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Working responibility across boundaries ? Some practical and theoretical lessons

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INTRODUCTION

This chapter examines some of the tensions between the ideals and the operationalization of responsible research and innovation (RRI). It does so through reflections on research into integrating assessments of various types in the context of complex, emerging technologies. Its aim is to address some aspects of what actually happens, as new collaborations are sought across institutional cultures and scientific disciplines. The chapter is especially interested in those types of integrations of assessments that take place, or will take place, as assessors of various flavours, seek closer collaborations with scientists, innovators, industrialists and policy-makers. Situated within the broader horizon of an empirical investigation into integration of assessments (https://www.researchgate.net/project/EPINET-2, accessed 15 March 2019) it recounts three (practical and theoretical) lessons for RRI.

There are differences in the ways in which the RRI concept is construed. For instance, different visions have emerged as (respectively) an interactive process (von Schomberg 2013), as six keys (EC 2012a), as responsible innovation (Owen et al. 2012; Stilgoe et al. 2012) or as anticipatory governance (Guston 2014). We can also observe discrepancies, or at least tensions or nuances, between the definition(s) of RRI as a concept and the practices that are gradually emerging from efforts to operationalize and implement policy decisions on RRI. Yet, a key component of most such initiatives is their cross-cutting character: they cross politics, science, technology, ethics and law, as well as relevant research perspectives, such as ethical, legal and social aspects (ELSA), science and technology studies (STS), different kinds of technology and impact assessments (von Schomberg 2011) and media studies. Responsible research and innovation is a 'boundary object' (Star and Griesemer 1989) that triggers boundary work, is not standardized in any way (Rip 2014) and draws upon different sources. For the purposes of this chapter, we mention three such sources, corresponding with relevant types of activity. First, RRI practitioners may seek to align or adjust action and values across sectors by trying to improve communication and coordination across, for instance, politics, science and industry. This resonates with notions from systems theory, especially prominent in innovation studies (see Owen 2015). Second, proponents of upstream engagements, stemming from fields such as public engagement and vision assessment, seek to directly influence and frame policy agendas in the earliest possible stages (Felt et al. 2007). Third, other initiatives seek some kind of interdisciplinary integration into research and innovation

networks, as is the case in constructive technology assessment (Schot and Rip 1997) and integrated projects in ELSA research (Fisher et al. 2006).

The cross-cutting character of RRI is not so much a unique development as a consequence of long-standing efforts to (net)work across sectors and institutions at national and European Union (EU) levels (Barry 2001). The knowledge economy (Nowotny et al. 2001) is strongly supportive of innovation that mobilizes contributions from highly composite research teams from different technoscientific and engineering fields (converging or key enabling technologies), and includes not only social scientists and humanities scholars, but economic players and stakeholders as well. The European Commissioner for Research, Science and Innovation, Carlos Moedas, was merely re-articulating an old programme and rhetorical strategy (Bowker 1993) when he declared how:

> Research, science and innovation have the potential to improve all areas of the economy and society, and help us tackle our main societal challenges. Working in silos is not an option . . . it is necessary to break artificial silos and work as a team in order to tackle major challenges, overcome tough obstacles and implement reforms. (Moedas 2014, p. 2)

Responsible research and innovation has structural similarities with such policy agendas since it brings the resources of different assessment practices together by integration and collaboration. It represents a new framework (Owen 2015) for several research fields working at the intersections of science and society, not least owing to a step change in scope and ambition. Responsible research and innovation is introduced in parallel with efforts towards the pooling of resources from across Europe in large research programmes, infrastructures, platforms and networks. The shift heralded by RRI, therefore, is mainly a result of how its proponents respond to and mirror developments inside the main innovation and policy institutions with which they interact. One visible outcome, especially in public engagements but also in different forms of vision assessment and foresight activities, can be seen in increased emphasis on possible futures and the desirability (or not) of specific imaginations and visions in innovation. This turn towards futures places the representations of such visions and scenarios at the heart of assessment processes. It brings forms of mediatization into RRI and begs a clear consideration of how such forms operate, and how the production values, and other material and symbolic aspects, might also come into assessment. For example, high production values and realistic aesthetics together with celebrity voices might be much more compelling materials in representing futures than black and white pamphlets with dense text.

We have in the past taken part in encouragements of greater (upstream) engagements, with research and innovation agendas (Felt et al. 2007; Wright et al. 2011; Rommetveit et al. 2013) and are convinced that there are aspects to these developments that invite further monitoring, articulation and deliberative reiterations. This is so if main values promoted by RRI are to be realized, especially those expected as outcomes when different groups come together in extended collaborations: reflexivity, responsiveness, anticipation and deliberation (von Schomberg 2011, 2013; Stilgoe et al. 2012; Owen 2015; see also Callon et al. 2001; Guston 2014; RRI Tools 2014). The emphasis on these capacities is not unique to RRI thinking, but could be said to incorporate collective processes of learning generated by a great number of actors on the science/technology/society interfaces over the past 40 or so years (see, for instance, Felt et al. 2007). Why do we raise (and frame) issues pertaining to integration in practice in such ways?

