

EPINET and Responsible Research and Innovation (RRI) – observations and reflections

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Summary

This text situates Epinet research in relation to the discourse on Responsible Research and Innovation (RRI), perceived as a new paradigm for achieving integration of assessments of science and technology into research, innovation and policy. Whereas Epinet research is not identical to RRI, there are several lessons to be drawn for RRI practitioners from the results gained in Epinet. These lessons especially pertain to what happens in practice, and to the relevant practices of assessment, but also to science and law, as they seek integration into research, innovation and policy. We point to three different entry-points for integration to take place: technoscience, interdisciplinarity, and law. We argue that frictions arise in practice, and especially in the concerned practices expected to integrate in different ways and at different levels of organisation. These frictions should be articulated as important occasions for deepening RRI as theoretical and practical-institutional project. In relative distinction to most prevailing analyses of RRI we argue that law is a resource, as-of-yet poorly articulated and utilised, for safeguarding and constituting relative autonomy and independence for assessment practices.

Introduction: EPINET and RRI

Even though EPINET is not formally responding to a call that explicitly refers to the concept of Responsible Research and Innovation (RRI), thinking about RRI has been part of the project since the beginning. There are important structural and thematic parallels between EPINET research and RRI (further outlined below), and there are also historical convergences of their respective thematics. As outlined by Rene von Schomberg (2012), a tendency over the last years has been for different assessment practices to move closer together. These include impact assessment (environmental, social, economic) technology assessments and ELSI/ELSA research and so-called integrated ELSA / integrated research projects. RRI, says von Schomberg, fits right into this picture: indeed, it can now be regarded as the main effort towards pooling the resources of such assessment practices.

There are differences in the ways in which the RRI concept is constructed, ie. between the EU (von Schomberg 2012b, EC 2012), the UK (Owen 2012, Stilgoe et al. 2012) and the US (Guston 2013), or in the ways in which it is tentatively tried out in (some) Asian countries (ie. Japan). One 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 operationalise and implement policy decisions on RRI. Specifically, a certain tension can be observed within the EU between the rather ambitious definitions of RRI and the attempt to operationalise RRI in terms of the so-called six (or five) “keys”.

However, in terms of general concept and underlying rationale there are several common characteristics. We take the following characteristics of RRI (mainly taken from the EU and UK contexts) to be especially relevant to EPINET research and recommendations:

First, the aim and ambition of RRI is that the resources of different assessment practices increasingly come together, become integrated, also including practices and principles established in ELSA research (Fisher et al. 2006). Hence, there is a sense in which RRI represents a new framework or paradigm (Owen 2015) on behalf of these research fields, and this happens in parallel with efforts towards the pooling of resources from across Europe. This is also the case with technoscientific networks studied by EPINET. As outlined in Epinet WP1 this “paradigm shift” is mainly the result of how the RRI community responds to and mirrors developments inside the main innovation and policy domains with which they interact.

Similar to this is an emphasis on specific qualities expected as outcomes when different groups come together, ie. *reflexivity, responsiveness, anticipation and deliberation*¹ (von Schomberg 2011, 2012, Owen 2015, Stilgoe et al. 2012, see also

¹ «Different groups» will often be conceived of in wide terms, including not only a variety of stakeholders but also citizens and civil society more generally, notably construed as «public participation» or «public engagement». Albeit central to RRI discourse, this aspect is not to any large

Guston 2013, RRI Tools 2014). This emphasis 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/society interfaces over the last 40 or so years (see for instance, Felt, Wynne et al. 2007). However, the RRI discourse configures these qualities in specific ways and mobilises them for purposes of remaking assessments, governance and institutions, frequently conceived as a kind of capacity-building (Guston 2013, RRI Tools 2014).

Next, there is in RRI a general turn towards possible desirable (or, undesirable) *futures* (*ibid.*), especially targeted towards bringing broader publics into visions of the public goods to be achieved through research and innovation. Also this can be said to be a reflection of developments in the fields with which assessors interact, and especially the strengthened drive towards the making of possible futures. This tendency is most clearly expressed in the increasing numbers of foresight activities, vision assessments, the use of scenarios and similar activities highlighting social desirability, acceptability and robustness.

