EPINET: Integrated Assessment of Societal Impacts of Emerging Science and Technology from within Epistemic Networks

Funded under FP7-SiS-2011-1.1.1-4, Grant Agreement 288971
http://www.epinet.no

# EPINET Final Report

**May/September 2015**

## Contents.

## Introduction: envisioning and making European research and innovation

EPINET has been analysing four fields of technoscientific innovation, most of which are in relatively early stages of implementation and marked by only partial and incomplete (to varying degrees) understandings of their societal, ethical and legal implications. These partial and incomplete understandings are generally paralleled with inadequately mediating (integrating, cross-cutting) policy actions, institutions and networks. The innovation domains are: **wearable sensors and behavioural change** (WP3), - **autonomous robots in care and companionships** (WP4), - **the growing of in vitro meat (or not**) (WP5), and **smart grids for transition towards sustainable energies** (WP6).

In terms of European policies these developments can be traced to (at least) two different, though related, sources of influence. First, there is a persistent drive towards innovation which by now has a long tradition in Europe but became much more pronounced following the Lisbon agenda. The drive towards innovation was further accelerated by the economic downturn of 2008, although, conditions for funding have shifted. Higher contributions of national budgets and industry will now have to make up for lesser EC funds available to implement the Horizon 2020 policy agenda and funding programme. But, the general agenda still follows broadly the 2006 Aho report recommendation that: *Europe and its citizens should realise that their way of life is under threat but also that the path to prosperity through research and innovation is open if large scale action is taken now by their leaders before it is too late*. The second source of influence for these policies is of a more recent origin, and perhaps not yet well understood nor well articulated. It is the notion laid down in the 2009 Lund Declaration that research and innovation should target directly key societal challenges. This is implemented already in 'priority 3' of the Horizon 2020 policy agenda, titled 'Societal Challenges' which then have been integrated into the very structure of H2020 programmes and calls.

As a consequence of these demands now placed on research and innovation agendas we observe strong tendencies towards 'cross-sectoral actions', as when the recent commissioner for Research, science and innovation, Carlos Moedas (paraphrasing Jean-Claude Juncker) in his inauguration speech stated how 'working in silos is not an option'. During his speech, Moedas kept returning specifically to the topic of policy silos and the need for cross-cutting actions. Although Moedas is navigating the Brussels bureaucratic machinery (which is one type of cross-cutting, ie. between DGs, between expert networks, between nation states) the metaphor of 'silos' and of breaking them down, is indicative of a problematic which has drawn our attention to what we term 'technoepistemic networks'. These are networks of actors (know-how and resources) working to innovate and integrate across sectoral and disciplinary domains throughout Europe and beyond. It is also characteristic of developments within the TA and RRI communities towards a pooling of resources, working in larger interdisciplinary teams, and generally 'integrating' with technology developers, researchers and (to some extent) policy makers. Hence, as we now explain, these developments lead to a blurring of boundaries between what is traditionally conceived as the relatively separate domains of research and innovation, policy making and technology assessment.

### Hybrid governance through technoepistemic networks

In three of the above-mentioned cases we identify explicit policy agendas that connect technoscientifc innovation with specific societal purposes, ie. wearable sensors, autonomous robotics and smart grids. In the vocabulary used by Epinet, each area is operatively an epistemic network[1] (Rommetveit et al. 2012, Haas 1992, Nordmann 2006). Although primarily dedicated to

1 The concept borrows from the following sources of academic analysis: first, Peter Haas (1992) article (on epistemic communities) is a modern classic in the field of *international relations*. However, it is mainly targeted at a specific kind of knowledge workers, ie. the classic realist notion of science providing neutral representations, performing the

the making of new things and process through innovation, these networks are also indicative of *hybridity in forms of governance*. Some characteristics of these networks include:

- they actively work to organise innovation and market-making at a European level, targeted towards European policy goals;

- they make new relations across national boundaries by joining forces with relevant forms of expertise and experience from different countries.

- they forge new relations across sectoral and disciplinary domains, although commonly building on existing forms of expertise, technologies and infrastructures (such as the European energy grids).

- The occasion for new actors and nodes to be connected to the networks are ofte-times heavily ICT-driven ones, cutting across the physical/digital divide, such as smart meters, wearable sensors, or improved robot sensors and actuators.

These developments take place simultaneously through the EU institutions and in shaping national networks. EU institutions do not by themselves possess the necessary forms of expertise, and so are dependent on external help. In mobilizing expertise from the different member states they simultaneously also integrate the members states into the Brussels 'network of networks' (see Barry 2001). On their side, expert networks from within the member states can achieve competitive advantages and increased standing within their home countries by uniting with similar networks across state lines: with other member states and with Brussels/the EU. Hence, national authority is used for networking abroad; international relations and connections in Brussels are used for enhancing authority and policy relevance at home.

