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ETHICS IN INNOVATION MANAGEMENT AS META- RESPONSIBILITY

The practice of responsible research and innovation in human brain simulation

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Mark Shaw*

Introduction

The concept and practice of responsible research and innovation (RRI) are subjects of intense academic scrutiny (Timmermans, 2015). This high level of attention is at least partly due to the support of RRI by research funders such as the European Union, the UK Engineering and Science Research Council (EPSRC), the Netherlands Organisation for Scientific Research (NWO) and others. Much research is being undertaken to clarify conceptual underpinnings and to describe current and future practice. Despite these activities, it is currently not clear how theoretical accounts of RRI can be put into practice to achieve RRI's promise to contribute to the social acceptability and desirability of R&I activities.

In this chapter we fill this gap by developing an account of RRI as a meta-responsibility and providing a high-profile case of how this meta-responsibility can be put into practice. The starting point is the application of theories of responsibility to RRI. We argue that responsibilities are pervasive in R&I environments. Traditional theories of responsibility tend to focus on singular instances of the term and describe why and how a subject is held to be responsible for an object. In social practice, however, responsibilities are always multiple and can be better understood as networks of overlapping and intermingling relationships. Using this idea of networks of responsibility, we propose that the best way of conceptualising RRI is as a meta-responsibility that aims to shape, maintain, develop, coordinate and align existing and novel R&I-related processes, actors and responsibilities with a view to ensuring desirable and acceptable research outcomes (Stahl, 2013).

Using the concept of meta-responsibility, we describe how RRI can be put into practice in the field of human brain simulation. The example of the EU Future Emerging Technology (FET) Flagship Human Brain Project (HBP) shows how the components of RRI can be realised. Drawing on various empirical sources, we trace the development of RRI back to the inception of the HBP. Despite constant attention to principles of RRI, we show that initially the extensive RRI activities had little influence on the overall project. The theory of meta-responsibility

allows for an understanding of why the initial setup remained unsatisfactory and points the way towards a resolution. The HBP more recently adopted an approach to ethics management that we reconceptualise as the missing piece required to render RRI as a meta-responsibility successful. We show how the various activities within the ethics management stream affected existing responsibilities and thereby contribute to the broader goals of RRI.

The chapter makes an important theoretical contribution to the debate on RRI by developing the concept of meta-responsibility. This theory builds on traditional accounts of responsibility and demonstrates that they can successfully be used in the complex socio-technical environments of modern large-scale science projects. By using the case of a high-profile live project such as the HBP, the chapter provides practical insights into the unfolding of RRI activities. The conclusions of these insights are spelled out in terms of lessons of interest for both the management of research on a project level and research policy.

Responsible research and innovation as a meta-responsibility

In this section we introduce the discourse on RRI and its current failing to translate its aspiration as an integrative concept to R&I practice. To remedy this gap, we propose conceptualising RRI as a meta-responsibility. Building on traditional theories of responsibility, we argue that in practice responsibility relationships are always embedded in networks. This view of networks of responsibility is the basis for the conceptualisation of RRI as a meta-responsibility.

Responsible research and innovation

RRI has developed into a key concept in the discourses around research governance and research policy. It has been adopted by the European Commission (2013, 2012) as a cross-cutting theme of its 8th research framework programme called Horizon 2020, which means that all research undertaken in this programme, which is worth around €70 billion between 2014 and 2020, will have to adhere to it. Other funders have adopted aspects of RRI as part of their strategy (e.g. the UK Engineering and Physical Science Research Council).¹ Some funding bodies, including the European Commission, the Dutch Research Council, and the Norwegian Research Council, have produced research programmes focusing on RRI. These aim to identify how RRI can play out in practice and be integrated into research policy and governance.

The debate concerning the definition and implementation of RRI is in full swing. A pivotal contribution by von Schomberg (2011) sees RRI as a process that renders societal actors mutually responsive to each other with respect to ensuring the acceptability, desirability and sustainability of research processes and outcomes. Whilst this raises a number of theoretical and practical questions, it can serve as a good starting point for understanding the discourse. Von Schomberg's understanding of RRI can be seen as a recasting of research governance within a long tradition of governance approaches to R&I. These approaches combine the desire to retain the beneficial consequences of research activities while controlling their downsides (Habermas, 1974, p. 268 ff). RRI thus builds on and incorporates long-standing activities such as technology assessment (TA) (Grunwald, 2014, 2009; Joss and Belucci, 2002; Stephan, Wütscher, Decker, and Ladikas, 2004), futures and foresight studies (Adam and Groves, 2011; Cagnin et al., 2008; Markus and Mentzer, 2014; Wilsdon, 2014), public engagement (Bickerstaff, Lorenzoni, Jones, and Pidgeon, 2010; Marris and Rose, 2010; Rowe and Frewer, 2005), science and technology studies (STS) (Coenen and Simakova, 2013; Grunwald, 2011), R&I policy (Auld et al., 2014; Čeičytė and Petraitė, 2014; Hekkert et al., 2007; Smits and Kuhlmann, 2004) and many others that aim to influence the role of R&I in society.

The academic discourse on RRI (Owen, Heintz, and Bessant, 2013; Stilgoe, Owen, and Macnaghten, 2013) has argued that RRI represents a novel contribution to research governance that builds on those prior activities and allows novel insights into R&I practice and policy. It allows the incorporation of particular policy aims, such as those promoted by the European Union (European Commission, 2012), which include gender equality, open access, ethics, public engagement, science education and research governance. Many questions concerning RRI continue to be the subject of investigation and discussion. These include the questions of normative underpinning, that is, how can RRI be justified, in particular, when it intervenes in existing R&I systems (Pandza and Ellwood, 2013). Candidates for such normative underpinnings include human rights (EU, 2010; Ruggie, 2010), philosophical ethics in its various flavours (Gutmann, 2011), established principles and good practice (Sutherland et al., 2012) and references to related areas such as corporate social responsibility (Garriga and Melé, 2004; Iatridis and Schroeder, 2015) and the need to account for co-responsibility in increasingly complex societies. Furthermore, discussions cover the question of how RRI is to be implemented given a large array of methodologies and instruments ranging from risk assessment (Owen and Goldberg, 2010) and various impact assessments (Becker, 2001; Wright, Gellert, Gutwirth, and Friedewald, 2011) to deliberative and mode 2 engagement with stakeholders and society (Hankins, 2012; van Est et al., 2012). In order to be successful, RRI will need to be based on capabilities that may be built through various mechanisms, such as education (Technopolis and Fraunhofer ISI, 2012), standards (Sutcliffe, 2011), professional bodies (Gorman, 2001; Wyndham et al., 2015) and others.