Fourthly, and partly following from the above, RRI discourse and the EPINET project share the commitment to “wicked problems” and “messy governance”. This attitude was well expressed by Jack Stilgoe: “[...] if the credit crisis has taught us anything, it is that efforts to govern complex systems should not be deterred by complexity.” (Stilgoe 2013, p. xiii). This is indeed one of the points where the more conceptual work may find itself in tension with practices within R&I institutions and their funding bodies.

In sum, RRI amounts to attempts at new modes of governance of research and innovation that aim if not higher, surely differently, than many current institutional arrangements. The final common trait of RRI is accordingly the emphasis on possible institutional change as part of assessments. Recent thinking about RRI does not regard the research agendas of the EC, the national research councils or other funding and programming agencies, as beyond their scope and ambition. As highlighted by Richard Owen (2015), the European Commission itself is not exempt from such possible assessments, considerations and recommendations.

Our analyses take these commonalities as their starting point. We base ourselves in a sympathetic, although also critical, reading of RRI. They are intended as contributions (in our view) to a necessary deepening of RRI as a theoretical, practical and institutional project. As assessment practices become expanded in time (ie. increasingly towards possible futures), place (European rather than national level) and social relations (ie. intensification of interdisciplinary and cross-sectorial collaborations), there is a risk that crucial characteristics of assessment practices are lost. Some of these characteristics pertain to the relative independence of the knowledge bases through which assessors make their claims, and on the basis

degree directly attended to by EPINET, which has focused more on epistemic networks of technology assessors.

of which they can be held publicly accountable. Deepening and not only expanding is crucial if RRI is to retain legitimacy, authority and relative independence. But our reflections are also convergent with the realisation that RRI is a social innovation still to be stabilised (Rip 2014), and now in the process of moving from its visionary phase towards more practical implementations (Owen 2015), including in projects dedicated to its realisation (for an overview, see RRI Tools 2014). It is therefore crucial to consider what happens to assessment practices as they become integrated (or not): with each other, with innovators, policy makers and publics. This is a particularly acute issue in the implementation of RRI as a cross-cutting principle in Horizon 2020².

EPINET could be said to have empirically explored important parts of the RRI program as it turns towards practical implementation: it has conceived of “integration of assessments” as practical achievements, as possible results of assessors, policy makers, researchers and innovators coming together. However, EPINET was not an empirical study of RRI *qua* policy object with its own performativity and process of construction and consolidation; this means that our report will only to a lesser degree comment directly on the ongoing policy developments in, e.g., the European Commission. Rather, this report documents some main learnings from this process of exploring empirically “integration in practice”, and with the relevant and concerned *practices*, and mainly from the perspective of *assessors* (of various kinds). It thus aims at being relevant to RRI as scholarship, as practice, and as a project directed towards institutional innovations. The text is structured according to three fields of tension, observed empirically by Epinet. These tensions, or frictions, are also relevant to the expansion and realisation of RRI, as “integration” is sought across previous boundaries: between assessments and research and innovation networks, between disciplines, and between law, technoscience and assessments. Our argument is that some of these frictions be articulated and actively used as occasions for further developments of RRI.

Integration 1: assessments into technoscientific innovation networks

In our WP1 summary we have highlighted how strong currents within EU governance are working towards “cross-cutting” research and innovation as ways of reforming societies, improving competitiveness and meeting societal challenges. Within the discourse on RRI such cross-cutting activities are also envisioned, in the form of integration into the activities of research and innovation networks. Another form of cross-cutting activity takes place within the (envisioned) RRI community itself, through increasing expectations towards interdisciplinary collaborations between previously distinct epistemic communities. Examples of such communities include ELSI/ELSA researchers, ethicists, impact assessors, science and technology

² <http://ec.europa.eu/programmes/horizon2020/en/h2020-section/responsible-research-innovation>

studies scholars, technology assessors, environmental impact assessors, and others (see von Schomberg 2012, Stilgoe et al. 2012).

