and innovation. Industrial actors have become increasingly responsive to the demand that their products reflect basic societal values and expectations.

This *Handbook* constitutes a valuable resource for all those interested in the further development and implementation of RI in all of its forms. As a truly global resource on the subject matter of interdisciplinary research and activity, the *Handbook* brings together prominent authors from the United States, Europe, Asia and Africa.

This naturally has the consequence that the authors provide a variety of perspectives and different assessments of what needs to be addressed by responsible innovations. All authors however share the notion that RI requires a form of governance that will direct or re-direct innovation towards societally desirable outcomes. Responsible innovation advocates will argue that the innovation process is neither steerless nor inherently good. Instead of being steerless, innovation can be managed and a growing body of research constitutes a testimony on how we can manage innovation and shape technologies in accordance with societal values and expectations as well as (re-)direct them towards normative targets such as sustainability goals. Furthermore, RI reflects an economic paradigm that acknowledges that market innovations do not automatically deliver on societally desirable objectives, and require a broad governance of knowledge coalitions of

governmental bodies and industrial and societal actors to address market deficits. Hence, responsible innovation has become a topic of research for social and natural scientists, economists and ethicists alike.

The initial definition Von Schomberg provided in 2013 captures the commonalities of the field:

> Responsible Research and Innovation is 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 2013, p. 63)

This definition was not proposed as an end-result but as a starting point for an ever-growing field of research and innovation actions. This volume reflects this body of work, addressing the conceptual issues underlying responsible innovation (Part I), the link with societal desirable outcomes in terms of grand societal challenges (Part II), emerging technologies (Part III) and cultural and regional dimensions (Part IV).

The collection concludes with a series of transcriptions from interviews with top representatives from a not-for-profit organization (the Bassetti Foundation), the European Commission and a major industrial actor, DSM. (DSM is a purpose-led global science-based company in Nutrition, Health and Sustainable Living. The head office of this multinational company is based in Heerlen, the Netherlands.)

## PART I CONCEPTS UNDERPINNING RESPONSIBLE INNOVATION

A recent body of work has been dedicated to the further conceptualization of notions underpinning RI, as (among others) amply illustrated in the diverse contributions to the *Journal of Responsible Innovation*, launched in 2013.[5]

In Chapter 2 of this *Handbook* Von Schomberg elaborates on the current deficits of the (global) research and innovation system. These deficits constitute the background to a call for RI.

Von Schomberg's definition, cited previously, is drawn from a conception of an ethics of co-responsibility which is articulated by the demand to be 'mutually responsive' or to have commitments to societal desirable goals from stakeholders in the innovation process. However, this perspective is not unanimous in the field. Some have argued for an ethics of care (see Owen and Pansera's Chapter 3 in this volume and Owen et al. 2013 for further examples) while Gianni (Chapter 4 in this volume) grounds the notion of responsibility in a social understanding of 'freedom'.

A further body of work has been devoted to addressing the governance of innovation processes. A commonly occurring theme in this work is the importance of stakeholder involvement and the participation of a broad range of actors. This is, for example, articulated by notions of democratic engagement with the innovation process (Hennen and Nierling, Chapter 14 in this volume), better integration of assessment mechanisms relevant for innovation (Forsberg, Chapter 10 in this volume) or, even, collective experimentation by societies (Nordmann, Chapter 12 in this volume).

An important field of investigation aims to specify and clarify what have been general reflections on socio-economic governance, concerning the relatively unaddressed yet vitally important analysis of the socio-economic governance of organizations and their relationship to society (Pavie and Blok, Chapters 15 and 16, respectively, in this volume).

Finally, many authors have emphasized the importance of reflexivity in the innovation process by either calling for reflexivity of the innovation process as such (Owen et al. 2013 and Owen and Pansera, Chapter 3 in this volume) or within the specific boundaries between scientific disciplines and the societal sector (Rommetveit et al., Chapter 6 in this volume). Özdemir (Chapter 5 in this volume) also introduces an element of reflexivity within ethics by calling for an 'ethics-of ethics'.

Part I is divided into three sections, the first 'Responsibility and Ethics' is followed by 'Governance' and the third is 'Responsible Innovation in Organizations'.