In order to integrate this wide range of approaches, methodologies, instruments and theories, RRI has been portrayed as an umbrella term (Grunwald, 2011; Stahl, McBride, Wakunuma, and Flick, 2013; von Schomberg, 2011). It comprises anticipation, reflection, engagement and action (the AREA framework, see [Owen, 2014]). The novelty of RRI lies in the first place in its drawing together of these different theoretical notions, practical approaches and methods that share a concern for ensuring that science, research, technology and innovation have positive, socially acceptable and desirable outcomes. The thread that is suggested to bind all these different components together is the concept of responsibility (Fisher and Rip, 2013; Grinbaum and Groves, 2013; Grunwald, 2011; Jacob et al., 2013; Stilgoe, Owen, and Macnaghten, 2013; van den Hoven, 2013). Responsibility, therefore, is the second major strand of the novelty of RRI, hence the adjective 'responsible'. In addition to enabling integration, the emphasis on responsibility supports the embedding of existing approaches 'in a day-to-day operational context' (Owen and Goldberg, 2010). Responsibility thus functions as a means to bridge the gap between theory and R&I practice that pre-existing reflexive fields such as ethics, STS and TA encounter in their efforts to affect R&I. However, in order for responsibility to fulfil its purpose, it is suggested that the concept needs to be reevaluated (Stilgoe, Owen, and Macnaghten, 2013).

Nevertheless, despite the aspiration of being all-encompassing under the heading of responsibility, thus far the discourse has not managed to produce a substantive conceptualisation of responsibility that achieves this aspiration. Consequently, the discourse still consists of a loosely connected amalgam of approaches and theories. On the one hand, the discourse comprises general discussions on RRI that have not yet determined how the term is to be translated into practice, while on the other hand it covers an ever-expanding multitude of approaches and theories geared towards rendering R&I societally acceptable and desirable without conceptually linking these approaches.

To contribute to meeting the integrative aspiration of RRI as well as closing the gap between theory and practice, this chapter further develops the notion of RRI based on a re-conceptualisation of responsibility.

Dimensions of responsibility

In order to accommodate the breadth and depth of the theories and approaches associated with RRI, our re-conceptualisation of responsibility needs to be as inclusive as possible, while also capturing the intricacies of individual components. For that purpose we build on a procedural account of responsibility that covers several important dimensions of responsibility that have been forwarded by established theories.

Responsibility has its etymological root in ‘response’, which points to a dialogical understanding of the term. This understanding is dominant in English as well as other languages such as French (Etchegeyoyen, 1993) or German (Lenk and Maring, 1995). A typical definition of responsibility in this sense is that it means ‘liability to answer’ (Lewis, 1972, p. 124), which carries a strong legal connotation but, we believe, is equally applicable to most other uses of the term.

These initial considerations provide the basic structure of responsibility (Lenk, 2006). Somebody or something is responsible for something or somebody else. We call the entity that is responsible the subject (S) and the entity that the subject is responsible for the object (O). This basic structure can be represented as shown in Figure 22.1.

Some examples of responsibility can be described like this, for instance, the responsibility of a parent for a child. However, in reality, responsibility always includes more aspects. A key additional component is what we call the authority (A). The authority is the entity to which the subject answers. The authority observes the consequences of the responsibility and is typically in a position to attribute sanctions to the subject. These sanctions can be positive (rewards) or negative (punishments). They can be manifest (e.g. a financial penalty) or more elusive (increase in peer esteem). This relationship could be depicted graphically as shown in Figure 22.2.

This still very simple model allows us to clarify some basic aspects of the theory of responsibility. First, we underline that responsibility in our sense is not a natural phenomenon but socially constructed and supported (Grunwald, 2012). Responsibility is something that is ascribed to the subject, and different social contexts will lead to different ascriptions.

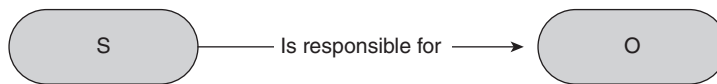


Figure 22.1 Basic structure of responsibility

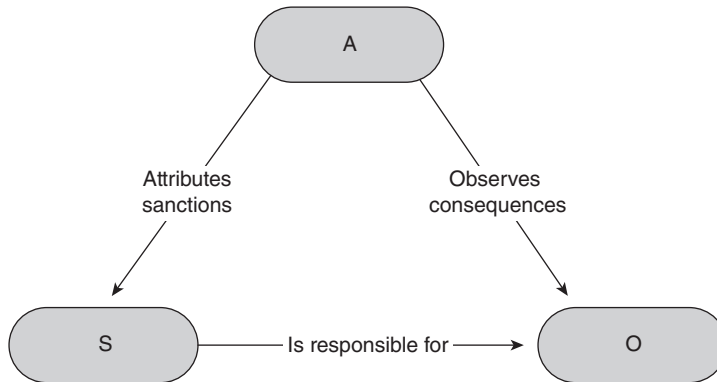


Figure 22.2 Responsibility structure including authority

The next basic point to be made is that responsibility as the social construct of ascription always has a purpose. There are different types of purposes, the most widely accepted of which is the determination of punishments or rewards (French, 1992, p. 18). Others include retribution and revenge, as well as an expression of the prevailing moral sentiment (Hart, 1968). We hold that the purpose of responsibility ascriptions in all of these cases is to reinforce, uphold or promote a particular social outcome. This view aligns the theory of responsibility with RRI that aims to ensure the desirability and acceptability of research processes and outcomes.

Having established that responsibility is a social construct of ascription that has the purpose of establishing a certain social state, we can return to the model of responsibility introduced earlier. All of the three core components, subject, object and authority, raise additional questions. There have been discussions about what constitutes a suitable subject of responsibility, whether it has to be an individual human being or whether it can be a legal person or collective body (Stilgoe, 2014; Velasquez, 1991) or whether technical artefacts may serve as subjects (Anderson and Anderson, 2007; Bechtel, 1985; Coeckelbergh, 2015). The answer to this question hinges on the conditions that a subject is deemed to have to fulfil. The literature on responsibility contains a significant number of such conditions, most of which can be interpreted as requirements that need to be in place for the social consequences of the responsibility ascription to be realised. They include freedom of will and action (Fischer, 1999), knowledge of the relevant aspects of the situation (De George, 2003; Groves, 2009; Weckert and Adeney, 1997) and the wherewithal to act appropriately, which requires a number of further characteristics, including the power or influence to have the desired effect on the object.