First, as governance and assessment practices appear to become ever more closely entangled with innovation networks, it is likely that the former gets affected by the main presuppositions, assumptions, commitments and drivers of the latter. Yet too close entanglements are problematic if, at the same time, it is the broader societal and environmental roles and impacts of these very networks that must be assessed. This amounts to another version of the long-standing syndrome of regulatory capture of assessors by commercial interests being supposedly regulated. Direct transfers of meaning and interests are not without problems, especially when it comes to public deliberation and decision-making. It is well known how innovation agendas harbour strong deficit views of the public, users and communities (Wynne 1992, 2007) and project scientistic ideologies onto society and the public. With its major emphasis on public engagement, however, RRI discourse critically opposes different types of deficit models.

The problems and challenges posed by deficit models are strongly associated with deficit views of knowledge and knowledge practices more generally. These problems commonly originate with the view that knowledge is always and everywhere the same, since then its recipients and users should also always in principle agree to the universal propositions and precepts of science (Wynne 1992; Knorr Cetina 1999; Toulmin 2003). In its initial configurations of modernity, this knowledge imaginary was mainly about abstract, theoretical knowledge. Currently, however, it is also expected to be characteristic of knowledge as intervention, innovation and societal reform. Yet, knowledge and its rationale for claiming authority is still considered or conceptualized as an independent social agent, seemingly capable of performing the same type of beneficial work (for the economy and for society) regardless of place, time and culture (Felt et al. 2007). In the realm of EU innovation, something similar applies to information-intensive communication, as when an expert group projected how everyone and everything will be permanently connected to a network and that network bandwidth and quality will increase significantly. The expert group summarized this future network paradigm as *anything, anybody, anytime and anywhere on any device* (EC 2012b).

This deficit view of (the supposedly needy recipients of) knowledge is therefore directly implied in renewed pushes towards collaboration and integration, in so far as underlying it we also find a model of seamless and frictionless communication. In main EU innovation agendas, knowledge and information are expected to act not merely as building blocks, but also as medium and lubricant for coordination of actions across societal, national, regional and disciplinary boundaries (Nordmann 2004). Yet, if knowledge, information and integration gloss over major cultural differences across regions (East–West, North–South), between countries, and between disciplines and knowledge regimes, integration projects may backfire owing to the different worlds, cultures and practices involved.[1] Such frictions cannot be denied without detrimental consequences, but need to be painstakingly negotiated (Felt et al. 2007).

We may also fail to observe and to draw the proper lessons from the many intricacies and frictions that arise in practice when different actors and networks come together in an attempt to collaborate. In this chapter we argue exactly this point, that such (disciplinary, institutional, national, and so on) differences cannot be ignored, but instead should be embraced as main conditions of possibility for robust communication and collaboration to emerge in the first place. That is, the frictions and complexities that arise in practice when actors engage in collaboration and boundary work (Gieryn 1983) are crucial

resources through which RRI, as discourse and practice, could deepen and solidify. As a key, but hitherto neglected, dimension of 'responsibility' in the RRI being explored here, this very deepening of integration and assessment is a crucial condition for any robust and accountable innovation.

This chapter recounts some lessons that we learned from three different sites of collaboration and of friction. Our account draws upon such boundary work as it occurs in the following areas: (1) between assessment work and innovation networks; (2) between the different assessment disciplines (interdisciplinarity); and (3) between law and other assessment practices. Before we turn to those descriptions, however, we need to explain our analytical and conceptual approach, as well as the research setting in which it was developed.

EPISTEMIC NETWORKS: PROBLEM-SOLVING ACROSS DISCIPLINES AND INSTITUTIONS?

Our analysis is embedded in a view of learning arising from efforts towards problem-solving across boundaries. The view of scientific inquiry as addressing practical human problems has been most forcefully articulated in the philosophy of pragmatism (Dewey 1929). What has only relatively recently become a focus of analysis, however, is how large organizations and broadly distributed networks organize around societal problems, as for instance articulated in the 2009 Lund Declaration. Hence, we see turns towards grand challenges and distributed problem-solving in fields such as innovation studies (Kuhlmann and Rip 2014), organizational studies (for an overview, see Ferraro et al. 2015), and STS (Barry 2001; Latour 2004; Callon et al. 2001).[2] We critically observe how social scientists increasingly embrace concepts originating from fields such as ecology and cybernetics, which may be seen as logical since main imaginations and practices towards interdisciplinary and cross-institutional action originated in these fields (Bowker 1993). In main parts of scholarly vocabularies we now find concepts such as complexity, uncertainty, distribution, ignorance, contingency, networks, systems, feedbacks, emergence and ecologies. In these vocabularies knowledge and communication increasingly occur as interwoven, and as engaged in problem-solving and efforts towards coordination of collective action. The way we have described the RRI discourse is itself very much part of these evolving meanings and networks. In RRI texts we observe a turn towards governance as networked interaction in complex environments, as 'governance in complexity' (Rip 2006, p. 82). Such understandings are routinely invoked to account for the conditions under which RRI practitioners operate and perform their work (see Stilgoe et al. 2012; Bessant 2013; Owen 2015; Strand 2015).