A good example of such a network is the newly formed Public-Private Partnership (PPP) of robotics. It mainly consists of industry, academic research and policy makers, but it increasingly also involves lawyers, ethicists, social scientists and public relations workers charged with the task of paving the way for a new generation of robots. One could say that very little unites many of these expert networks [2], apart from their dedication to realising the vision of autonomous robots for specific societal purposes. In the case studied by Epinet this is a a prominent role within the EU agenda addressing demographic problems by developing autonomous robots for care and companionship.

The main distinguishing trait of a technoepistemic network is exactly this dedication, across its different constituent networks, to realise the technoscientific innovation in close conjunction with one or more specified societal challenge. Hence, whereas great diversity exists between the actors within the broader network (such as law, politics, science and industry), the *sine qua non* of the technoepistemic network is the commitment to the realisation and making of a specific

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task of ”speaking truth to power”. According to *philosophers of technoscience* (Nordmann 2006), the technosciences (as studied by Epinet) stand out not because of the ways in which they provide neutral and disinterested representations, but rather due to their focus on doing, making and engineering. Within technoscientific networks, the provision of neutral representations are placed at the service of technological interventions into natural and social systems. Also relevant to the concept is the notion of the *Actor-Network* (Latour 2005) with its emphasis on material entanglements and the drive towards increasing hybridisation. Equally relevant is the notion of *socio-technical imaginaries* (Jasanoff and Kim 2009), corresponding to the normative and technoscientific ideas, images and meanings that serve to guide and coordinate action across different parts of the network.

2 Hence, a recent euRobotics Roadmap (2014) starts out by explaining how ”Each person will read this document, and the Strategic Research Agenda, with a different perspective”. Pluralism is recognised, but also contained, within the limits of the strategic agenda. http://www.eu-robotics.net/cms/upload/PDF/Multi-Annual_Roadmap_2020_Call_1_Initial_Release.pdf

technoscientific application coupled with one or more clearly identified societal challenges.

As a counter-example we mention the fourth case study of Epinet, In-Vitro Meat (IVM), a group of networks trying to establish itself around the making of IVM, legitimising this innovation domain in relation to differing rationales, societal and environmental goals: from countering climate change to improving population and individual health, to alleviating the suffering of animals, to the need to feed the world. In this case we do not identify a set of stabilised innovation and policy goals, and the only common denominator across the networks' constituent parts remains the dedication to realise IVM as a biotechnology. Therefore, the IVM network does not qualify as a genuine technoepistemic network, but rather as a set of more loosely connected actors trying to establish themselves as such (and as of yet not succeeding). For instance, there is no technology platform to stabilise their relation with EU policy makers, and they have no high-level representatives within the Commission or elsewhere to bring their case forward; they struggle with recognition among their scientific peers.

The technoepistemic networks hold out the promise of re-making societal relations, mainly centred around wide-spread and pervasive technoscientific infrastructures, many of which are ICT-driven. They come along with specific policies and institutional dynamics, seen as necessary for their realisation. Some of these dynamics have been outlined above. It is important to understand them, and the institutions and networks developing around them, in order to appreciate the prospects (limitations and possibilities) for actual integration of technology assessments and the requirements of Responsible Research and Innovation, into the large-scale programmes, the agenda setting and the innovation networks of the EU.

**Assessments: integration into technoepistemic networks**

Historically oriented work conducted for WP1 is a treatise on how 'integrated assessments' of the impacts of science and technology on social and environmental relations have changed over-time. Classical TA was predicated on notions of a 'rational scientific process', and targeted towards parliamentarians. Later efforts have also included efforts towards integrating with technoscientific innovations themselves, e.g., constructive technology assessments, ELSA research and so-called integrated projects. Recent and ongoing efforts towards Responsible Research and Innovation (RRI) continue such developments, but are also actively transforming and expanding them (further strengthening the European level, also targeting policy agendas, towards possible futures, cf. von Schomberg 2012).

Many of these characteristics follow from, and indeed mirror, the developments within the technoepistemic networks themselves: First, the technoscientific networks make assessments about societal needs, as when it is expected that behavioural change can be induced by introducing wearable sensors and mobile phone applications, or when autonomous robots are called upon to address ageing and negative demographics. This is a reflection of developments in which increasingly societal, political and environmental challenges (and dedications towards *change*) are delegated to technoscientific research and innovation (Rommetveit and Wynne, forthcoming). This tendency actively promotes and to some extent achieves a blurring of boundaries between the domains of research and innovation, law, politics, industry, democratic institutions, and everyday lives. Similarly, the boundaries blur between innovators, policy makers and assessors. Societal, ethical and legal assessments are themselves becoming 'integrated' into the technoepistemic networks, to the extent that they, and their methods, may become hard to distinguish from the work of technoscientific innovators. For instance, we observe the influx of 'ethical entrepreneurs' (Rip 2009). Assessors operate as members of larger teams, 'integrated ELSA', and large-scale interdisciplinary RRI projects: they do not stand outside the network whose practice and products they assess (What Arie Rip, 2006, terms 'governance in complexity' rather than 'governance of complexity').