The philosophically inclined reader will see that this is a list of highly contentious issues that philosophy has grappled with for millennia. And the questions do not stop with the subject. There are numerous different types of responsibility. The type of responsibility influences what counts as an appropriate authority, how the link between subject and object is construed and which sanctions may be linked to the ascription. Important types of responsibility include legal, moral and role responsibilities (Paul, Miller, and Paul, 1999), as well as capacity, causal, role, outcome, virtue and liability responsibility (Vincente, 2011). These often overlap and mirror each other, but they also differ in important aspects. One of these differences refers to authority. In some cases, such as legal responsibility, the authority is clearly defined (judge, jury) and there are clear ways of attributing sanctions and enforcing them. In the case of moral responsibility, the authority is much less clear and may be one's conscience, one's community or a metaphysical entity. Professional and role responsibility can sit between these, and the authority may be a professional body or a code of conduct with sanctions being less clear.

The mechanisms of ascribing responsibility to the subject differ according to the type of responsibility. The ascription may happen transitively or reflexively, which means that in some cases the subject assumes responsibility voluntarily, whereas in others it is forced upon the subject. Responsibilities can have different temporal horizons; sometimes looking back to past events and objects, sometimes looking to the future, and sometimes covering both aspects (Poel et al., 2012). The type of responsibility and authority furthermore influences what counts as the normative basis of responsibility. This can be the law, philosophical ethics, professional standards, community expectations and many more. Figure 22.3, while not claiming comprehensive coverage, attempts to capture some of the aspects of an individual case of responsibility ascription and reflect its complexity.

Figure 22.3 shows that responsibility is a highly complex term that is laden with difficult concepts and assumptions. The figure is indicative only. Real-life responsibility relationships are invariably even more complex, as the context of ascription potentially influences all of the components and dimensions listed earlier. Despite this complexity, however, responsibility is not

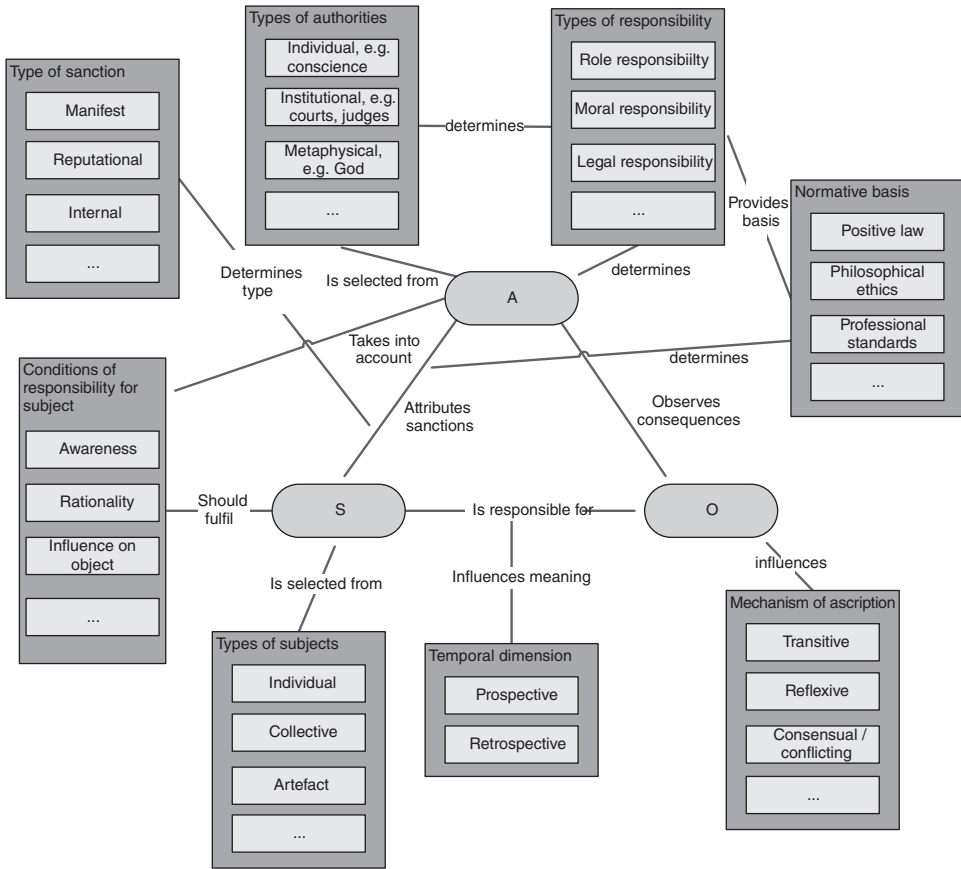


Figure 22.3 Components and dimensions of responsibility

only a theoretically interesting concept but also is practically highly relevant. Most importantly for our argument, it is successful in the sense that the mechanisms of responsibility described earlier actually steer individual and social action and often lead to desired outcomes. It would be difficult to explain this practical relevance of the concept using the description of responsibility offered so far. In order to understand why and how responsibilities are practically relevant, we now move beyond an individual instance of responsibility and introduce the ideas of networks of responsibility and meta-responsibility.

Meta-responsibility for the networks of responsibility

One crucial aspect of responsibility that much of the philosophically informed literature referred to earlier tends to overlook its flexibility and fluidity. The enumeration of key components and their representation in figures such as Figure 22.3 could be misread as meaning that responsibility is fixed and static. In practice, this is far from true. While there are generally agreed instances that one could see as social templates of responsibility, the individual responsibility relationship is socially negotiated and continually open to further re-negotiation. Rather than being static and fixed, responsibilities are dynamic and fluid. Some aspects may remain constant, while others change.

Theoretical accounts of responsibility are not always immediately or clearly action-guiding in a given context. This means that there are always elements of contexts that may influence a particular responsibility ascription that are not clear in advance and that can affect the practical outcome. One of the advantages of the concept of meta-responsibility is that it is tailored to deal with this type of ambiguity. The relationship between the key components can be adjusted according to specific requirements. Practical examples can clarify this point. Let us look at the responsibility of an engineer in an innovation process. The product the engineer works on may have foreseeable social consequences that require the engineer's attention. A change in the technical infrastructure (e.g. widely available social networks) may affect the way in which this knowledge can be gathered. Therefore, the engineer's professional responsibility towards their customers may change. This can happen through an update of guidelines issued by their professional body. If the engineer infringes on these, the professional body as the authority in this particular example can use established mechanisms to determine reasonable expectations and how the engineer should have acted in accordance.

The point here is that responsibility, while potentially infinitely complex, is built in a way to accommodate this flexibility. A meta-responsibility approach circumscribes a normative horizon relevant to the actions of particular actors, such that accountability is possible without resorting to universal moral theories. This is done overtly, and so all parties can be said to know their responsibilities. Where important components of responsibility are unclear and contested, there are normally mechanisms that allow for these questions to be clarified. And, interestingly, these mechanisms are typically also responsibilities, but they are of a different reach and configured differently from the original responsibility.