Effectively, the many disciplines mobilized by the RRI discourse can be described as epistemic networks (cf. Haas 1992), in so far, as a key component, they act towards the making of novel associations across previous science–society interfaces: articulating academic, disciplinary and relevant experience-based specialist knowledge in order to respond to a societal or institutional problem (or question). Such epistemic networks are also increasingly becoming orientated towards engineering and design, as in value-sensitive design or privacy by design. The many players expected to contribute to RRI are already in the business of developing distinct hybrid styles of reasoning on the

intersections of more traditional academic/disciplinary knowledge and policy-relevant contexts, partly in response to societal challenges, and partly in response to industrial and political imperatives to innovate. For instance, public engagements with science draw upon both sociological and political theory, but also transform these by applying them to new fields of practice and in new institutional settings. This hybridity in networks is already entailed by tropes such as integration, interdisciplinarity, reflexivity, anticipation and responsiveness: Not merely ideals to be achieved, they can also be seen as partial and implicit accounts of the conditions under which actors engage in mutual collaborations and knowledge-making for some societal purpose (networked, complex, dynamic, and so on).

In spite of long-standing practices of integration of science into policy and regulatory contexts, which can be traced back at least to the 1970s, this does not imply that disciplinary and professional affiliations, values and commitments are abandoned upon entry into interdisciplinary, policy-advice and collaborative projects. On the contrary, scholarly professionals who participate in epistemic networks do remain crucially characterized by their disciplinary backgrounds in negotiations and collaborations with others (Stengers 2006). When they enter into interdisciplinary and cross-institutional collaborations, disciplinary identities and affiliations might become pushed to the front stage of presentation and communication. Without epistemic grounding in some discipline or community, the actors will lose epistemic and political authority. As an example, in the field of privacy and data protection it is expected that law increasingly integrates risk management methodologies (van Dijk et al. 2016). Although this development seems necessary and valuable, it also poses severe threats to the integrity of law. Legal practitioners (but also ethicists and social scientists) may be transformed into mere strategic players pursuing whatever possibility there is for funding and self-promotion. In this process they may aid in legitimizing the increasing reduction of protecting rights to exercises of risk managerialism. A perfectly rational, sometimes even laudable, response may therefore be to withdraw from collaboration,[3] because professional integrity is at stake, and it is not compatible with the goals, values or methods of some proposed collaboration (Gutwirth and Christiaens 2015). This does not imply that increased networking and integration is futile; epistemic networks change over time, are more flexible than traditional academic disciplines, and are to great extents themselves results of prior cross-disciplinary or interdisciplinary exchanges.

Moreover, we note how epistemic networks hold assumptions about the broader conditions and problem horizons under which they work: their relationships with other actors and networks; and the underlying mechanisms of innovation ecologies and systems, including their broader aims, goals and values. The actors make assumptions and shared representations about what it takes for fruitful collaborations, and about the means and goals of collaboration and networking. They use such assumptions to operate and position themselves within highly networked and competitive ecologies of practices (Stengers 2006), for approaching and distancing themselves in relation to others. A disciplinary community is constituted through the identification and recognition of shared representations such as key texts, images, models, institutions and specialized language. Networked collaboration between communities requires, on the one hand, a reification of such representations held by the individual discipline so that it can remain distinct and legitimate. On the other hand, it requires another set of representations that constitute

the boundary elements of collaboration or interdisciplinarity.[4] Our aim is to highlight the communicative and community-building practices at stake in collaboration and networking. Based on this account we may also appreciate how epistemic commitments and values become triggered during encounters with other disciplines and professions, and during controversies over the nature and goals of knowledge, research and innovation.

LESSONS LEARNED

The lessons to which we shortly turn were generated within the Epinet research project which aimed to study integrations of different assessment methodologies. The project investigated integration as practical achievement, that is, as networking, or as integration of different assessment methodologies[5] into practices of research, innovation and policy-making. It engaged with practitioners (assessors, researchers, innovators, policy-makers, industry and civil society) involved in EU agendas targeted simultaneously towards innovation and a specific societal challenge. Research was carried out in three main stages: mapping of policy agendas and state of the art in assessments of these fields, mutual vision and agenda assessments with members of the relevant networks through participative workshop methodologies, and integration of all results into a set of policy recommendations and academic publications. Throughout the whole process, self-reflexive ethnographic studies were also made of interdisciplinarity and collaboration in this kind of project. Our lessons for RRI are grounded in this work, in so far as they result from efforts towards integration and/or collaboration across boundaries. In this chapter our argument is of a more general and reflexive nature. Detailed empirical descriptions on which these are based can be consulted elsewhere[6] and will be referred to when necessary. The first of our lessons (about integration) originates from a generic problem throughout our research, that is, the controversies within RRI-relevant epistemic networks; the second (about interdisciplinarity) emerged from our ethnographic studies of interdisciplinarity, whereas our third lesson (about law) stems from investigations into 'robolaw' and data protection impact assessments.