Examples of such increasing integration and blurring of boundaries are clearly indicated in tasks such as: the hard-coding of ethical and legal principles (dignity, privacy, data protection, but also morals) into technological infrastructures, and so-called integrated projects, where RRI or ELSA actors operate as members of the larger networks. Frequently and increasingly such efforts go hand-in-hand with design-oriented approaches and "value-sensitive design". And, in the regulatory area we see increased emphasis on scientific risk management and assessments, again performing a blurring of boundaries, or 'breaking down of silos', between technoscientific innovators, policy makers and assessors.

Finally, on the boundaries of such technoepistemic networks we observe more loosely tied networks of innovators, sometimes making up distinct technoscientific publics. Examples here include DIY biology, maker and hacker movements, consumer organisations, networks dedicated to the promotion of open culture and to the digital commons. In WP3 we have observed how citizens and users are experimenting with taking management of health and lifestyle data into their own hands, experimenting with wearable sensors, hand-held devices, apps and social media. To varying degrees such alternative innovation networks may integrate with and influence the actions of technology developers and policy makers (Gunnarsdóttir et al. 2014, Gunnarsdóttir et al. submitted); at other times they play against them, opposing the goals and/or means by which the predominant forces of the technoepistemic networks operate, and organising around alternative visions (see for instance Levidow et al. 2013).

**Changes of scope, scale and social relations**

One practical result of the activities of technoepistemic networks is the occurrence of more and more issues, challenges and policies at specifically European levels. Hence, they perform a change of scale and ambition, as well as a step change towards (generally) more competition-driven and market-oriented behaviours. While such developments are long in the coming, their impacts are becoming, as of recently, more pronounced and visible. In the field of technology assessment and governance, we observe how national actors have been dismantled (Denmark, Flandern [3]), with the previous leader of the Danish Board of technology talking about a tendency towards the "competition state" [4]. This is one in which policy-makers and technology assessors increasingly compete for attention and position through the EU institutions, upon which they become increasingly dependent. To paraphrase Andrew Barry, the network of the networks is becoming stronger.

Similarly, quite recent studies of governance of science and technology in Europe (Hagendijk and Irwin 2006) remained focused on the different national regulatory cultures (cf. Jasanoff 2004). Today, however, one may just as well analyse main differences in governance of science and technology in relation to the different waves of technologies, such as bio-, nano-, and various ICT-driven game-changers (Internet of Things, Big Data, next generation robotics, and so on.). Each comes along with new ways of governance, in many cases cutting across national cultures (a similar argument is made for scientific advisory bodies by Bijker et al. 2009, 43), working in more horizontal ways across state lines. We observe how the technoepistenmic networks perform a kind of *infra-governmentality* as they increasingly work horizontally to induce and produce new modes of governance. The challenge for member states, individual and professional communities alike, is that of latching onto developments, by making the agendas their own, and by actively working to promote and fulfil the promises of the innovation agendas[5].

[3] With most of the TA activities dislocated to other places. See http://easst.net/easst-review/easst-review-volume-311-march-2012/a-pioneer-in-trouble-danish-board-of-technology-are-facing-problems/, and http://www.oeaw.ac.at/ita/fileadmin/epta/countryreport/flanders.html

[4] This statement was made at the meeting of the EST-Frame project, Den Haag, 12.-13.09.12.

[5] Another indicator of the changes to which we point can be taken from Science and Technology Studies and analyses of the careful work to maintain the boundaries between science and politics (and law) through *boundary work* (Gieryn

To summarise: in observing and commenting upon recent developments in innovation, policy and governance, it is not our intention to idealise or display them as straightforward and streamlined tendencies. Indeed, competition-driven behaviours coupled with strong beliefs in technologies and markets as the main drivers of integration may backfire as the on-going negotiations over the Eurozone clearly demonstrate. We frequently observe a disconnect between predominant visions and the realities on the ground, for example, implementing visions and agendas in practice by certain actors, or the prosperity and well-being citizens, users and communities are intended to gain from technoscientific innovations. Indeed, some of the observations from Epinet pertain to pervasive forms of 'quasi-integration', in which only a limited set of actors and networks are actually invited to the driver seat of techno-political innovation, while others among the European citizenry are expected to simply follow suit. The premises on which new social realities, communities and publics are meant to take shape, are largely left out by key policy initiatives like the Horizon 2020 agenda, or they come into the picture too late.

The lack of adequate public institutions may by itself result in problems and conflicts as technologies become implemented, and as actors are supposed to collaborate across national and professional boundaries without the support to achieve sufficient degrees of understanding and lines of good communication. This was one main finding from our investigations into networks devoted to smart grids and energy transition across Europe. Several participants in our workshops underlined how there is no lack of technological solutions, however, an almost complete lack of societal and political institutions to coordinate efforts between countries (Van Der Sluis et al. 2014). Hence, technological innovation without corresponding political and legal institutions, may end up as poor investment, since there is no way in which society at large, publics, users and local communities, may effectively and realistically connect and interact with each other [6] in order to address the shared challenges faced by Europeans, in this case energy transition. In that sense, the requirements and precepts of RRI (see introductory section) remain an outstanding unresolved challenge.