What are the costs and challenges, and the deeper conditions for such collaborations (and integrations) to successfully take place? That is, whereas it is projected that interdisciplinarity and action across domains are desirable, the epistemic communities called upon to do the job may pose requirements of their own, resistances grounded in scholarly commitments that cannot easily be accommodated within policy goals towards integration. We see this, for instance, in the reluctance from (parts of) the STS, TA and ELSI/ELSA communities to direct their scholarly contributions towards such broad-scaled policy-oriented 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-oriented parts of the STS community. Specifically, he argues that STS should not take its main criteria of quality from the policy context. And, focusing more on contexts of research and innovation, Alfred Nordmann (2010) has compared technoscientific research to a crime scene, and warned against technology assessment (likened to forensics science) to become part of the promise- and wishing- machinery of the very technosciences it is supposed to assess.

There are many examples of well-considered positions within TA and STS that do not see the same objections as do Nordmann and Wynne, and reflect differently on the possibilities for integration into processes of research, innovation, and governance. Let us for a moment interpret these positions as to construe a clear contrast between them and that of Nordmann/Wynne. We do this to pursue clarity, hopefully not at too much of an expense of nuance and realism. As examples, we mention the program of anticipatory governance (Sarewitz and Guston 2001, Guston 2013, Liebert and Schmidt 2010), approaches closer to innovation studies and evolutionary economics (Etkowitz and Leyersdorf 1997), including niche management (Schoot and Geels 2008), and also constructive TA (Schot and Rip 1997). Integrated ELSA devoted to “mid-stream modulation” (Fisher et al. 2006) also fits with such approaches. All of these are relatively optimistic on behalf of the possibilities for assessors to identify signals and early warnings about possible future states that can be used to steer the development of 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 Guston³ 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

³ Guston refrains from embracing technoscientific imaginations of prediction and control, as critiqued by Nordmann. However, his default option is for a “building of capacity” (for reflexivity, responsibility), and thereby “shaping” developments. The main site for such integration is the laboratory (2013, 16). Hence, he never ventures far from the technosciences.

policymakers with feedback in order to provide for “a productive innovation cycle” (von Schomberg 2012, 70)?

When it comes to the possibilities for 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 entanglements with innovators, researchers and policy makers. Guston and von Schomberg, on the other hand, take more *pro-active* stances, and they frequently use concepts such as shaping, designing, anticipating, loops and feedback.

Whereas EPINET would not use a grand word such as paradigm to characterize these divergences of positions, we have developed the concept of epigrams (van Dijk & Gunnarsdóttir 2014) to articulate some such differences. An epigram is a “concrete constellation of relations between different kinds of knowledges or modes of knowledge production” (van Dijk & Gunnarsdóttir, 2014). They are often proposals, either explicitly or implicitly inscribed in a strategy, and can consist of concrete tools, figures, tables, conceptions and imaginations, for ordering relations between knowledge forms. Epigrams are closely related to epistemic networks, but add a kind of reflexive dimension to these, by attempts of actors to come up with their own models, schemes and diagrams for these networks and for their conceptualisation, integration or even unification.

Such knowledge constellations may operate on the level of single disciplines but are not determined by them: Nordmann is a philosopher, Wynne is commonly associated with STS; von Schomberg is also a philosopher, and Guston is generally considered a member of the STS community. Hence the epigrams can also operate through notions that cut across disciplines, which we have termed “infra-concepts” (van Dijk & Gunnarsdóttir 2014). These are concepts that are often derived from a disciplinary assessment vocabulary, but are proposed to establish linkages with other vocabularies and thus often acquire a cross-cutting character. Epigrams are sufficiently sharp to distinguish, in given contexts, between different scientific and political positions, including how the possibilities for active intervention into social and technological innovation networks are imagined and pursued. When questions come up about integrating into the technoscientific contexts of research (Nordmann) or into concrete policy arenas and agendas (Wynne), epistemic and normative commitments are triggered.