INTEGRATION 1: EPISTEMIC AND NORMATIVE DIFFERENCES ARE SOURCES OF LEGITIMACY

Our first site of friction is located on the boundaries of large-scale technoscientific innovation projects and the assessment networks and communities expected to integrate into such projects. Whereas interdisciplinarity and action across institutions are a stated goal, the actors called upon to do the job may pose requirements of their own that cannot easily be accommodated within policy goals towards integration. We see this, for instance, in the reluctance from (parts of) the STS, technology assessment (TA) and ethical, legal and social issues/ethical, legal and social aspects (ELSI/ELSA) communities to direct their scholarly contributions towards such broad-scaled policy-orientated projects as proposed in discourses on RRI and integrated assessments. For instance, Brian Wynne (2007) warns against STS becoming 'dazzled by the mirage of influence' that has over the latter years been presented to the more policy-orientated parts of the STS community. Specifically,

he argues that STS should not take its main criteria of quality from the policy context. Also, focusing more on contexts of research and innovation, Alfred Nordmann (2010) has warned against TA becoming part of the promise- and wishing-machinery of the very technsociences it is supposed to assess.

Nevertheless, there are also many scholars within TA and STS that reflect differently on the possibilities for integration into processes of research, innovation, and governance. We can mention the programme of anticipatory governance (Sarewitz and Guston 2001; Liebert and Schmidt 2010; Guston 2014), approaches closer to innovation studies and evolutionary economics (Etkowitz and Leyersdorf 1998), including niche management (Schot and Geels 2008), constructive TA (Schot and Rip 1997), and integrated ELSA devoted to 'midstream modulation' (Fisher et al. 2006). All of these are relatively optimistic about the possibilities for assessors to identify signals and early warnings that could be used to steer research and innovation towards more socially or ecologically desirable outcomes.

Why does Alfred Nordmann think it is better to stay out of the business of shaping the future, whereas Dave Guston thinks this is exactly what assessors should be doing? Why does Brian Wynne prefer to diagnose policies rather than integrate with policy processes, whereas Rene von Schomberg thinks that RRI should provide policy-makers with feedback in order to provide for 'a productive innovation cycle' (von Schomberg 2013, p. 70)?

The controversies outlined above can be linked to two different styles of reasoning (cf. Hacking 1985; cf. also Fleck 1935 [1979]), identified within our own research consortium (van Dijk and Gunnarsdóttir 2014) and historically (Rommetveit 2013). One (Guston and von Schomberg) is systems-based, in so far as it deploys theoretical frames and concepts from multi-layered scalable systems, as a way of making sense of possibilities for collaborations with others across disciplinary or institutional boundaries. The other (Wynne and Nordmann) is grounded within networks- and practice-based accounts and imaginations of agency,[7] and of the environments in which assessors perform their work and are expected to provide inputs for research, innovation and policy. These two styles represent different logics of integrating assessments, and different ways of sorting things out (Bowker and Star 1999).[8]

When it comes to the possibilities of achieving integration across the boundaries between assessors and innovators, Nordmann and Wynne both use the word diagnosis. They are suspicious of adopting the meanings deployed (or imposed) by technoscience and they remain agnostic towards close entanglements with innovators, researchers and policy-makers. Guston and von Schomberg, however, take a more proactive stance: they use concepts such as shaping, designing, anticipating, loops and feedback. They are more accommodating of the frames introduced by systems thinking mainly emerging through innovation studies; Nordmann and Wynne refuse them as prescriptions for the kind of work performed by assessors.

Such styles of reasoning may operate on the level of single disciplines but are not determined by them. The scholars mentioned above range from philosophy to STS and innovation studies. Hence styles of reasoning deployed by epistemic networks also operate through notions that cut across disciplines, what we have termed infra-concepts (van Dijk and Gunnarsdóttir 2014).[9] Here, the issues revolve around concepts such as integration, collaboration, engagement, shape, frame and influence. Furthermore, we can observe a tendency for such infra-concepts to be progressively used in clusters of proximity, in which

they also have a bearing on how we imagine and use other concepts, such as participation, reflexivity, deliberation and responsibility. We see how, in given situations, concepts may become sufficiently honed to distinguish between different scientific and political positions, including how the possibilities for active intervention into social and technological innovation networks are imagined and pursued. They may enable collaborations and closer integration of institutions or disciplines, but may also have the opposite effect. When questions come up about integration into the technoscientific contexts of research (Nordmann) or into concrete policy arenas and agendas (Wynne), epistemic and normative commitments might be triggered and the boundaries between sectors or disciplinary communities become visible.

Our intention at this point is only to indicate that there are different epistemic and normative commitments at work in assessments. These commitments cannot be easily overcome or done away with, without also doing away with the authority and validity claims of the assessment practices themselves. It follows that differences and controversies as just outlined, and the commitments reflected by them, should be articulated as conditions of possibility for TA/RRI/ELSI/STS, as they seek (some type of) integration into research and innovation networks. So far, however, questions about epistemic and normative differences are not much highlighted in RRI discourse. However, the problem arises in practice of how to accommodate different commitments that arise in the process of joining different approaches towards common goals. That such differences arise should be expected in collaborations across knowledge sectors and disciplines, as we have discovered and explored in some detail in our work (cf. note 6). This implies that a discourse that is tailored towards increasing approximation of disciplines and institutions, needs to be structurally compensated for adverse and unwanted effects through the introduction of additional safeguards. Efforts should be directed to putting into place mechanisms of distantiation, when integration between certain actors or practices has become too tight and leaves little room for manoeuvre by others. Responsibility presupposes checks and balances, and plurality of epistemic competencies and normative commitments. We do not believe many promoters of RRI would disagree with this; we do think, however, the point has to be made with greater force, and recognized as a basic condition for the type of work carried out by assessors. In the next section we discuss interdisciplinarity as another point of entrance for the analysis of this condition.