The 'Responsibility and Ethics' section opens with Chapter 3, 'Responsible innovation: process and politics' by Richard Owen and Mario Pansera. The authors start with an introduction to discourse surrounding the emergence of RI as a concept, before describing its development into responsible research and innovation in the hands of the European Commission. The chapter carries the reader through the process of an apoliticized concept that becomes politicized through the application of its content, before concluding with a section entitled 'Change for good', in which they raise the need to investigate what good might actually mean.

The section continues with Robert Gianni's 'Choosing freedom: ethical governance for responsible research and innovation', an analysis of a concept of responsibility that derives its overall sense from freedom, something the author describes as the very factor that it is called to develop and protect. Through his own particular social understanding of individual freedom, Gianni argues the advantages of his interpretation of responsibility, before integrating his theory into a governance framework with the aim of increasing broad social engagement.

In Chapter 5, 'Towards an ethics-of-ethics for responsible innovation', Vural Özdemir argues that the implementation of what he describes as an ethics-of-ethics would lead to greater reflexivity regarding processes of knowing, across the fields of natural and social sciences as well as within technology development. The author argues that such an approach would ensure that the actors working within these fields are held accountable for their choices and agendas through transparency.

The final chapter in this short section is Chapter 6, 'Working responsibly across boundaries? Some practical and theoretical lessons' by Kjetil Rommetveit, Niels van Dijk, Kristrùn Gunnarsdottír, Kate O'Riordan, Serge Gutwirth, Roger Strand and Brian Wynne. Through reflection based upon their vast collective experience, the authors examine the tensions that can be found between the ideals underpinning RRI and real-life practices in emerging technology research. Their aim is to address what actually happens, with the authors raising a host of issues related to different epistemic and normative commitments, interdisciplinarity, and the underdeveloped potential for law, together with describing what they see as three practical challenges from the European policy perspective, namely, the diffusion, mainstreaming and monitoring of RRI.

The 'Governance' section of this collection contains eight contributions.

The first is Chapter 7, 'Understanding the movement(s) for responsible innovation'. Miles Brundage and David H. Guston describe the recent rise of responsible innovation

in the literature and in practice as being (at least in part) a scientific-intellectual movement (SIM). The authors guide the reader through a host of arguments based upon both empirical and theoretical inquiry. Issues addressed include the prehistory of RI, the development of RI, grievances and demands of RI advocates and resistance to RI, before moving on to describe a case study in artificial intelligence and robotics. The authors conclude with a summary of their findings and a call for further research on the SIM perspective on RI.

This is followed by Chapter 8, 'Is innovation always good for you? New policy challenges for research and innovation', in which Luc Soete argues that history would suggest that we see innovation as destructive creation rather than creative destruction, with the danger it brings of benefiting the few at the expense of the many. The author proposes the need for an awareness-raising discussion across the board of innovation actors around the sticky problem that innovation may not always be a good thing.

In Chapter 9, 'First steps in understanding the economic principles of responsible research and innovation', Miklós Lukovics, Benedek Nagy and Norbert Buzás argue that although academically RRI is supported by a body of research, an explanation of the background of RRI using economic terms is lacking from the multidisciplinary RRI framework. To address this issue the authors use concepts from the neoclassical school to introduce an economics perspective to the field of responsible innovation. Their aim is to demonstrate that the notion of responsibility can be approached using everyday economic research tools, offering new perspectives on ways to promote responsible behaviour in innovation. Rather than being technical the chapter aims to offer food for thought regarding expanding RRI research from an economics perspective.

As touched upon above, in Chapter 10 'Responsible research and innovation in the broader innovation system: reflections on responsibility in standardisation, assessment and patenting practices', Ellen-Marie Forsberg's point of departure is that responsibility in research and innovation involves a broad range of actors, that goes well beyond researchers, institutions and the innovators themselves. Analysing the application of RRI in different research and innovation fields, the author operationalizes RRI into four dimensions before offering an integrated analysis of the implications for the application of these dimensions to the broader research and innovation system. Many issues are raised, including the political nature of agenda-setting for research and innovation, challenges of capacity-building for broad stakeholder involvement, the elusive nature of reflexivity, and the problem of documenting genuine societal responsiveness.