As we have identified in (Rommetveit 2013) these debates may take on new socio-technical expressions and change overtime (see also Van der Est and Brom 2011), but the controversies are not unprecedented. In the early days of controversy over TA, Brian Wynne (1975) described it (TA) as a “consensus technology”, whose main aim was to preclude public deliberations. Similarly, during early debates over the establishment of the US Office of Technology Assessment (OTA), another critic claimed that “...if technology policy is to be forged in the fire of political controversy, then a responsible technological opposition must constitute itself” (Folk 1972).

Criticisms such as these, at the time associated with debates over technocracy in policy making, highlighted the ways in which predominant parts of the TA community remained reliant on notions of prediction and control taken over from engineering, cybernetics and control systems. As it were, these were the same sources of epistemic authority also relied upon by the technology developers and researchers. Similar controversies occur today, as in Nordmann's (2010) criticism of how, in taking over technoscience's commitments towards prediction and control, TA itself becomes a kind of technoscience.

Guston and von Schomberg are more accommodating of the frames introduced by systems thinking (mainly emerging through innovation studies); Nordmann and Wynne are not willing to accept them, at least not *as prescriptions for the kind of work performed by assessors*. The controversies outlined above can be empirically linked to two different types of epigrams, identified within the Epinet consortium (van Dijk & Gunnarsdóttir 2014) and historically (Rommetveit 2013). One (Guston and von Schomberg) is **systems-based**, the other (Wynne and Nordmann) is grounded within **networks- and practice-based** imaginations of agency⁴. These represent different logics of integrating assessments. In this sense epigrams can point to modes of integration and are perhaps more akin to the notion of scientific styles of thought (Fleck 1935/1979, D1.1) or ways of sorting things out (Starr & Bowker).

Our intention at this point is only to point out 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/RRIELSI/ELSA, as they seek (some kind of) integration into research and innovation networks.

So far, however, questions about epistemic and normative differences are not much highlighted in RRI discourse. But the problem arises in practice: how to accommodate different commitments (normative and epistemic) that arise in the process of integrating 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 EPINET work (ref. all the workshop reports, D2.2, D1.2, etc.). Further, although we do not necessarily agree with the concrete alternatives put forward by Nordmann and Wynne, we

⁴ Even as we say this: there is no way in which the epigrams can be used to determine how members of an epistemic community will eventually position themselves in relation to research, innovation or policy making. Interpretative flexibility is considerable, as demonstrated when early-day system thinkers such as the Club of Rome (Meadows et al. 1972) explicitly positioned themselves against the incremental and piece-meal approach taken by the then nascent field of innovation studies (Cole, Freeman et al. 1975, Rommetveit 2013). That is, whereas they sought to fully integrate science-society-ecosystem relations within the Earth models, they insisted on remaining outside what they took to be "business-as-usual" of technoscientific progress.

nevertheless side with them over one issue: there is a need for relative independence for the disciplines that enter into the constitution of RRI. As articulated by Folk (above), 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; in spite of the contrast drawn above, we would specifically expect Guston and von Schomberg to agree. We do think, however, the point has to be made with greater force, and recognized as a basic condition for the kind of work carried out by assessors. In the next section we will discuss interdisciplinarity as one point of entrance for the analysis of this condition.

Integration 2: between disciplines

Let us now continue with a discussion of some of the results and conditions that emerge as technology assessment are compelled to embrace the multiplicity of relevant concerns and analytical perspectives. Within such conditions – and this was the point of departure for EPINET – emerges the need to combine and “integrate” single assessment disciplines into multi- trans- or interdisciplinary teams. The implication of main policy agendas, including that of RRI, 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 present-day research and innovation, including the societal challenges to which they allegedly respond. In addition to integrations as dealt with in the previous section, interdisciplinarity may be invoked in the following two contexts: (1) the use of different assessment disciplines or methodologies within advisory bodies, frequently referred to as science-for-policy; (2) interdisciplinary teams working in close relation with researchers and innovators, as for instance in integrated ELSA projects. Such modalities of interdisciplinarity are routinely also invoked in main RRI texts.