INTEGRATION 2: INTERDISCIPLINARITY IS A POSSIBLE OUTCOME, NOT A PREMISE

Let us now continue with a discussion of some of the results and conditions that emerge as different disciplines are compelled to embrace the multiplicity of relevant concerns and analytical perspectives. The implication is that single disciplines are not up to the tasks of grasping the cross-cutting and cross-sectoral activities of researchers and innovators, and of societal challenges implied. Mobilizing more disciplines and more perspectives, it is assumed, will provide a richer set of assessments, and more adequate policy responses. Interdisciplinarity is therefore hailed as a solution to the problems posed by the novel character of current research and innovation, including the societal challenges to which they allegedly respond. In addition to integrations into policy agendas and innovation

networks, interdisciplinarity may be invoked in the following contexts: (1) the use of different assessment disciplines or methodologies within advisory bodies, frequently referred to as science-for-policy; and (2) interdisciplinary or multidisciplinary teams working in close relation with researchers and innovators, as for instance in ELSA projects. Such modalities of interdisciplinarity are routinely also invoked in main RRI texts (Owen et al. 2013; Stilgoe 2013; van den Hoven et al. 2014; Owen, 2015), and research programmes implementing RRI.[10]

Nevertheless, issues of process and communicational practice are often overlooked in such calls for increasing interdisciplinarity. The work of achieving shared understandings of the questions at stake in multi-modal projects demands robust and prudent communication strategies. While the media texts produced through innovation projects can provide items to gather round, the different (dis)positions around technological objects require discussion and diplomacy. They should recognize plurality, but must simultaneously be able to articulate some shared recognition of the object. Such shared recognition requires an added layer of media inscription to enable a process of integration: minutes, protocols, notes, images of workshops, manifestos, policy recommendations, recordings, documentation, and so on. These resources constitute the often neglected material dimension of interdisciplinarity. Furthermore, projects that have the possibility at their disposal of the work of interpretation and integration are likely to be more able to incorporate agonistic approaches that retain specificity while also exchanging legitimacy effectively. Legitimacy and compelling representations go hand in hand.

A challenge for technology assessors, and especially those orientated towards qualitative methodologies, is the predominance of quantitative approaches promising rapid and actionable knowledge, readily deployable across boundaries. Quantitative approaches are much more invested in the work of representing findings as image and spectacle, and these are seductive in terms of rhetorical power. Examples of such approaches include risk assessments, econometrics, polls and surveys, quantitative impact assessments and the use of indicators. These assessments offer broad sweeps of the fields and issues in question, and are capable of speedier responses to calls for urgent policy-relevant action: numbers and indicators as concise and evocative representations give the impression of being easily communicable and directly translatable into action. This rhetoric of speed and efficacy contrasts with the sometimes painstakingly slow process of other disciplines more orientated towards interpretation, and depending on provisions of contextual understandings and explanations in communication with policy-makers, the public, courts and others.

In so far as perspectives from ethics, law, knowledge assessments, vision assessments, constructive TA, or STS, are involved, promises of rapid shortcuts are illusive, and undesirable.[11] When it comes to integration of methods and disciplines, and working towards interdisciplinarity or multidisciplinarity, one-size-fits-all approaches obscure more than they reveal. The challenges of multidisciplinary collaborations should come as no surprise to RRI promoters and practitioners, and interdisciplinarity has been a topic in TA for several years (for instance, Decker and Grünwald, 2001).

In our research, as in writings on interdisciplinary TA (Decker and Grünwald, 2001; Decker and Fleischer 2010), a problem- or issue-orientated approach was chosen for the structuring of multidisciplinary and interdisciplinary relations and interrelations (see also Dewey 1929; Marres 2007). This type of approach seems required regardless of whether the implied assessment methodologies are qualitative or quantitative, or both. Owing to

the often broad and sweeping visions, coupled with fast developments of many innovation fields, there is a need to provide a prior focus and understanding of the issues (societal or technology induced) to which the different assessments are expected to respond. As stated by Decker and Fleischer (2010, p. 119) this identifies 'the definition of the problem as the central element' of research. This process of definition is in itself a communicative exercise aimed at producing conceptual alignment and generic frames of reference. In turn, it structures other significant problems among the project partners, for example, choices of methods, when and where to seek intervention, and who to include in the broader assessment. We do not proclaim our problem- and issue-orientated approach to be the only option. However, we would like to draw attention to two broad lessons to derived from that.