Hannot Rodríguez, Andoni Eizagirre and Andoni Ibarra tackle some governance issues in play at the EU level in Chapter 11 on 'Dynamics of responsible innovation constitution in European Union research policy: tensions, possibilities and constraints'. The authors raise the issue of the need to analyse the relationship between the EU implementation of its RRI strategy and its economic aim of growing the EU economy. They argue that the scope, evolution and implementation of RRI could be viewed as a management strategy implemented to institutionalize the trade-offs made necessary by a move towards more openness, as part of a commitment to economic competitiveness. They conclude that this apparent tension needs to be explored through an analysis of the 'principles, assumptions, objectives and resistances that shape the content, evolution and scope of responsible science and technology policies in Europe'.

Alfred Nordmann argues in his contribution, Chapter 12 'The ties that bind: collective experimentation and participatory design as paradigms for responsible innovation', that 'Design science for and with society', and other such slogans in use by the European Commission amount to a specific interpretation of RRI based upon its aim of addressing Europe's grand societal challenges. The author argues that not only does this imply a novel conception of science, but also a commitment to design as the approach needed in order to meet these challenges, leading to particular research and innovation approaches with distinct forms of alignment to the needs and values expressed by European society.

In 'Engaging the micro-foundations of responsible innovation: integration of social sciences and humanities with research and innovation practices' (Chapter 13), Erik Fisher considers the different approaches to socio-technical integration, arguing that this array of styles and approaches embodies varied and divergent rationales for engaging with scientific and technical expertise. Fisher argues the need for reflexive and creative approaches in order to aid the success of such approaches, with the practices themselves being sources of socio-technical change and therefore resources for the governance of science and technology.

This section closes with Chapter 14, 'Responsible innovation and technology assessment in Europe: barriers and opportunities for establishing structures and principles of democratic science and technology policy' by Leonhard Hennen and Linda Nierling. The authors reflect on the lessons learned from the experience of establishing technology assessment (TA) as a form of democratic policy input, and how these lessons learned might be useful in addressing the opportunities, barriers and challenges of establishing RI on a European level. They argue that as TA and RI both focus on public opinion, they require comparable socio-political-cultural environments to flourish. The question the authors raise is how barriers and opportunities seen within the development of TA can offer a useful model within the practical implementation of RI.

The final section of Part I is 'Responsible Innovation in Organizations', and contains two contributions.

Xavier Pavie deals with responsibility as part of the innovation process from an organizational perspective in his contribution, Chapter 15 'To what extent should the perspective of responsible innovation irrigate the organization as a whole?' Pavie argues that the application of responsible innovation in organizations requires a detailed and in-depth analysis of different innovation structures and strategies, with a particular focus on public and stakeholder engagement. The aim of such an analysis is to determine whether the innovator takes on a role of moderator in the process and, if so, how this can be used to the advantage of an RI development strategy.

This section and Part I close with Vincent Blok's 'From participation to interruption: toward an ethics of stakeholder engagement, participation and partnership in corporate social responsibility and responsible innovation'. Blok raises the question of which concept of participation and partnership is best equipped for the form of stakeholder engagement that could take on board the broadest array of viewpoints and perspectives. He proposes a non-reductive and ethical approach to stakeholder engagement, collaboration and partnership, inspired by the philosophy of Emmanuel Levinas.

# PART II RESPONSIBLE INNOVATION: BECOMING RESPONSIVE TO THE GLOBAL SOCIETAL CHALLENGES

From the EU perspective, responsible innovation was introduced as a concept with the aim (among other things) of addressing the right impacts of research and innovation. While most national and regional public policies are constitutionally anchored in public shared values (EU environmental policies, for example, aim to ensure a high level of protection of the environment), science and innovation policy is most often introduced as a goal in itself, following an ideology based upon the belief that promoting science and technology (notably with financial incentives and support) will contribute to economic growth.