This leads us to the next point, which is that some literature on responsibility tends to overlook the diversity of views on responsibilities and the connections among them. In social reality, responsibilities never appear in the singular. The context in which they appear is an essential ingredient for understanding what they mean and what they imply among those who they involve. New responsibilities are always placed in a social world full of existing responsibilities.

This networked nature of responsibility is part of the social fabric. It is important to note that there are numerous linkages between different responsibilities. One typical responsibility within R&I, for example, would be to clarify standards and good practice in a particular field. The subject of this responsibility might be a professional body under the authority of a statutory requirement. In our terminology, this means that the definition of an authority (or norm) is the object of a different responsibility. This complex network of interlinking, often overlapping and sometimes even contradicting responsibilities is the background for the introduction of the concept of meta-responsibility.

The behaviour of actors in R&I is governed by a fluctuating and often ambiguous set of interlinking responsibilities. Any approach to research governance has to contend with this complex social structure. We propose that RRI should not be seen as a mechanism that simply adds to the complexity of existing responsibilities by requiring further actions (e.g. public engagement) or setting up additional structures (e.g. ethics review boards), but that it is better conceptualised as taking place on a different level. RRI should look at the overall landscape of intermingling and networked responsibilities and aim to affect the overall constellation of responsibilities with a view towards achieving the acceptable, sustainable and desirable consequences that it stands for.

Accepting this concept of RRI implies seeing RRI activities on a different level from the established networks of responsibility that currently govern research. RRI would then sit above other responsibilities and could be construed as a responsibility to shape, maintain, develop, coordinate and align R&I-related processes, actors and responsibilities, with a view to achieving

its aims. To use a legal analogy, in this view RRI could be likened to constitutional law (i.e. the law that determines how other laws and regulations are created). The position of RRI on a higher level than existing responsibilities explains the use of the term meta-responsibility.

We believe that this concept of RRI as a meta-responsibility can make an important contribution to the discussion of RRI and of research governance more generally. It offers a role to RRI that does not conflict with existing governance structures but provides it with a constructive influence on research. It answers the question of whether research prior to RRI was irresponsible by pointing out that despite numerous existing responsibilities, further responsibilities may be required to achieve social aims.

Despite the importance of the idea of RRI as meta-responsibility, we are aware that at present it raises more questions than it answers. If RRI entails new responsibilities that constitute its meta-level nature, then this immediately raises a number of follow-on questions: Who or what is the subject of the meta-responsibility? How are the objects identified and constituted? What are authorities and norms? Which sanctions and consequences arise from it? What are its limitations? These are just some of the more obvious questions. We do not believe that these questions can simply be answered from an abstract point of view, but that they will be subjects of social negotiation. Instead of attempting a top-down theoretical definition of RRI as meta-responsibility, we therefore introduce an example to show how the idea of a meta-responsibility can be put into practice. This example will be drawn from the field of brain simulation and will focus on the activity of ethics management as a way of realising meta-responsibility.

Applying RRI in human brain simulation

RRI is most obviously important in cases where research is complex, multidisciplinary and can raise public concerns, be it over safety, ethics, use of resources or other potentially controversial issues. Our example, the EU-funded HBP fulfils all of these. The project was planned as a 10-year flagship project set to receive funding in the area of €1 billion and bring together more than 100 partner organisations. The fundamental idea behind the HBP is that the use of ICT can offer insights into the human brain that would otherwise be difficult or impossible to gain.

In this section we start by outlining the methodology used to understand the activities of the HBP. We then describe the project itself in more detail, before going into social and ethical concerns. This is the basis of the discussion of RRI in the HBP. The limitations of the original setup of RRI led to the creation of an ethics management activity, which we discuss using the theoretical ideas of meta-responsibility.

Methodology

The data that inform this paper originate from different sources. The description of the original perception of ethical and social issues draws on a set of 20 interviews with the leaders of the HBP's 12 subprojects. These interviews were conducted between January and July 2014. They were tape recorded, transcribed and analysed using principles of thematic qualitative data analysis (Miles and Huberman, 1994). Following the initial round of interviews, the key concerns were tested by sending a quantitative survey to all researchers in the HBP which aimed to find out to which degree researchers shared the view that the issues were relevant – 266/714 (37 per cent) researchers responded. The survey was started in November 2014, and reminders were sent in February 2015. The survey was closed in March 2015.

In addition to these formal data collection methods, the chapter is based on the experience of the authors. The first author was appointed ethics manager of the HBP in April 2015, and the

other authors are part of the ethics management team. This means that the chapter can draw on insights gained by participation in senior management meetings, as well as interaction with all parts of the project in the context of ethics management. The research informing this chapter displays characteristics of interpretive case study research (Walsham, 1995), participant observation (Oates, 2005) and (confessional) auto-ethnography (Schultze, 2000). Given the ongoing role in ethics management and the fact that the research informs current and future practices through circles of planning, acting, observing and reflecting, the research furthermore displays characteristics of action research (Argyis and Schon, 1989; Baskerville and Wood-Harper, 1998; Blythe, Grabill, and Riley, 2008). We believe, however, that the question of an appropriate label for the methodology is less important than the insights we have gained into the practice of RRI.

The Human Brain Project

The HBP (www.humanbrainproject.eu/) is an EU FET flagship project funded under the Future and Emerging Technologies research stream. It started in October 2013, and is set to run for 10 years with an overall budget of more than €1 billion, half of which will be provided by the European Commission. The project combines numerous activities related to neuroscience and ICT research, including the provision of strategic mouse and human data required for simulation, cognitive architectures, the development of theory, creation of approaches and technologies to neuroinformatics and simulation, as well as new inputs to high-performance computing, neuromorphic computing and neurorobotics. Following a two-and-a-half-year ramp-up phase, the project moved to its operational phase in April 2016. Its main objectives for the operational phase are to (HBP, 2015, p. 9):

- Create and operate a European scientific research infrastructure for brain research, cognitive neuroscience and other brain-inspired sciences.
- Gather, organise and disseminate data describing the brain and its diseases.
- Simulate the brain.
- Build multi-scale scaffold theories and models of the brain.
- Develop brain-inspired computing, data analytics and robotics.
- Ensure that the HBP's work is undertaken responsibly and that it benefits society.