One challenge for technology assessors, and especially those oriented towards qualitative methodologies, is the predominance of quantitative approaches promising rapid and actionable knowledge, readily deployable across sectors. Examples of such approaches include risk assessments (and management), econometrics, polls and surveys (ie. the Eurobarometer), quantitative impact assessments and the use of indicators. Such approaches offer broad sweeps of the fields and issues in question, and are capable of much more rapid action in response to calls for urgent policy-relevant action: numbers and indicators give the impression of being directly translatable into action. This contrasts with the sometimes painstakingly slow process of other disciplines more oriented towards interpretation, and depending on provisions of contextual understandings and explanations in communication with policy makers and others.

Insofar as disciplines such as ethics, law, knowledge assessments, vision assessments, constructive TA, or STS, are involved, promises of rapid shortcuts are illusive. When it comes to integration of methods and disciplines, and working towards inter- or multidisciplinary, one-size-fits-all approaches obscure more than they reveal. The challenges of multi-disciplinary collaborations should come as no surprise to RRI promoters and practitioners, and interdisciplinarity has indeed been a topic in TA for several years (see for instance Decker and Grünwald 2001, Decker 2004). Yet, so far the discourse on RRI has not made it into a specific problem, or indeed, basic condition, for research and policy advice. In general, interdisciplinarity seems to be regarded more as a default option, rather than a critical achievement that can only come about at the end of a laborious process of mutual adjustments, knowledge exchanges and learning.

In EPINET, as in previous writings on interdisciplinary TA (Decker and Grünwald 2001, Decker and Fleischer 2010), a problem- or issue-oriented approach was chosen as a way of structuring (multi- and inter-)disciplinary relations and interrelations (see also Dewey 1927, Marres 2007, Rommetveit and Wynne forthcoming, Rommetveit van Dijk et al., 2014). Such an approach seems required regardless of whether the implied assessment methodologies are qualitative or quantitative, or both. Due to the frequently 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, 119) this points to “the definition of the problem as the central element of transdisciplinary research”. Once a proper definition is arrived upon, this understanding can be used to structure other significant problems among the project partners, such as: choices of methods, when and where to seek intervention, who to include in the broader assessment, and so on.

We do not proclaim our problem- and issue-oriented approach to be the only option. However, we would like to point to two broad lessons to derived from that.

The first has already been stated, and seems almost too obvious for mentioning, especially to those with experience with interdisciplinarity: interdisciplinarity integration is an outcome to be achieved, and not the default position. In EPINET, even as the researchers tried taking these matters into consideration, we identified shortcomings and problems relating to organization and structure of projects. Some of these may indeed be specific to EPINET and the specific solutions chosen by the project. However, several issues are procedural across this kind of research project, these relate to lack of continuity (when the project ends, research ends as well, and “interdisciplinarity” will have to be re-established in another setting, if at all). There are limitations in communication and a lack of face-to-face interaction required for common understandings to arise and thrive, also specific to the case at hand. Finally, there are shortcomings in, and challenges for, learning. In many cases the most valuable outcomes do not necessarily relate to a fusion of disciplinary horizons, but rather to one field of study borrowing or learning something new from another.

Where there is learning, it is hard to qualify it as trans- or multi-disciplinary. In many cases it is better to accept such dynamics as the normal conditions, the natural friction in learning, communication and for (some) integration to take place, rather than differences and complications to remedy. In short, we regard epistemic and normative pluralism as a resource, and not an obstacle to be overcome.