**Science, law and assessments come under pressure**

The above developments pose decisive challenges for technology assessors and for those aiming to achieve more responsible research and innovation, including also people working in governance, policy-making and publics seeking to engage with research and innovation. Analyses from history (Shapin and Schaeffer 1985), sociology (Latour 1993) and philosophy (Toulmin 1990) point to how western societies have, in their search to legitimate their actions, relied on separations between law and science, nature and politics. Granted, these relations were always more complex in real life than in their idealised official versions. But these idealisations also performed real functions, exactly by imposing some checks and balances between the different domains.

Within the activities of the technoepistemic networks, and through the breaking down of silos in a number of areas, these separations and modes of legitimization are no longer as strong as they once seemed. In their place we observe visions and promises to reform societies along more prosperous, sustainable lines of technoscientific research, innovation, living and producing. We are also starting to gleam the emergence of new societal relations in certain areas shaping around these networks, such as increased reliance on privatized health care provisions, pressures towards "responsibilisation" of patients, citizens and consumers (of energy, health care, and others); we

1995, Jasanoff 2005). Compared to such analyses, the relations pursued by the technoepistemic networks have the character of *boundary engineering*, since they no longer try to keep the domains separate, but rather to join them together in projects of design and engineering.

[6] Similarly, participants at the same workshops complained about a huge number of pilot projects on smart grids and smart meters, but few efforts at real coordination of results, standards and technologies.

also see communities and individuals taking things into their own hand through self-care groups, the quantified self movement, or new micro-grid communities for local energy production.

Main questions still remain about the sources of legitimacy that will in the end serve to prop up such new-emerging socio-technical orders. But neither is it the case that all previous structures evaporate: science and law are still crucially relied upon for the making and running of the networks, and new relations are forged with technology assessors and publics, for instance through public engagement activities. The new relations in which technology assessors find themselves are indicative of new roles for expertise, operating both within and across previous structures. What Epinet has first and foremost observed are the ways in which new and old forms of expertise are working to find their place within the new relations taking shape around the technoepistemic networks. We observe how lawyers and scientists assert themselves within new transdisciplinary configurations and take on new tasks; we observe how they seek out, and to some extent achieve, collaborations in new interdisciplinary teams; we observe how they come under pressure from policy makers and industries and their agendas to increase competitiveness and innovation.

Within such new constellations, assessors of science, technology and society relations, are also struggling to find their place. Main tensions relate to the need to remain both policy relevant, to be listened to and to get a place at the table, whereas at the same time retaining academic standing and the crucial independence (not to be confused with neutrality) from the very forces one is trying to understand and influence. Hence, the prospects of achieving more Responsible Research and Innovation are promising. And, the project of pooling the resources of the different epistemic communities of assessors may indeed be necessary, if some real influence is to be achieved within the ranks of networks that are strongly driven by industry, politics and powerful technologies. At the same time, these very developments raise doubts and criticisms from within the ranks of the concerned disciplines, such as TA, STS and ELSA.

A final corollary of this analysis, to which Epinet has devoted Work Package 2, concerns the pressure to achieve practically in realising the broader goals of responsible and sustainable research and innovation. Interdisciplinarity is at best the partial outcome of such work, far from being the default orientation from which assessors of science and technology, innovators and other relevant parties start their collaborations. This becomes visible in and through our findings. For example, interdisciplinary collaborations are indeed doable, however, in need of sufficient time, well-argued occasion to come together and a level of trust which can only be established in and through communication and togetherness. Even as urgency is used to push new relations across knowledge domains and experiences, one main outcome of our research is that disciplines respect their own disciplinary commitments in order to retain legitimacy within multi-disciplinary contexts. If assessors have to sacrifice basic presuppositions and commitments, they lose hard-earned authority. Correspondingly, other practitioners lose the possibility to hold them accountable according to publically available validity claims. The result of that would be a deterioration of the authority of assessments-for-policy.

## 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*[7] (von Schomberg 2011, 2012, Owen 2015, Stilgoe et al. 2012, see also 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).

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

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. This turn towards futures places the media through which such visions and scenarios can be constituted and communicated at the heart of assessment processes. This brings forms of mediatisation into RRI and demands both a clear consideration of how the material and symbolic aspects of these forms might also come into assessment, as well as a reflection on RRI as producing its own media forms.

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), in place (European rather than national level), across social relations (ie. intensification of interdisciplinary and cross-sectorial collaborations) and across forms of media communication, 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 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 2020[8].

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

[8] http://ec.europa.eu/programmes/horizon2020/en/h2020-section/responsible-research-innovation

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.