This list of objectives points towards the complexity of activities undertaken in the project. The proposal for the first two years of the operational phase includes 667 pages, which makes it clear that we cannot do justice to all aspects of the project. The one point we wish to underline is the last objective of undertaking the work responsibly and for the benefit of society. The inclusion of this point into the main objectives demonstrates the commitment of the HBP to RRI and the importance of rendering RRI practically relevant.

Ethical and social concerns

It was clear from the outset that the project would raise significant ethical and social questions (Rose, 2014). These are related to its subject matter, its size and its potential to disrupt the status quo in neuroscience, medicine and ICT, as well as its potential social impact. In order to provide an initial insight into the complexity and multitude of ethical issues, we discuss the findings of the 'researcher awareness' task. This task is part of the ethics and society activities, and communicates with HBP scientists to explore their concerns regarding ethical and social aspects of the project.

Governance of data and platforms

The HBP gathers data to support the development of ‘brain signatures’ for future medical purposes. The idea is that such brain signatures can provide insights into brain diseases and be linked to ‘disease signatures’. Proper management of such data raises many ethical and social issues, particularly with regard to individual privacy.

Data are also gathered about animal and human brains to support the creation of simulations. Encouraging neuroscientists to disclose their experimental data to a repository before journal publication represents a change of practice for this community. The social and ethical concerns about the handling of these scientists’ intellectual property are therefore important.

The ICT platforms will be made available not only within but also outside the consortium. This resource needs to be controlled in some way. All of these issues point to the need for sophisticated data and platform governance. Much data are produced within the HBP, but the simulations also require access to available external data. Both the flow of data into the various computing platforms and the use of data and models within and outside the HBP needs to be governed. Ethical issues to be addressed here range from immediate regulatory concerns, such as data protection, to difficult issues concerning incentives for collaboration and community engagement for platform use.

Responsible research practice

The size of the consortium and the diverse backgrounds of its members mean that responsible research conduct needs to be considered, especially as there are a variety of scientific approaches, not only in the consortium but also among external and future partnering projects. Of particular concern are animal experimentation and common standards, as well as the need to be assured of research integrity.

These issues are typically covered by research ethics and are subject to review and approval by research ethics committees. Clinical scientists are typically well aware of the issues and the regulations surrounding them. A difficult issue in this type of large collaborative project is that the various national regulations and requirements are not consistent. Research ethics cultures vary across the EU. While some aspects are regulated via European directives which have to be translated into national law (notably clinical trials and animal experimentation), the exact interpretation by national authorities can diverge. Similarly, the standards of research integrity may vary by country and discipline, rendering it difficult to tell when exactly accepted standards have been breached.

Development of collaboration

The diverse membership of the consortium and possible partnering projects implies that the ability to work together can cause problems. The social and ethical themes raised by creating such a collaboration is considered in four areas: the ability to discuss shared concerns, the tension between individual and common good, the support of multiple ontologies and the handling of intellectual property.

The structure of the HBP during the ramp-up phase reflected the many approaches to neuroscientific research that need to be part of the consortium. Interviewees recognised that this scientific diversity should be embraced and forums provided where there is an opportunity to discuss different positions.

The tension between individual and common good refers to the question of how partners balance their obligation to the project as a whole with their interest in promoting their own

research. While collaborative projects generally face this issue, the size and complexity of the HBP exacerbate it. This refers both to the partners within the project and perhaps to a greater extent to the interaction with external user communities who make use of the infrastructure being built.

Furthermore, this complexity of the communities involved raises the question of shared understanding of epistemology and ontology. Little was said directly in the interviews that recognised this as a problem and a potential source of conflict.

The development of trust should extend to ensuring the proper handling of intellectual property with regard to applications resulting from the work of the HBP. This is especially true when those outside the consortium come to use the platforms.

Remote issues

In addition to the mostly practical concerns listed so far, the HBP increases the likelihood of various issues that may arise in the future if the research is successful. Some of these refer to individuals, for example, the question of the consequences of brain-based ‘disease signatures’ that may be used to classify individuals’ disease states. This links to broader concerns about the way in which increased knowledge of the brain and its functions not only determine categorisations and treatment of diseases but also affect individuals’ views of themselves and as members of the community.

The outcomes of the HBP may have an effect on many aspects of society. This starts with the way in which neuroscience and neurology are undertaken. The insights gained by the HBP may lead to novel types of individualised treatments and thus contribute to the trend of personal medicine, which raises further questions about accessibility and fairness. In addition, new brain-based computing artefacts may revolutionise the way society uses computers, further accelerating the rate of change brought about by emerging technologies.

Finally, there are rather distant scenarios which can be influenced by the HBP, including questions of machine intelligence and consciousness (Lim, 2013), machine ethics and human-computer confluence, that are currently in the realm of science fiction but may become reality at some point.

HBP-wide survey

Following the senior scholar interviews, we undertook an HBP-wide survey. This survey was sent to all 714 researchers in the HBP, and 266 responded with 5 refusing their consent to continue. The effective response proportion was 261/714 (37 per cent). Of the 261 respondents, 89 per cent (233) were working in a university or an affiliated institution.

Likert scale questions were asked around the themes of data protection, intellectual property and governance of the shared platforms, animal experimentation, research excellence, applications of brain signature research, development of collaboration and responsible R&I. The answers ranged from ‘strongly disagree’ to ‘strongly agree’ in seven steps, with neutral being the mid-step. After scoring disagreement in the range -3 (strong) to -1 (some) and agreement from 1 to 3, an average score was calculated.

With regard to data protection, there was agreement (represented by a positive average score) that individual consent should be provided for all human data used in the HBP, that the HBP should share responsibility with the collecting institution for the protection of personal data, that the HBP should appoint a designated officer responsible for privacy and data protection and that it should establish best practices for medical ‘big data’ research. Respondents were neutral (zero average score) about whether public good outweighed concerns about privacy.

With respect to the medical applications of HBP research, respondents agreed that the social and scientific consequences of identifying brain signatures need to be assessed by research and that the prevalence of brain signatures in the general population should also be assessed. They were neutral about whether it would be possible for a patient to challenge a psychiatric diagnosis based on brain signatures and were against the concept that psychiatric disease can only be defined in terms of brain abnormalities.

These responses are broadly in line with expectations one might have if the respondent were choosing an ‘ethical’ stance; something that is borne out by analysis of the other themes in the survey. The conclusion is perhaps unsurprising because it is likely that only those who considered it important to express their views on ethical matters responded to the survey. In this light, a response rate of 37 per cent suggests that a substantial minority of HBP staff are concerned about the ethical issues raised by the project and hold broadly conventional views.