The right impacts of research and innovation could therefore be identified by re-connecting science and innovation policies to the same values other public policies are already based upon (taking the environment example above and extending the ties across the other stated policy goals). It should be borne in mind we would add that these values are more legitimate when they are shared at supra-national levels, for example, at the level of the EU or at the level of the global sustainable development goals of the United Nations.

This re-connection (or possibly connection) to these broader societal values would make science and technology policies more controversial in public debate because, from the perspective of RI, these values need to be discussed with a critical perspective taken on the objectives, shaping and directions of scientific-technological endeavour.

This, however, might alleviate the current situation in which we are often confronted with innovations that nobody had actually called for or even anticipated. Responsible innovation requires informed public debate and a legitimation that goes beyond arguments merely concerning economic growth.

Responsible innovation is critical of the dominant global economic paradigm through highlighting that there are market deficits in delivering innovations on societally desirable goals. The global societal challenges typically reflect issues we are confronted with regardless of our specific economic and socio-political backgrounds. They may reflect a general consensus of the need to address the basic needs of people around the earth. However, responsible innovation needs to be sensitive to local, regional and specific cultural contexts. The discussion on shared values may well lead to a variety of different requirements for good innovations.

This part brings together work that has been conducted on responsible innovation addressing these global societal challenges.

Jack Stilgoe uses the idea of 'shared space' as an analogy for the responsible governance of geoengineering in Chapter 17, 'Shared space and slow science in geoengineering research', arguing that the conventional distribution of responsibility between climate understanding and climate control is more complicated and political than is often perceived. After an entertaining description of practices from his own personal experience, the author concludes by discussing the merits of 'slow science', a concept that he argues may seem out of place within scientific discourse but that may well be an adequate description of the processes seen in geoengineering research.

In Chapter 18, 'Responsible innovation and healthy ageing', Ellen H.M. Moors argues that healthy ageing innovation poses a challenge to traditional health-care innovation

practices owing to the change in values it brings to the field. The author raises the question of how responsible innovation can be addressed within these innovations, with the primary focus on the users involved within the area of Alzheimer's disease, concluding with a discussion on strategies, policies and interventions from both a user and a practitioner perspective.

Part II continues with Phil Macnaghten's Chapter 19, 'Responsible innovation and agricultural sustainability: lessons from genetically modified crops'. He opens a discussion into the position of genetically modified (GM) crops vis-à-vis responsible innovation, asking how an analysis of the controversy surrounding their development could lead to a better understanding of how RI might benefit future developments in this particular field. After describing empirical research from Brazil, India and Mexico, the author introduces an RI framework in order to explore whether and how the implementation of such an approach might lead to less polemical debate regarding these crops.

The final chapter in this part is Chapter 20, 'Responsible inclusive innovation: tackling grand challenges globally' from Doris Schroeder and David Kaplan. The authors argue that in order for the concept of RRI to be just, it must be global, before going on to analyse three well-known definitions of RRI to assess their suitability for globalization. The authors then take the foundational principles of von Schomberg's well-known definition (cited previously) and compare them with the principles of inclusive innovation. Schroeder and Kaplan argue that the apparent parallels between the two concepts lead them to conclude that RRI could go global.

## PART III EMBEDDING RESPONSIBLE INNOVATION IN EMERGING TECHNOLOGICAL PRACTICES

Although RI is preferably addressed at specific issues, such as those of the grand societal challenges, emerging technological practices might confront us either with systemic issues or as holding the potential as a game changer, and therefore immediately become a topic of broad societal debate.

Responsible innovation requires more than merely an ethics of responsible development for a technology: it needs to be anticipatory, for example, by being guided by a foresight practice that provides us with alternative options for normative framing or, even, designing technologies. Nanotechnology, synthetic biology, information and communication technologies (ICT) and human brain research are important examples of emerging technological practices that are still in an early development phase and therefore have the potential to be shaped by responsible innovation. These emerging practices are discussed in this part.

Part III opens with Chapter 21, 'Responsible innovation in emerging technological practices' by Armin Grunwald. Arguing that the field of nanotechnology (and its related subfields) represents ideal field laboratories for the exploration of the initial ideas that underpin RI, the author explores the different ways that responsibility could be characterized and operationalized in the face of a lack of knowledge regarding use and consequences of the development of these and similar technologies. The author questions the established consequentialist paradigm, aiming to offer a broader perspective that he believes could offer interesting standpoints for viewing RI processes.