The first lesson seems almost too obvious to be mentioned, especially to those with interdisciplinarity experience: interdisciplinary integration is an outcome to be achieved, and not a default starting position. In our work in the Epinet project, even as the researchers tried taking these matters into consideration, we identified shortcomings and problems relating to the organization and structuring of projects. Some of these may be specific to the solutions chosen by us. However, several issues seem endemic across this type of international interdisciplinary research project. There is often a lack of continuity. When the project ends, research also ends, and collaboration will have to be re-established in another setting, if at all. There are limitations in communication (which is side-lined as separate from the main activity) and a lack of face-to-face interaction required for common understandings to arise and thrive, also specific to the case at hand. This indicates frictions generated by a failure to recognize the importance of communication at the heart of the project. Finally, there are shortcomings in, and challenges for, learning. In many cases the most valuable outcomes do not necessarily relate to a fusion of several disciplinary horizons as inscribed in the general objectives of the project, but rather to fields of study locally reaching an approximation in the course of addressing a concrete research challenge. Finally, special attention should go to the structuring role of leadership within multidisciplinary teams in the techniques and tools by which the coming together is orchestrated (similar to the styles of reasoning mentioned previously).

The second lesson is that the assessment team should be in a position to choose and define the research and policy problem to be addressed with considerable independence. This again speaks in favour of distance and a relative disconnection from policy-makers, researchers and innovators. Cultivating a knowledge base for RRI will have to be aimed at problem-selection in accordance with the validity claims and commitments of the concerned assessors and RRI practitioners. They cannot be expected to simply adopt the problem frames provided by innovators or policy-makers. On the contrary, these should themselves be part of the object of assessment. As analysts, we should not simply take over or accept the initial framings provided, for instance, by industry or governance, but must critically aim to assess these frames, including their democratic potential and their fitness for purpose in addressing main societal challenges (and here there are numerous nuances and differences according to the maturity of the technological fields and policies).

We believe that the point just made affords a potential for reconciliation in the debate between, for example, Nordmann and Guston: well-considered interdisciplinary integration might maintain proper balances between autonomy and mutual learning, and between critical distance or opposition to and adoption of the given problem frame. One way

forward is to search for sources of strength that may secure autonomy and critical distance without becoming useless and out of reach of the real issues, as described in the previous sections. Next we discuss what we encountered somewhat to our surprise in the Epinet case studies; namely, that law and legal expertise afford particular sources of strength.

INTEGRATION 3: LAW AS A RESOURCE AND GUARANTEE

Across several developments studied in the Epinet project, especially in autonomous robotics and data protection impact assessments, we have observed not only how law is increasingly called upon and mobilized to meet research and innovation at earlier stages, but also how in doing so it comes under pressure from science, engineering, politics, industry and ethics (see Rommetveit and van Dijk 2014; Rommetveit et al. 2015). New configurations arising to meet the new requirements include privacy and data protection by design, as well as new incursions of risk management into the institutions of fundamental rights (van Dijk et al. 2016). The intense 'ELSIfication' of R&D and the subsequent development of RRI (especially in EU science policy) have brought lawyers to effectively collaborate in multidisciplinary innovation coalitions, together with engineers, policy-makers, risk assessors and managers, (social) scientists, economists, ethicists, industry and business. Such collaborations raise the question of the particular roles that lawyers can offer when they participate in the assessment of technological innovation: Do legal requirements easily translate into engineering requirements, as is assumed by a programme such as data protection by design, or even, in a more general way, by the concept of legal protection by design (Hildebrandt 2011)? Is it possible to 'hardcode' fundamental rights of privacy and data protection into information infrastructures (cf. Gutwirth 2010)? How can risk assessments apply to fundamental rights and freedoms: what is a risk to a right? (van Dijk et al. 2016).

These types of questions must be directed towards the RRI discourse, and whether it, in its current form, has the capacity to respond to such challenges. Mirroring the arguments of Nordmann (2010; cf. also Tribe 1973), the discourse about RRI is largely predicated on notions of prediction and control as taken over from the sciences, but not granting much attention to the specifics and requirements posed by law itself, even when they are brought to bear on the articulation of its main objects, namely, rights. If we review the literature on RRI (see, for instance, the contributions in Owen et al. 2013), we see how the Collingridge dilemma[12] is generally accepted as a valid statement of the working conditions and challenges for RRI. Within this universe it becomes a matter mainly of finding the right time for intervention, as in the metaphors of up-stream, mid-stream and downstream (see also Fisher et al. 2006). When law is seen in this light, the problem of a legal lag (Ogburn 1922) appears inescapable. According to this notion, technoscientific developments move so fast, and are so encompassing and complex, that legal procedure stands no chance when it comes to keeping up.[13] The Collingridge dilemma ascribes great agency to the technosciences as producers of progress and new societal relations. In so far as the question hinges on predictions of consequences of science and technology (Liebert and Schmidt 2010; Nordmann 2010), it seems to pre-empt the types of meanings, questions and public problems that can be provided and used for problem-definitions within interdisciplinary teams.

On this conception, law is conceived in an instrumental way, as a tool for regulatory intervention that feeds into what Lessig has called the optimal regulatory mix – together with technology, social norms and market mechanisms in order to steer human behaviour (Lessig 1999 [2006], ch. 7). Law as practice has its own singular ways and cannot simply be integrated into a regulatory whole or into a governance system. (cf. Gutwirth et al. 2008). On the contrary, 'doing law' depends on a particular regime of coping with controversial issues, or a particular way of seizing or subsuming things, which most people instantly recognize as being legal. The law expresses itself through a distinctive hermeneutical regime of enunciation: you become a jurist if and because you abide by its constraints (Latour 2002, 2013). Qualification is crucial: jurists must subsume the issues at stake with containers they have to derive from pre-existing sources of law (Gutwirth 2015).