Networked responsibilities in the HBP

These various ethical issues link to many responsibilities, some of which are straightforward and clear-cut, while others are more open and ambiguous. In a large and heterogeneous project such as the HBP the attribution of responsibilities is not always straightforward. Let us take the example of animal data. Where the HBP undertakes research on animals, this is done by labs which typically have a lot of experience in such research and have the required infrastructure in place, including relevant approvals. However, it may well be that the simulation of parts of a rodent brain on the brain simulation platform would require additional data, which might be sourced via the neuroinformatics platform from a lab outside the HBP and outside Europe. In this case, it is not immediately obvious who, if anyone, is responsible for ensuring that the original data collection followed acceptable principles and what should happen if this were not the case.

In a project with over 150 tasks and a similar number of task leaders who can all serve as local principal investigators (PIs) drawn from a broad range of disciplines, it becomes clear that the attribution of responsibility for the various ethical issues becomes difficult.

To exacerbate matters, the HBP was subject to intense public scrutiny and controversy. This culminated in an open letter to the European Commission, signed by more than 800 scientists (www.neurofuture.eu/). In particular, parts of the neuroscience community were critical of the approach and the governance of the project (Frégnac and Laurent, 2014). In addition, there were internal tensions between partners related to the external controversy, which led to an external mediation exercise (Marquardt, 2015).

This very brief outline shows that it is appropriate to speak of networks of responsibility within the HBP. The originally planned RRI activities added to this network by introducing ways to better understand social and ethical concerns.

RRI in the HBP

From the outset the HBP realised that it needed to engage with social and ethical concerns and therefore included the ethics and society subproject as part of project’s core activities. At inception this subproject covered five work packages, each addressing a different angle of RRI.

The first set of activities was part of technology foresight (Georghiou et al., 2008) and aimed to explore the possible future in the three main areas of activity of the HBP: future medicine, future ICT and future neuroscience. Second, there was a set of philosophical and conceptual investigations that explored questions of relevance to the HBP, such as the concept of simulation (Dudai and Evers, 2014) and issues around consciousness. The third work package included

activities related to engagement, with a number of events organised to reach out to an interested audience and the European public at large. Fourth, there was work on researcher awareness that aimed to explore the views and positions of researchers and scientists within the HBP, as reported earlier. Finally, there was a governance aspect that aimed to assemble a research ethics committee and an ethical, legal and social aspects committee to support the HBP, later merged into the ethical advisory board (EAB).

All of these activities are reasonable; they are clearly part of RRI and were carried out competently. Despite this, they had a rather limited effect on the HBP as a whole. The RRI activities included numerous and frequent interactions with the affected researchers of the HBP, but in spite of willingness to engage on both sides, practical exchanges rarely occurred. It remained unclear as to what exactly the ethical issues of the HBP were and how the issues could be assessed and prioritised to allow the RRI activities to focus on those that were most relevant. The overall governance of the HBP was rather complex and underwent changes. As a result, it was not clear as to what degree the highest level of project management and governance supported RRI.

This was the situation the project found itself in when it underwent a technical and ethics review by the European Commission in January 2015. The outcome of this review included significant changes to the project governance structures (Abbott, 2015) and a review of how ethical components were being managed. An ethics management component was added to the RRI activities. We believe that this ethics management component displays the characteristics of a meta-responsibility that was previously missing.

Ethics management as practiced meta-responsibility

Explicit attention to the management of ethical issues was introduced by the HBP's ethics and society subproject in response to the apparent shortcomings of the RRI processes. We now summarise the activities of the ethics management function and explain how it can be understood as a key component of meta-responsibility. This will be followed by discussion of the limitations of this view.

Ethics management plan in the HBP

Ethics management includes a number of interdependent activities and processes. The first one was the decision to have ethics management explicitly and visibly represented in the project structure. This was achieved by creating a work package on ethics management, which is led by the ethics manager. The ethics manager became a non-voting member of the board of directors, the highest decision-making body of the HBP. Furthermore, the ethics manager is responsible for the creation and maintenance of the HBP ethics map (see later for more detail) and the development of standard operating procedures to govern particular issues. The ethics management team sets up and maintains a point of registration (PORE) that allows members of the HBP, as well as external stakeholders, to raise issues they believe to be of importance. A crucial activity with regard to European Commission rules was the redesign of compliance procedures which require all local PIs and task leaders to provide approvals for their research, which are held in a central repository. Ethics management works closely with the European Commission to ensure that mutual expectations are clear. A new ethics advisory board (EAB) was formed from the previous research ethics committee and the ethical, legal and social aspect committee. This board is supported by the ethics management function. Members of the EAB were selected on the basis of their expertise. The members are independent of the HBP and provide expert

advice. The interaction between the EAB and the HBP follows various routes, with a key one being the ethics rapporteurs, a concept that was proposed by the EAB members. The ethics rapporteur programme is also supported by the ethics management function. Each subproject nominates one or two individuals as their permanent contact points with regard to ethical and social issues.

All of these activities have project management components. However, instead of seeing them as part of project management, they should be interpreted as a means of improving transparency and communication about social and ethical issues. The guiding idea is that they should provide a social, discursive infrastructure that allows issues to be identified and discussed openly with subject experts and allows appropriate ways of addressing them to be found. Furthermore, the various components of ethics management are meant to provide an audit trail of all of these activities, which partly satisfies funding requirements, but more importantly allows discourse to be picked up where open questions remain and allows external input from within and beyond the project.

Changing networks of responsibility

We argue that these ethics management activities play a key role in transforming RRI from a more research-oriented activity to a meta-responsibility that can shape and align both new and existing responsibilities to ensure that the social acceptability, sustainability and desirability of the project are promoted. In order to make this argument, we discuss the three main components of responsibility and outline how the networks of responsibilities are affected.

The first and most obvious component is that of the objects of responsibility. What are the problems and issues that should be considered? Perhaps even more importantly, what is the relationship between these? The ethics management group went through a number of processes to identify these issues. In addition to drawing on the interviews and the survey mentioned earlier, as well as the work of other parts of the ethics and society subproject, the group arranged meetings with all subproject leaders, managers and ethics rapporteurs. These meetings were used to discuss known issues and raise potential further ones. A further online survey was subsequently sent to all task leaders to ask them about issues.

All of this led to a long list of issues, starting with issues raised by ethics reviewers and including numerous further ones. These range from well-regulated and easily identifiable ones, like the ethics of animal research, to more fluid and contested ones, such as ethical issues arising from big data. At the end of the spectrum there are more distant and speculative issues, such as the changing nature of the medical profession or even the possibility of machine consciousness.