Dirk Stemerding continues this discussion from the perspective of synthetic biology. In Chapter 22, 'From technology assessment to responsible research and innovation in synthetic biology', he reflects upon the move from TA to RRI, based upon the author's experience of working within TA and his participation in the SYNENERGENE project. The author argues that the move from TA to RRI represents a shift in perspective, this assertion based upon a comparison between the philosophies and qualities of the two approaches.

Part III returns to the familiar nanotechnology argument with Chapter 23, 'Responsible innovation and public engagement: what we can learn from the case of nanotechnology' from Richard A.L. Jones. The author describes the evolution of public engagement and responsible research and innovation agendas from within the context of debates around nanotechnology from a primarily UK perspective. The overview offered highlights that public participation and RI perspectives and views have co-evolved, and that this has brought real outcomes for science policy, leading to a discussion on how science and innovation systems work and develop more generally. The contribution concludes with suggestions of lessons that may be learned from this particular analysis of developments.

In Chapter 24, 'Responsible innovation in ICT: challenges for industry' by Bernd Carsten Stahl, Elisabetta Borsella, Andrea Porcari and Elvio Mantovani, the authors argue that RRI should be understood as a meta-responsibility aiming to shape and align both existing and novel responsibilities found in innovation and research practices. As the title suggests, their field of interest is ICT, with the authors developing a framework for the implementation of RRI that addresses a series of properties in the field that make prediction and governance difficult. The chapter also relates to and supports Moors's Chapter 18 in this volume in that one of its focuses is on ICT in ageing.

'Ethics management and responsible research and innovation in the Human Brain Project', Chapter 25 by Stephen Rainey, Bernd Carsten Stahl, Mark Shaw and Michael Reinsborough, focuses attention on the roles and practices of ethics management within the RRI approach-based efforts of the Human Brain Project. Tied to the previous chapter in this volume (Stahl et al.), the authors highlight the meta-responsibility aspect of RRI, offering a detailed explanation of the theory in practice and action in a concrete setting.

In Chapter 26, 'Grass-roots case studies of "poiesis-intensive" responsible innovation (PIRI)', from Jonathan Hankins, the author proposes the concept of PIRI, defined as the addressing of ethical and aesthetic issues combined through a production process, arguing that the use of this concept as an analysis of production processes offers a new interpretative standpoint in RI research, one that brings the personal knowledge and community of practice of those working within the process to the fore. Hankins uses case studies to argue that the PIRI concept can be articulated into two different strands, one technology orientated and the other organization orientated, addressing the concept's relationship to the current RI debate, including studies on de facto and bottom-up RI.

The final chapter in this part is 'Robotics and responsible research and innovation' from Pericle Salvini, Erica Palmerini and Bert-Jaap Koops. The authors provide suggestions for how RRI could be implemented in robotics, based upon their analysis of the roles played by the different social aspects, ethical approaches and legal requirements at play in robot-

ics research and development. After an overview of current developments in the field, the authors describe different standpoints and perspectives on the three main components of their approach described above, before moving their analysis to include what they describe as fundamental values (seen from a European perspective), raising the question of how these could be embedded into the process in order to steer research towards maximizing societal benefit.

## PART IV REGIONAL PRACTICES

Part IV guides the reader through a series of contributions written from particular geographical or economic perspectives, highlighting that responsible innovation needs to be regionally or locally embedded. This local vision leads to the impressive contributions of 'frugal innovation' in India and the broadly voiced public demand for the narrowing of the currently existing enormous income gaps that characterize China and India. The fear that innovation increases rather than narrows income gaps is a concern for public policy, a problem that has more recently become a topic in the US and Europe. This situation invites some mutual learning between the various regions.