### Implications & learning 1: assessments entering into collaborations with technoepistemic 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. Concepts of community and collaboration invoke forms of mediation. Community, communion and communication and the relations between these terms, whilst not quite explicitly so, are evidently about communicative practices around which an experience of community can be understood. Collaboration demands recognition of different communities whilst invoking the sense of labouring together to the same purpose. All such communication and mediation requires substantial work and a friction between difference and connection. Examples of such communities include ELSI/ELSA researchers, ethicists, impact assessors, science and technology 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? As we have foregrounded, one cost and challenge is that of how to do the work of communication, whilst also reflecting on the power-effects of such work, and at the same time analysing the media productions of innovation projects. The deeper condition required in order to avoid being caught up in the circulation of surface level discussions (such as those experienced by those of multiple linguistic origins using a common but unfamiliar second language) is to pay attention to the mediatisation of technology, as well as the technologisation of media. It is crucial to avoid assessing the vision as the technology (and vice versa) to avoid the lure of the spectacle, or at least recognising that this is at stake, whilst also being mindful of ones own resistances and commitments.

Further, 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, such as 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 technsociences 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. Epinet has approached such different commitments in terms of "styles of thought" (Deliverable 1.1), and in terms of a similar concept of "Epigrams" (Van Dijk and Gunnarsdottír 2014, Gunnarsdottír and Van Dijk submitted, Rommetveit et al. in prep.). We refer the reader to these documents for a further analysis of these concepts.

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. The Epinet account of different epistemic stances point to deeper commitments also on ontological levels: of what do innovation environments really consist, -are they systems that can be steered towards desirable goals, or are they more like distributed practices and networks? The different commitments among assessment practitioners also tend to reflect, although not in any deterministic sense, on the ways in which practitioners imagine the possibilities and conditions for "integration", that is, for some kind of collaboration (or not) with technoscientific innovators and policy makers. 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 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.

### Implications & learning 2: Interdisciplinarity

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. http://ec.europa.eu/programmes/horizon2020/en/h2020-section/responsible-research-innovationhttp://ec.europa.eu/research/participants/data/ref/h2020/wp/2014_2015/main/h2020-wp1415-swfs_en.pdf - 14

However, whilst modalities of interdisciplinarity are invoked, issues of process and communicational practice are not. The work of achieving shared understandings of the questions at stake in multi-modal projects demands robust communication strategies. Whilst the media texts produced through innovation projects can provide things to gather round, the different dispositions and different viewing positions around such objects require discussion and consensus building, which might be able to recognize plurality, but must be able to articulate some shared recognition of the object. Such shared recognition requires an added layer of media inscription, another communicative thing; something produced in the sharing across the collaborators to enable a process of integration (e.g. minutes, notes, images of workshops, manifestos, policy recommendations, recordings, documentary). Projects that have resources at their disposal for the work of interpretation and integration are likely to be more able to incorporate agonistic approaches that retain specificity whilst also exchanging legitimacy effectively. Legitimacy and compelling representations go hand in hand.

A 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. Quantitative approaches are much more invested in the work of representing findings as image and spectacle and as such are seductive in terms of rhetorical power. 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 as concise and evocative representations give the impression of being directly translatable into action. This rhetoric of speed and efficacy 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 multidisciplinarity, 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 communication, 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". This process of definition is in itself fundamentally a communicative practice of producing representations, establishing shared intelligibility and framings. This requires the sharing of language, images and other forms of representation and definition. The capacity to engage is this, and the framing of the problem, structures 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: interdisciplinary 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 (which is sidelined as separate to 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 points to the friction that a failure to recognize the extent of communication at the heart of such a project generates. 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, but this too has to be represented as such.

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 2020 [9]. 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). However, the challenge here is that in many instances of emerging technology assessment there is no innovation object except the visions that are instantiated in media forms (e.g. in the case of smart energy grids), and technology assessment lacks a technological object, becoming an assessment of media forms in which visions are materialized.

Coming finally to the question of *what actually happens when people are brought together across disciplines and, not to mention, geographical distances*, the first thing to encounter are the procedural conditions that should be expected in carrying out the kinds of studies we have observed. We do not present here a complete index of procedural conditions to keep in mind but a select list will give an idea of the extent of potential shortcomings and complications. What we are listing here is not a complete index of comments and suggestions we heard but although many of these items seem minute and stating the obvious, they should absolutely not be trivialized and waived off as a matter of *just getting a job done*. They point to the importance of *caring* for organizational, professional and inter-personal conditions in carrying out teamwork and leading it. What we see is evidence of a lack of clarity on what *integration* stands for and what can be expected from bringing together expertise across disciplines professions and borders like these case studies have done. In short, it is in the actual execution of teamwork and leadership which has been set up to achieve idealistic goals of interdisciplinarity and integration, that the know-how can come up short in building and sustaining momentum, precisely because *trivial* details of care are missed.

First on this list are the ***limits to participation***. Personal and inter-personal, professional and institutional dynamics will test those limits. Contracts are time-limited and come to an end, funds run out, family members die, accidents happen and people are unavailable for one or another reason or somehow not cued in.