The second pertains to the choice of “the problem” to be addressed. The assessment team should be in a position to choose and define the research (and policy) problem with considerable independence. Again, this speaks in favour of distance and *relative* disconnect from policy makers, researchers and innovators. Cultivating a knowledge base for assessments and for RRI will have to be aimed at problem-selection in accordance with the validity claims and commitments of assessors and RRI practitioners. This may have become even more important with the implementation of Horizon 2020⁵. There, something akin to a problem-oriented approach is pursued by the orientation towards “societal challenges”. But assessment practitioners have to address the real problems faced by European societies, while they cannot for that reason be expected to simply adopt the problem frames provided by researchers, innovators or policy makers. These should themselves be part of the object of assessment. In our memo on cross-cutting challenges for EPINET it was therefore stated that “there is a general need to get a better grasp of the public character of the innovation/policy objects in question, preferably as far upstream in innovation trajectories as possible. This means that we, as analysts, do not simply take over or accept the initial framings provided, for instance by industry or policy visions, but critically aim to assess the character of innovation/policy objects: we crucially also include **their democratic potential and their fitness-for-purpose in addressing main societal challenges**” (Rommetveit, van Dijk et al. 2014).

We noted above that we construed the debate between, e.g. Nordmann and Guston, as a contrast that may have been exaggerated. The opposite risk is that we now underplay the severity of the contrast and the underlying issue. Still, we believe that the point just made affords a potential for reconciliation in practice in the face of the dangers of repressive tolerance and cooption: Proper interdisciplinary integration maintains proper balances between autonomy and mutual learning; and between critical distance/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. Epistemic authority and well developed styles of thought – e.g. as witnessed in the construction of epigrams – are two such sources. In what follows, we shall discuss what we encountered somewhat to our surprise in the EPINET case studies: that law and legal expertise afford particular sources of strength.

⁵ Hence, we strongly agree with the recommendations of a recent Advisory Group (Swafs 2014) about the need for basic research to be a routine part of RRI research and funding programmes.

Integration 3: law into engineering and risk management

In three of the EPINET case studies questions about law have been very prominent, because in thinking about “integration” of different practices and domains of action, law emerges repeatedly as a site for posing fundamental questions.⁶ Law, science and engineering have traditionally been regarded as separate in western traditions (Latour 1993). These separations have been main sources of legitimacy upon which (respectively) research and innovation, and politics would rely. However, through the cases we have studied on privacy and data protection in smart grids and wearable sensors, and the hardcoding of morals and laws into social robots, such basic institutional boundaries become blurred. *Has the question been asked about how science and law as (traditionally) separate spheres will (or should) be united through engineering? How are fundamental rights of privacy and data protection going to be hardcoded into information infrastructures? How are risk assessments going to fit into the design of rights and freedoms?*

Across several research lines and policy domains we have observed how law enters into research and innovation, but also how in the process it comes under pressure from science, engineering, politics and industry. And, as law is made to enter into the “regulatory mix” (Lessig 1999/2006) of different assessment practices, such as risk assessment, it is forced to share its authority with other disciplines. This might itself be a good thing, or at least an interesting opportunity. However, problems arise since law also increasingly has to base its assumptions and premises upon possible futures as established by researchers, engineers and risk managers (and, to some extent, ethicists and social scientists).

The question arises whether the RRI discourse in its present form has the capacity to respond to such questions. Mirroring the arguments of Nordmann (2010) our answer is mainly negative: the discourse about RRI is largely predicated on notions of prediction and control as taken over from the sciences, whereas not granting much attention to the specifics and requirements posed by law itself. If one reviews the literature on RRI (see for instance all the contributions in Owen et al. 2013), one sees how the Collingridge dilemma⁷ 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). Now, it is not so much that we disagree with the Collingridge dilemma when taken on its own terms; but it provides for a rather one-sided characterization of all the different things going on in a society, and it specifically ascribes great agency to the technosciences as producers of progress and new societal relations. As such, it seems to preempt the

⁶ It must be noted that we use the term law in a broad way, which includes the different senses of law as legislation, law as regulation of behaviour, constitutional law as checks and balances and lastly of law as a specific constrained jurisprudential practice that tries to solve new problems with old principles in its own pace. These are very different and sometimes opposed conceptions.