It follows that jurists should not be expected to engage in non-legal evaluations of proposed and/or contested policies and rules, in forecasting of social, cultural or environmental effects of innovations, in pondering their (un)desirability, or in determining the set of leading economic, organizational and/or ethical assessment benchmarks. They can do so (and too often they in effect do), but then they do not practise law. In such cases, they take up another role than that ascribed to them by the 'L' in ELSA and turn into amateur policy-makers, economists, sociologists, ethicists or, even, amateur engineers.

This is not to say that law and lawyers are always retrogressive, or that ways cannot be found in which jurists can fruitfully engage with and even integrate with other disciplines. Our findings here are similar to those described for interdisciplinarity: ways can be found, but these depend on careful negotiations, mutual respect for boundaries, and time and space for working out the salient issues. Except when adjudicating – when they decide and effectively provide the legal closure – jurists always anticipate. However, they anticipate legally: confronted with a set of facts they will turn to the pre-existing legal sources (legislation, precedents, customs, doctrine, and so on), process the facts and the sources according to the legal operations and procedures foreseen, explore the most probable and possible or creative ways to come to a solution, and weigh the possible constructions against each other in terms of plausibility.

Jurists always work with means that are older than the facts, a feature that is nicely expressed by the principle of non-retroactivity of the law. This explains the redundant litany that the law is always too late and overtaken by the pace of real-world developments, as well as why this critique mainly expresses a misunderstanding of the role of law.[14] The legal lag argument does not appreciate the capacity of law to steer and guide developments, and to stake out new directions for societal and technoscientific innovations on its own terms (Jasanoff 1995; Latour 2013). When law lags behind developments, this is partially an outcome of specific political and economic priorities making things occur and appear that way. The law lag is an innovation frame.

No person can claim certainty about the legality of actions before a competent judicial body finally decides so in a case. Only then, the *res iudicati, pro veritate habetur* enters the stage: the way this issue is settled by the judge, is and will remain the now indisputable truth (*ne bis in idem*). However, the overwhelming majority of actions and issues in this world will never be submitted to judges. Such de facto improbability of a judicial intervention is a given which creates leeway and liberty for government, private persons, businesses and public bodies to assume or decide that their undertakings are legal. In our research,

we have observed these dynamics in several fields, from robotics, smart grids and wearable sensors, to the governance and assessment of data protection and privacy. The preference in practice is for vague and principled statements when it comes to implementations of human rights, autonomy, dignity or privacy, whereas there is strong pressure to establish the concrete legal rules and regulations needed to accommodate industry-driven innovation (Rommetveit and van Dijk 2014; Rommetveit et al. 2015). Hence, the question should also be asked about what types of law are invoked in large-scale collaborative projects, and what types of issue frames and ensuing assessments are thereby enabled?

We argue that law should not be instrumentalized as a tool within the regulatory mix in this way (Gutwirth et al. 2008). Instead, one important role would be to mobilize lessons from constitutional law in thinking about the constitutive relations between, the mutual checks and balances upon, and the required relative independence of, the different assessment practices or the broader public that enter into the mix. If we think in these ways, there is no need for law to exclusively base its assumptions on science and engineering. This could free up the attention of assessors to engage with the more normative questions of what types of practices and public should be included in decision-making about science, technology and innovation, the broader societal purposes to which they are directed and the quality criteria for the processes of how to get there.[15] This could also indicate a median position in the debate between the proactive and the agnostic stances of STS and TA as regards innovation policy, by, on the one hand, focusing on the constitutive relations between practices when STS/TA orient their contributions towards policy in interdisciplinary settings of research projects, but, on the other hand, recognizing the importance of an independent critical home base to hold the (possibly) more action-orientated policy entrepreneurs accountable. A sensitivity for checks and balances is crucial in these circumstances, with a need for sometimes observing distances and separations between practices (such as policy and industry) and at other times establishing new relationships with unconnected practices with relevant experience.

Another important role for law could lie in the use of legal concepts as conductors for (orchestrations of) impact assessment processes (cf. Hildebrandt and Gutwirth 2008). In our research into data protection impact assessments, for instance, due process has been put forward as an important principle for shaping the processes of impact assessments, whereas proportionality was proposed as an important principle for ordering assessment questions and lessons learned from other fields of application, such as environmental governance and risk management. These concepts include purpose specification, legitimacy of purpose, fitness for purpose, and alternatives (van Dijk et al. 2016). Thus, in addition to our two previously identified styles of thought, we now also introduce a third, that is, process- or proceedings-based, and it derives its main source of authority not from concepts of networks or systems, or from any technoscience, but from law and legal procedures.

CONCLUDING REMARKS

The concept of RRI is now moving from its visionary phase towards having to face tough questions about implementation and practice. In particular, three practical challenges stand out from the European policy perspective:

1. The diffusion of RRI across Europe into research and innovation funding and practice, as proposed, for example, by the recent Rome Declaration on RRI and at national levels.
2. The possible mainstreaming of RRI across European research funding programmes, notably the various work programmes of Horizon 2020.
3. Promotion and monitoring of RRI through quality criteria and indicators for RRI.