Secondly we mention ***barriers to communication***, some of which are relatively easy to manage with innovative uses of ICTs and provisions to met regularly face-to-face. There are communication barriers when team members are rarely co-present and given the communication hurdles that need overcoming to achieve some degree of disciplinary approximation, we refer to those barriers as a *stress-text of resilience. C*ommunication, and *being in-communication*, is key to the necessary dynamism in keeping a shared study environment alive and going forward.

9 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.

Thirdly, ***myths of interdisciplinarity*** are exposed in the many ways in which a journey of working together tests the limits of learning, knowledge creation and sharing. We will discuss this matter in more detail in the next section, but these conditions of the journey also provide pathways to sort things out, to make sense of a case and lead the work forward.

What we call *epigrams*, are practical models for ordering pieces of knowledge and modes of production into constellations of relationships They are indications of epistemic power and their identification can serve reflexively the need to install epistemic checks and balances. Within the case studies, the making and use of epigrams serves us to explore emerging networks of innovation and assessment, but also how actors situated in or around these networks are reflexively trying to make sense of epistemic relations. The team leaders (and sometimes assertive team members) come up with their own illustrations, diagrams and other schemas for what the innovation networks are, how to conceptualize them and how to integrate assessment efforts, even unify them. We argue that the making and using of epigrams is a display of epistemic power and the need for explication and confrontation. We take here four examples to address some of their key characteristics and functions in relation to the development of the corresponding cases.

The key lesson to take from the use of epigrams concerns the evidence they give of how a study is proceeding. They are indicative of the leadership and direction in doing this work, and they are also indicative of various styles of leadership and choice of direction. Taken together, we heuristically distinguish three ways in which epigrams can be characterized in terms of the direction they give. ***System-based*** orientations in epigrams are biased towards preset analytic criteria and frameworks. In epigram 1, the association is with complex multi-scale, multi-layered systems but also in other system-based orientations we observe concerns over how to integrate different assessments of such systems or perform *causal-chain* assessments of them. ***Network-based*** orientations in epigrams lean on issues, actors, practices, performance, mediation and other factors that get taken into account in a cartography of connections and disconnects *in practice*, which also produces novel leads to take forward. In epigram 2, these leads point to the need to establish new relationships and plug knowledge gaps. ***Proceedings-based*** orientations in epigrams seek adequacy and quality in preparing for or reporting on legal and other proceedings. Primary elements in them concern process relations, purpose-specificity, participation and clarity in epistemic quality checks and decision-making. In epigram 3, the elements are preparatory for proceedings (lesson in law), whereas in epigram 4, they dictate the reporting of proceedings (lesson in innovation practices).

That said, key learning to take away from our observations is how selectively and pragmatically experts learn in approximating other disciplines and in distancing themselves. There remains a sense of unease with unfamiliar scholarly and methodological terrains which may require proactive mitigation and mediation, however, we also observe that a sense of integration to take away from case work like this, should not have to be *the* priority. Rather, this work ought to enable thinking about the material at hand in multi-dimensional ways, while aiming for novelty in knowledge creation. The learning here is perhaps stating the obvious that if we confront the fact that the making of contemporary technologies navigates multiple sites, then gaining a good sense of the nature and extent of this multiplicity is better facilitated by engaging with people across different disciplines, occupations and experiences. But, as one member put it, “part of this is the fact that I have realized that it is not so easy to ...err ...really work together with different ...err disciplines or different approaches, no, because at the end of the day I still understand ...err ...my methodology better than the others and I'm ...I still do what I do”. We can argue in this respect, as Stengers does, that there are good reasons to adhere to ones disciplinary home base as a source of legitimacy and authority but also perhaps that, in

this *process of integration*, we become much clearer about what our own disciplinary base has to offer into the mix.

Interdisciplinarity, except in the most basic sense of *collaborating*, is not likely to be achieved by just putting different disciplines together to work on a project. It should be considered an achievement of hard work and, as we observe, such an outcome is more likely to emerge on a much smaller scale than is expected from a large-scale 'interdisciplinary' project. Disciplines tend to collaborate one-on-one or in very small-scale teamwork and we observe that such occurrences are taking place in the absence of formal attempts at integration and often with surprising result. They typically happen in the course of exploring a common assessment issue that produces an ontological entanglement while encouraging a quest for belonging. There are many such small-scale entanglements to observe within the case teams.

At the heart of what we observe is the willingness (or not) to overcome disciplinary barriers, as much as that is indeed possible, and how that then works with more explicit concerns about integration as a cross-cutting issue in the Horizon 2020 program. From what we have learned to- date, we suggest that each case study is an exploration, a laboratory of assessment practices aiming to grasp their ecology in order to tie the question of what constitutes a practice to the question of its co-existence in an environment of other practices. Each case is approximating and distantiating disciplines, and entangling them in ways in which leads each case to a *mode of integration*, so to speak. Looking now through the developments within the case studies, we can say that the different modes of doing this work hinge in part on technology-specific issues, in part on sector-specific issues as well as more generic issues. For example, ICT-based innovations which essentially are key enablers in most innovation domains nowadays, constantly call for a distinction between technology specific, societal and generic problems.