A key task of the ethics management team was to represent these in a way that is accessible to both internal and external users. This was done by developing the 'HBP ethics map'. The idea behind this map is that it is the central repository of all relevant ethical issues that is used to discuss future actions. For this purpose, the map has the form of a spreadsheet. More important in terms of relating various issues and allowing them to be prioritised and discussed is the graphical representation of the issues as shown in Figure 22.4. The figure maps the issues along two axes: one indicating the likelihood that these issues are going to be serious and create problems for the HBP and the other indicating the potential social impact that the issues will have.

Figure 22.4 represents the state of discussion at a particular point in time. It does not claim to be complete nor to be a perfect representation. Whether an issue has a higher or lower likelihood and whether they should be grouped together as indicated is up for further debate. The map should be seen as the starting point for discussion, rather than its definitive outcome.

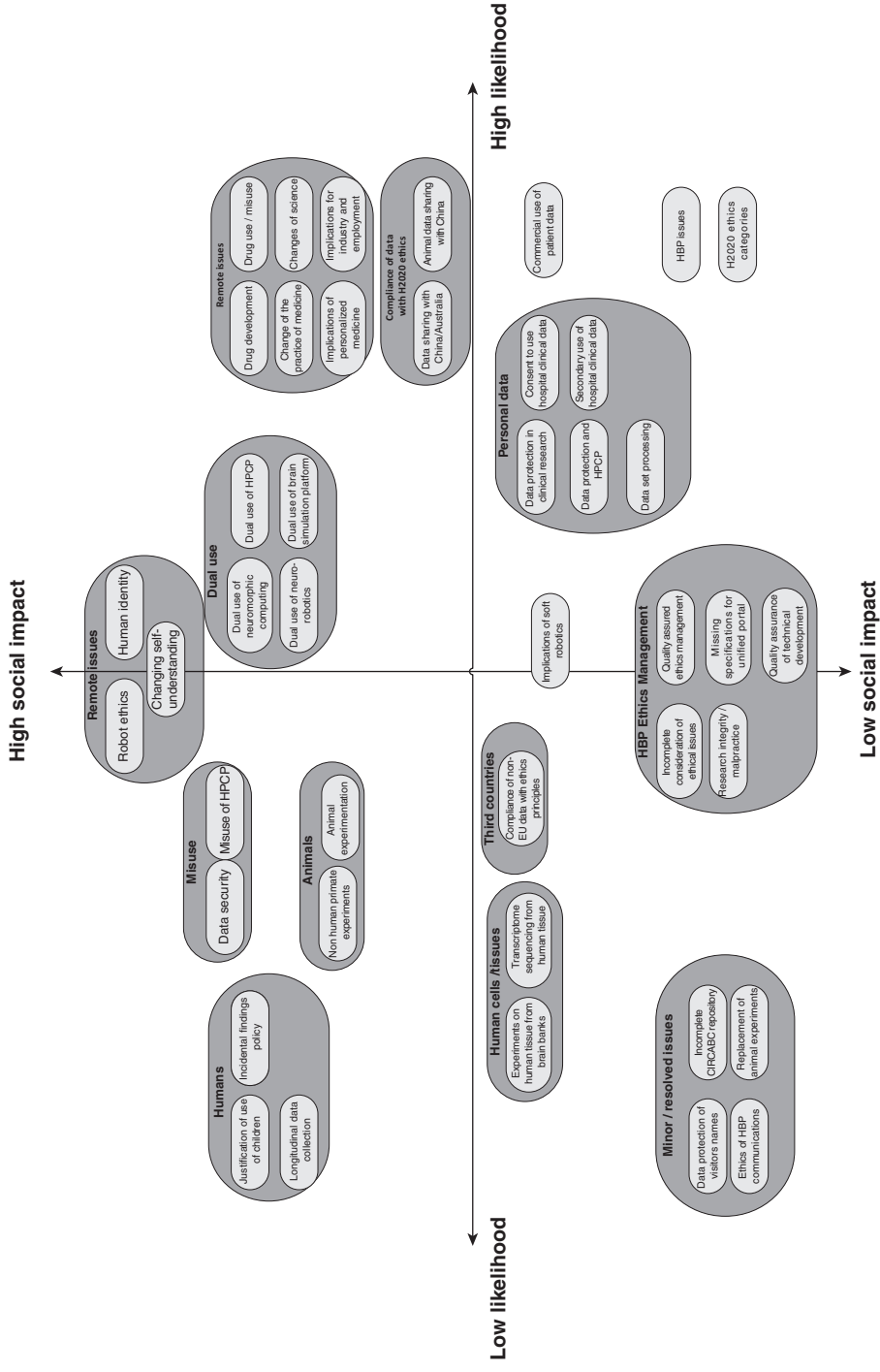


Figure 22.4 Graphical representation of the HBP ethics map

For the argument in this chapter, however, the graphical representation of the ethical issues is of crucial importance. It is a tool that allows us to see the various objects of responsibility in relation to one another. This is necessary for prioritising issues and discussing the relationships between them. It renders it clear, for example, that some of the remote issues, that is, those issues that are unlikely to come to full fruition in the immediate future, have a greater potential impact than many of the issues that have been the focus in the past (e.g. compliance issues of clinical and animal research). Its purpose as a tool is not so much to be a correct representation of reality but to be a stimulus for a debate that allows us to contextualise the various issues.

In addition to gaining an overview of the objects of responsibility, ethics management has also made significant progress in identifying the relevant subjects, i.e. determining who is responsible for the various issues. This was achieved by meeting with the senior scientists, managers and ethics rapporteurs, as well as surveying all PIs. These activities provide the groundwork for the overt circumscription of normative horizons that facilitates the knowledge of role and activity responsibility. It also doubles as an awareness-raising activity for the ethics management procedures that are underway.

The identification of the authority involved in the various aspects that make up the network of responsibilities in the HBP was greatly aided by the publication of a European Commission guide on how to undertake an ethics self-assessment (European Commission, 2014). This document lays out the types of ethical issues that the EC requires to be reflected on (corresponding to the dotted ovals in Figure 22.4). More importantly, it contains references to applicable legislation and the details of meeting ethical and legal requirements.

Arguably the most important work undertaken by the ethics management team in terms of RRI as meta-responsibility was the development of standard operating procedures (SOPs) and ethics action plans. SOPs were developed as general guidance on how to deal with particular issues in the HBP. Action plans for specific ethical issues were developed in collaboration with the affected scientists in order to give specific guidance on topics that fall outside of general guidance. These documents are linked to the HBP ethics map to indicate how the individual issues are to be addressed. Work on these documents is crucial because it allows for an open discussion across the different disciplines, with a view to ensuring that the issues are addressed in accordance with the overall aim of the project and also with a view to broader societal concerns. This is therefore the step that allows for the harmonisation and alignment of different responsibilities and the shaping of new ones where required. This clarifies to whom each of the roles within the HBP are responsible, making accountability transparent.