⁷ 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).

kinds of meanings, questions and public problems that can be brought to the table, and be used for problem-definitions within interdisciplinary teams.

When law is seen in this light, another classical dilemma appears as inescapable, namely the problem of a “legal lag” (Ogburn 1922). According to this notion technoscientific developments move so fast, and are so encompassing complex, that law stands no chance when it comes to keeping up⁸. Indeed, the Collingridge dilemma could be easily made to fit with the legal lag hypothesis: “at early stages of developments, we cannot legislate since we do not know their consequences. By the time consequences settle in society, it is too late for legislation”.

This, however, only appears to be the case as long as we do 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 2003, Latour 2013). That is, large parts of the dilemma follow from a chosen prioritization of technoscience as the main site of dynamism and innovation in society, whereas law (and the public institutions it is meant to safeguard) is relegated to a status of backwardness, or even irrelevance (due to its inherent conservatism and positivism). But the problem also relates to a lack of attention and care (Pellizzoni 2004) to the mechanisms and networks that would be needed for applying existing laws and principles to new fields and problems. In EPINET research, we have observed these dynamics in several fields, from robotics 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 or privacy, whereas the pressure is hard to establish the concrete legal rules and regulations needed to accommodate industry-driven innovation (Rommetveit and van Dijk 2014).

When law lags behind developments, this is also an outcome of specific political and economic priorities making things occur and appear that way. The “law lag” is an innovation frame. It is not a social characteristic carved in stone, as one could be led to believe if one ascribed too much importance to the Collingridge dilemma. To paraphrase Nordmann (2010, see also Schmid and Liebert 2010): the dilemma only occurs as a dilemma to be solved when seen from the perspective of control as provided by science and engineering. This precludes us from asking about the potential uses and roles of law. Within the RRI discourse law occurs mainly as one among others among all the disciplines relevant to RRI. This is also mirrored in some developments where lawyers are increasingly expected to collaborate with risk managers and others, or where they have to build their assumptions about future developments on the visions and projections of scientists and engineers. However, we argue that law should not be a part of this regulatory mix in this way. Instead, one important role would be to mobilize lessons from constitutional law in

⁸ 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.

thinking about the constitutive relations between, the mutual checks and balances upon, and the required relative independence of the different assessment practices or broader publics that enter into the “mix”. If one thinks in these ways, there is no need for law to base its assumptions on science and engineering. This could free up the attention of assessors to pose the (repeated) questions of what kinds of practices and publics should be included in decision making about science, technology and innovation, and the broader societal purposes to which they are directed. Consequences and causality enter into liability and tort schemes, and then as quite technical matters. But these are not exhaustive of the potentials of law.

This could also point towards a median position in the debate between the proactive and the agnostic stances of STS and TA with regard to 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-oriented 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 (like policy and industry) and at other times establishing new relations 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. In the Epinet research strand on 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. Such concepts include purpose specification, legitimacy of purpose, fitness for purpose, and alternatives (van Dijk & Gunnarsdottir, 2014), (van Dijk, Gellert & Rommetveit, submitted).

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 R&I funding and practice, as proposed e.g. by the recent Rome Declaration on RRI.
- 2) The 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 in above, EPINET 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 kinds) as these become implemented *in putting practitioners to practice*, we believe that our experience provides clues to the way forward with the current challenges. EPINET 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 in this text 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 basis 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 in the use of epigrams) 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 rather part and parcel of the deeper commitments that provide different assessment disciplines with their validity and legitimacy. There is a need for fundamental research 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 kind of integration or cross-cutting principle. However, it cannot be taken for granted as a default option for research and policy, but must rather be considered the achievement to some degree of well-orchestrated procedures, as well as 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 a network- and practice-oriented perspective, 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 network and learning-based focus rather than pre-made formulae and schemata.

Finally, we argued that there is an under-developed 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 potentially a constitutive part of the broader ecologies of practice within which assessments of research and innovation take place.

Taken together these elements point towards 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.

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