### Implications 3: the role of Law

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.[10] This section deals with implications for law in general; in the next section we provide further examples of law's role into different forms of assessments by taking a look at Data Protection Impact Assessments.

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 dilemma[11] 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 technsociences as producers of progress and new societal relations. As such, it seems to preempt the 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

[10] 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.

11 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).

move so fast, and are so encompassing complex, that law stands no chance when it comes to keeping up[12]. 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 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 pro-active 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

12 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.

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).

## Conclusions: Epinet and RRI

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 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 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, communication and media production, 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.

## The case and example of DPIAs

We will end this report with the example of a (relative) newcomer in the world of (impact and technology) assessments, namely Data Protection Impact Assessments (DPIAs). they are of a relatively recent origin; they respond to deep public and political issues, especially visible following the Snowden revelations, but also as part of a much debated ongoing development in the regulatory and legal context, that is, as pertaining to the proposed General Data Protection Regulation (EU GDPR). Finally, the case of DPIAs is relevant across three out of four Epinet cases (that is, In Vitro Meat excluded). As such, the case of DPIAs is an interesting case in itself. It is also, however, a good illustration of how Epinet research was carried out and led to specific results with clear implications and recommendations in this new and emerging field of technology assessments and governance.

**Background**

One of the many novelties of the EU proposed General Data Protection Regulation (EU GDPR) consists in the introduction of data protection impact assessments (DPIAs), which presents new elements and challenges to legal practice. Since these assessments will become a mandatory exercise for data processors, this practice will become one of the important sites and apparatuses for the governance of new and emerging information technologies. An interesting novelty in this context is the concept of "*risks to the rights and freedoms of data subjects*" introduced as the focal point of data protection impact assessments. Article 33(1) GDPR states that "Where processing operations present specific risks to the rights and freedoms of data subjects by virtue of their nature, their scope or their purposes, the controller or the processor acting on the controller's behalf shall carry out an assessment of the impact of the envisaged processing operations on the protection of personal data. The new Regulation seems to imply a shift towards more precautionary approaches compared to more classical data protection orientations.

Currently, two mains technology-specific DPIA methodologies have been developed under EU leadership: the industry proposed PIA and DPIA framework for Radio Frequency IDentification applications (RFIDs) and a DPIA template for smart grid and smart metering systems proposed by the Expert Group (EG2) from the Smart Grids Task Force (2013). Both in these documents and in the most recent versions of the GDPR, a risk-based turn to data protection impact assessments (and to data protection in general) can be observed. The DPIA methodology for the assessment of risk to rights is here based on a framework of risk assessment and risk management, directly imported from the organisational and business sphere. This becomes apparent in the wording used to frame the assessment like "data protection risk assessment", "privacy risks" and "likelihood" of occurrence, which make for a rather narrow conception of privacy taken over from computer security.

The idea of assessing risks to rights is not as straightforward as it might seem. It is in fact a rather curious notion. Traditionally, rights and risks belong within very different spheres of knowledge and social organization. Rights typically belong to the domain of law where courts articulate them through legal concepts and procedures, predominantly after the event of an alleged breach of law and in terms of lessons drawn from the past. Risk often belongs to risk management practices, mainly in governance and large corporations, and is typically defined

through scientific concepts of probability in dealing with the possibilities of futures events. In merging the concept of a risk with that of a right, the initial meanings of both are changed into something that could hardly be predicted in advance. Still, certain general traits are starting to emerge, each with its own prehistory and institutional setting.

A major effort of the Epinet team has consisted in mapping relevant expertise and experiences with striking relations between risks and rights in different institutional fields like government, courts, civil society and organizational risk management (van Dijk et al. 2015). The result of this exercise can be seen in the inventory represented Annex I. This mapping research served to identify gaps and shortcomings in the way DPIAs are currently operationalized according to the risk management approach, which ascribes a greater role to managerial and organizational logics and procedures, possibly weakening the impacts of law. If unchecked or not accompanied by other measures and perspectives, the turn towards risk management could even pose new threats towards digital rights and freedoms. There is a need, therefore, to investigate the inclusion of other types of networks of expertise and concerned publics and data subjects, into the process of managing and assessing risks and rights.

This is what Epinet set out to explore through the organization of two embedding event in 2013 and 2014 with representatives of different professional communities, involved in, or with a stake in, the making of data protection impact assessments in the European Union. On the basis of the mapping research, the project team invited (and challenged) representatives from the professional communities of law (including human rights law), privacy impact assessors (including both assessment and social science perspectives), science and technology studies (especially of risk and governance), and data protection authorities (i.e. the EDPS). This mapping and embedding in this way thus provided opportunities for improvement and for lessons to be drawn from other practices and expertises that strike different relations between risks and rights (Rommetveit & van Dijk, 2014).