The part opens with two articles from the Chinese perspective, the first from Yandong Zhao and Miao Liao and the second by Qian Wang and Ping Yan, the presentation and inclusion of which aims to further address some of the issues discussed previously regarding the cultural embedding of the concept of RI (particularly in light of the Chinese government's adoption of the concept), as well as some of the issues that the liberal formulation of the concept of RI raises in such a case (see, for further discussion, Wong 2016).

In Chapter 28, 'Chinese perspectives on responsible innovation' Yandong Zhao and Miao Liao offer a historical overview of the development and institutional environment of Chinese science, technology and innovation, including an analysis of who the main drivers of RI approaches and ideas are in China and the challenges that such approaches face.

The description of this perspective is further developed by Qian Wang and Ping Yan, whose Chapter 29, 'Responsible innovation: constructing a seaport in China', describes the development and operations of the Port of Dalian in RI terms. The authors offer an interesting perspective on RI as a government-orientated approach, and the overall significance of such a model for the further development of ports in China.

The next port of call, in Chapter 30, is India, as Krishna Ravi Srinivas and Poonam Pandey offer some 'Indian perspectives on responsible innovation and frugal innovation' introduced via the ideas and approaches of two pioneers from India, J.C. Kumarappa and A.K.N. Reddy. The authors analyse these particular pioneering approaches in light of recent developments in RI, before moving their focus to frugal innovations, asking if and how they can be considered as responsible innovations and how RI norms might be useful in assessing frugal innovations.

'South-East European perspectives' are offered by Norbert Buzás and Miklós Lukovics in Chapter 31. The authors describe the findings of a survey carried out across several South-Eastern European countries whose aim was to understand the context that RRI implementation sits within and is influenced by in this geographical area. They find

features that influence RRI and that lead to the need for different approaches within RRI implementation from those found in more developed parts of Europe (as regards scientific research).

Andrew D. Maynard and Elizabeth Garbee, in Chapter 32, offer 'Responsible innovation in a culture of entrepreneurship: a US perspective', in which they describe US entrepreneurial culture and its relationship with the ideas that underpin RI. They describe their university experiences of teaching RI, raise the question of a possible culture clash and ask how a culture of responsibility could be developed among entrepreneurs in a way that makes sense to the entrepreneurial community.

The final chapter in this part addresses middle-income countries. In Chapter 33, 'Public engagement as a potential responsible research and innovation tool for ensuring inclusive governance of biotechnology innovation in low- and middle-income countries', Pamela Andanda takes us full circle through the debate on public engagement. The author raises the question of whether public engagement policies within the field of biotechnology in low- and middle-income countries addresses the needs of those people living on the poorer margins of society. Lessons are drawn from Kenyan and South African case studies, questioning how far the public engagement practices seen are appropriate if viewed from an RRI perspective.

## PART V INTERVIEWS

The *Handbook* closes with three interviews with prominent representatives from within the practitioner field of RI. The interviewees are drawn from a private foundation, a public authority and from within industry, each offering an insider perspective and their own personal views on how they seek to advance RI.

Piero Bassetti, President of the Bassetti Foundation in Milan, speaks to Manchester Metropolitan University Professor Sally Randles (Chapter 34), Robert Madelin, ex-Director General and advisor on innovation for the European Commission speaks to Jan Staman and René von Schomberg (Chapter 35), concluding with Rob van Leen, Chief Innovation Officer, Head of DSM Innovation Center and Member of the Executive Committee of DSM, who speaks to Jan Staman (Chapter 36).

## NOTES

* The views expressed here are those of the authors and may not in any circumstances be regarded as stating an official position of the European Commission.

1. Further details are available from the NWO website, accessed 6 November 2018 at https://www.nwo.nl/en/research-and-results/programmes/responsible+innovation.
2. The EPSRC website offers insight into its Framework for Responsible innovation, accessed 6 November 2018 at https://epsrc.ukri.org/research/framework/.
3. The VIRI network website offers further details: https://www.virinetwork.org/.
4. See the SAMANSVAR programme website, accessed 6 November 2018 at https://www.forskningsradet.no/prognett-samansvar/Home_page/1254002580879.
5. The JRI can be viewed online here, accessed 6 November 2018 at https://www.tandfonline.com/action/showAxaArticles?journalCode=tjri20.

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