As noted previously, the Epinet project has studied assessment practices and not assessment policy-making, and cannot give much tactical advice for the latter. Still, because Epinet has empirically explored the question of what happens to assessments (of various types) as these become implemented in putting practitioners to practice, we believe that our experience provides clues to the way forward with the current challenges. Our text has focused on the practices and the networks in which assessors will have to work if they are to integrate and come together with other groups. The corollary of the analysis provided here is that there is a need for a deepening of practices and networks in which RRI comes into being, if it is going to achieve long-term legitimacy, epistemic and normative authority. This we have explored in relation to some of the basic coordinates with which assessors have to do their work.

They have to deal with different commitments (epistemic and normative). These differences cannot be ignored but must be regarded as fundamental to providing checks and balances, and as part of the working conditions of assessors. Hence, we briefly outlined some main differences (explicated as styles of reasoning) when it comes to the possibilities for integration into innovation, research and policy. Such epistemic and normative commitments are not mere divergences of opinion about the prospects for RRI; they are an integral part of the sources that provide different assessment disciplines with their validity and legitimacy. Fundamental research is needed to unravel what RRI can be, what it can achieve, and how the different approaches it already comprises serve as repositories for reflection, knowledge creation and public legitimacy.

Similarly, we have seen that interdisciplinarity emerges as a central aim, and is itself a type of integration or cross-cutting infra-concept. However, it cannot be taken for granted as a default option for research and policy, but must be considered the achievement to some degree of well-orchestrated procedures, communication and media production, as well as of tough negotiations and learning processes between the involved disciplines. This insight resonates, for instance, with the view that indicators for promotion and monitoring of RRI should be constructed from qualitative perspectives, in which dynamic and living learning processes are more central than the metrics of centrally collected data variables. It also resonates with the view that mainstreaming processes for RRI should take a learning-based focus rather than pre-made formulae and schemata.

Finally, we argued that there is an underdeveloped potential for law to be regarded as more of an autonomous actor. Law should not merely be part of a regulatory mix, but should also be seen as a constitutive part of the broader ecologies of practice within which assessments of research and innovation take place.

Taken together these elements indicate the need for a firmer embedding of RRI within broader ecologies of practice, in which mutual checks and balances can be exercised: between different epistemic and normative commitments, between disciplines, and as provided for by firmer legal guarantees.

NOTES

1. For instance, where such sensibilities are lacking, we may ignore how 'responsibility' arose mainly in northern European and Anglo-American cultural context. It is then also easy to ignore how it would be received in Eastern or Southern Europe, or in non-western cultures.
2. Precursors to this literature can be found in the management discourse from the 1990s (see Boltansky and Chiapello 2007).
3. A famous case is described by (Rabinow and Bennett 2012).
4. In our research we have identified the particular strategies for ordering knowledge as epigrams. These are practical models for ordering pieces of knowledge and modes of production into constellations of relationships.
5. Not aiming for complete representativity in respect of all assessment approaches, the project included: ethics, law, media analysis, vision assessment, multi-scale integrated assessment, risk and uncertainty analysis, socio-technical analysis and knowledge assessment.
6. For documentation see the different workshop reports on http://www.epinet.no.
7. Even as we say this: there is no way in which styles of reasoning can be used to determine how members of an epistemic community will eventually position themselves. Interpretative flexibility is considerable.
8. In addition, in the final section, we introduce a third, process-based style of reasoning.
9. Infra-concepts can be seen cross-cutting notions surging from the attempts within particular assessment practices, in the course of their analysis, to establish relationships with other assessments practices and/or broader innovation and policy contexts. They often derive from disciplinary assessment (or policy) vocabulary, but are functionally proposed to establish linkages with other vocabularies and thus acquire meta-topical value. Some of these concepts migrate beyond these disciplinary practices to other sites in the epistemic network where they exert ordering (epistemic) force (van Dijk and Gunnarsdóttir 2014).
10. It should be said that interdisciplinarity remains open to questioning, especially if it implies the belief in an integrated scientific worldview that eventually would put an end to all controversies, and thus would short-circuit politics, law and ethics. From view point the mutual dissolution of all disciplines into one interdiscipline turns into a nightmare and it would be more prudent to speak of multidisciplinarity.
11. In legal practices, for instance, such slow-motion is considered a virtue, stimulated by all types of procedural safeguards for quality of process.
12. At early stages of implementation of a technology, its consequences remain uncertain and unpredictable; as the consequences settle in society it is too late to have any influence on them (Collingridge 1980).
13. When it comes to the articulation of a different lag, namely, that of culture, society and possibly also democracy, to catch up with research and innovation, the emphasis within RRI on public engagements seems to be more up to the tasks.
14. The latter is to stabilize bonds in a final and absolute way where necessary and, accordingly, to deliver the (legal) certainty that every thinkable instability can and will be legally stabilized, if proceedings are launched (Gutwirth 2015).
15. Consequences and causality enter into liability and tort schemes, and then as quite technical matters. However, these are not exhaustive of the potentials of law.

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