The various steps of the ethics management function thus live up to the idea of RRI meta-responsibility. They shape, maintain, develop, coordinate and align existing and novel R&I-related processes, actors and responsibilities, with a view to ensuring desirable and acceptable research outcomes.

Limitations of ethics management

Ethics management in the HBP fulfils the criteria of RRI as meta-responsibility. It represents a crucial step from reflection and deliberation to action to ensure that RRI has manifest outcomes. We do not claim, however, that it is perfect or a panacea for all ethical and social issues.

The limitations start with the arguably contradictory term 'ethics management' itself. Ethics as the philosophical reflection of morality (Stahl, 2012) is not and cannot be subject to management. It is, in fact, the relationships between different actors and the overall network of responsibilities that are managed, so the term is somewhat misleading.

Furthermore, there are practical questions. The case of ethics management described earlier is relatively novel and is still very much in development. At this point it is not clear how successful it will be in terms of achieving the societal goals. Furthermore, it is part of a very dynamic project environment that has attracted much public and political attention. It is difficult to foresee how this will affect ethics management.

The practical implementation of ethics management is on its way, but again, it is too early to tell whether scientists will resist it because they feel it is too onerous or whether it can raise questions with regard to enforcement.

However, we believe that these points, while raising caution with regard to the particular example of ethics management in the HBP, actually strengthen the overall argument for RRI as meta-responsibility. The socio-technical environment of R&I activities in societies tends to be fluid and contested. It is difficult to identify the exact actors and their responsibilities. Governance activities are likely to curtail options for some actors and may thus lead to resistance. In this environment a flexible and procedural approach is required that has the potential to see beyond immediate necessity to shape the overall research landscape.

Conclusion

RRI is a key concept of R&I governance and policy. The discourse around RRI is rich and offers numerous competing definitions and components. One aspect that is currently not clear is how RRI goes beyond the numerous well-established activities in science and research governance, such as technology assessment, foresight or science and technology studies. Similarly, on the European policy level it is not clear whether the six pillars (ethics, engagement, science education, gender, open access and governance) are comprehensive or whether addressing them would render research automatically responsible.

In this chapter we propose a different view of RRI as a meta-responsibility that aims to shape, maintain, develop, coordinate and align existing and novel R&I-related processes, actors and responsibilities, with a view to ensuring desirable and acceptable research outcomes. This proposal assigns a fundamentally different role to RRI that encompasses the various components and yet goes beyond them. We believe that this idea contributes to the RRI discourse by providing a focus and offering ways of rendering RRI practically relevant.

The theoretical contribution of the chapter is thus a development of the RRI discourse based on long-established theories of responsibility. The idea of networks of responsibility provides the basis for the re-conceptualisation of RRI as a meta-responsibility.

In addition to this theoretical contribution, we provide empirical evidence of the usefulness of the concept of meta-responsibility. Drawing on the newly established practice of ethics management in the HBP, we demonstrate that meta-responsibility can gain practical relevance and guide work on RRI. This does not replace existing RRI activities, but allows them to move out of isolation to be practically relevant. In terms of the AREA framework of RRI (anticipate, reflect, engage, act [Owen, 2014]) the idea of RRI as a meta-responsibility points towards options of realising the final A, the 'act'. If RRI is to remain an important component of research governance, then this move to practical relevance needs to be established.

Recommendations

Having demonstrated that RRI can be understood as a meta-responsibility and that this interpretation can help put it into practice, we can make some preliminary recommendations to individuals involved in setting research policy, as well as those who put it into practice.

RRI as a meta-responsibility constitutes an instance of responsibility in its own right. This means that the various components need to be defined and the conditions of a successful practice of responsibility should be considered. Most of this chapter spoke about the various objects of responsibility that RRI has to consider, from research ethics and gender equality to technology foresight and public engagement. To be able to align and coordinate these, RRI needs to be linked to a subject of responsibility. At present the RRI discourse shies away from the question of who is responsible for RRI. However, from the theory of responsibility we know that this is a crucial aspect of any successful responsibility ascription. It is therefore advisable to define the need for someone responsible for RRI on a policy and programme level as well as on the level of the individual project.

A second set of recommendations that arise from RRI as meta-responsibility relates to what we have called the authority, that is, the norms, the question of how they are applied and what sanctions are linked to their application. To put it differently, what are the rewards for a successful implementation of RRI, and what are the sanctions for failing to do so? These are important questions which are clear with regard to some aspects of RRI (e.g. failure to comply with research ethics can lead to withdrawal of funding) but are much more open with regard to other aspects such as temporally more remote questions, including the changing nature of the medical profession or the impact of novel neurotechnologies on human identity. In addition, they are generally not addressed with regard to RRI as a whole. Successful implementation of RRI in research policy thus requires attention to be paid to these questions and, at a minimum, a definition of processes that will lead to practical answers.

These recommendations are very preliminary and subject to further discussion. What they show, however, is that the concept of RRI as meta-responsibility not only improves our understanding of the topic but also can provide practical input into research policy development.

Further research

Much research remains to be done. This chapter demonstrates the applicability of the idea of meta-responsibility using one specific example. RRI spans all of R&I, and it is therefore important to explore whether and how meta-responsibility can be instituted in different contexts. It seems likely that ethics management as described here is not the only way of implementing meta-responsibility. Another open question refers to the specifics of discipline and subject. Our example of the HBP is of interest due to the size of the project, its interdisciplinary nature and the intuitive ethical relevance of the subject. It remains open, however, as to whether projects of different sizes or in different fields raise comparable or fundamentally different issues and how the idea of meta-responsibility might be used to address them.

Further work would also be useful in applying different theoretical lenses to reflect on RRI as meta-responsibility. Here we have focused on the theory of responsibility, which is plausible due to the inclusion of this term in 'RRI'. We suspect that similar arguments could be made from other theoretical positions. One strong candidate for such an alternative theory would be that of discourse ethics (Apel, 2002, 1990; Habermas, 1991; Mingers and Walsham, 2010). We believe that the idea of meta-responsibility could be expressed in these terms. If so, it would be interesting to see which practical implications could be drawn from this.

However, despite the clearly recognisable need for further work, both conceptually and empirically, this chapter has provided a much-needed theoretical development of RRI and used one of the biggest and most complex research projects worldwide to demonstrate the importance of this development. The chapter therefore furthers both theory and practice in research governance and policy.

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Note

- 1 EPSRC: Framework for Responsible Innovation <https://epsrc.ukri.org/research/framework/>, accessed November 11, 2018.

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