The considerations here pertain to general issues related to the introduction of data protection impact assessments. Considering, the technology sector-specific DPIA methodological frameworks and templates for RFIDs and smart grids, these recommendations are further highly relevant for the on wearable sensors and smart grid technologies studied in the other Epinet case studies. For specific recommendations in these fields we can refer to the sections on data protection impact assessment in the policy documents in WP 3 (Gunnarsdóttir et al., 2015) and, especially the call for "a more inclusive and flexible approach to data protection impact assessments" in WP 6 (van der Sluijs et al., 2015), (Kloza et al., 2015). In the latter case, they pertain directly to the Data Protection Impact Assessment (DPIA) Template for Smart Grid and Smart Metering Systems. Considering the fact that the DPIA template for smart grids has just entered a two year test phase (starting in March 2015) to gather feedback in order to fine-tune and improve its efficiency and user-friendliness, we urge for the take-up and incorporation of these recommendation in this testing-phase process.

**Policy considerations**

- **Disconnect from publics versus need for public participation**
  We learnt that there seems to be a tendency to cancel out the views of the data subject within the new data protection regulation in general and in data protection impact assessments in specific. Furthermore, the DPIA template for smart grids explicitly describes the role of consumers during the execution of the DPIA as rather passive, unless his views are actively requested throughout the process. At the same time, the issue of public participation in assessments of the impacts of technologies is a central topic of discussion and concern among several of the epistemic communities consulted in Epinet.

- **Experimentation**
  Experimentation is a concept has surfaced on several quite different occasions during the Epinet project. On one hand, it refers to collaborative experiments in self-hacking, self-awareness & autonomy as manifest in new movements towards self-care and health-care, but also in smaller communities experimenting with energy independence. These are based on user-centered computing and on collaborative practices. This model is interesting for a co-operation between different parties and actors focused on *autonomy*, but through doing things together. In a very different sense the term was used by PIA practitioners and data protection authorities to refer to collective experiments in the marketplace in order to push the limits of privacy sensitivities and acceptability, in order to ”try out and see what happens”.

- **Risk & Uncertainty**.
  The differentiation between risk and uncertainty is at the core of some of the Epinet partner methodologies. Our research line on data protection impact assessments proposed to take into account one of the lessons of environmental governance on the relation between risk and uncertainty in the framing of the DPIA methodology. The term has been discussed by distinguishing between risk, uncertainty, ignorance, indeterminacy and ambiguity, and the observation has been made that present DPIAs strongly favor quantifiable, knowable risks only.

## DPIA: Policy Recommendations

### (1) Learning as an Important Value for Technology Assessment

First, an important matter is the point of learning or ‘heritage’ itself for technology assessments. This is especially the case for those that migrate into a new field like is the case with data protection impact assessments. It is here import to draw lessons from other practices with relevant expertise and of learning from experiences attained in previous attempts. An important argument of Epinet is that there is a need for bringing more actors into the definition and exercise of data protection impact assessments, especially as these seem destined to become important parts of data protection in Europe (and beyond). Experiences from different assessment practices will be necessary for different contexts and problem matters. The question then is how to know when to use what kinds of methods and principles, and how to find (or orchestrate) a right balance between the different assessment perspectives. In doing so, we would also argue that there is a need to integrate human rights law and lessons from previous governance of risk and environment.

Secondly, there is also important learning potential in performing impact assessments themselves. On the one hand, businesses will learn about privacy issues through doing privacy or data protection impact assessments, which is a first necessary (although not sufficient) step. On the other hand, regulators can also partially learn how to regulate through impact assessments. This thus fits in a larger co-production of knowledge and normativity along a learning process within democracy.

**(2) Consensus points between the different epistemic networks**

*a. A need for improved regulatory tools overall.* There is a need for better regulatory and legislative mechanisms in coming to terms with risks and threats to fundamental rights and freedoms. At present we are looking at poorly regulated fields in which the general attitude is to introduce new technologies and see what happens. None of the participants actively disputed that new forms of regulation should be anticipatory and implemented as far upstream in developments and processes as possible, or throughout projects implementation (i.e. a life-cycle perspective). What is not agreed upon is the need for and importance of risk management, and what forms such management should take.
b. *A need for improved interdisciplinary and cross-domain collaborations.* There is a need for increased and improved interdisciplinary collaboration, including also improved collaborations across sectors of society. Regulation must stretch beyond the legal to also include other forms of expertise. However, what shape, and what relations between law and other disciplines, should be sought out, remains in dispute.
c. *A need for including data subjects and concerned publics*. The concern for the data subjects, users and citizens' point of view is voiced by several actors. It remains unclear however, how to bring the voices, values and perspectives of data subjects into the debate, and into the relevant assessment practices. Even as Epinet argued that broader perspectives and practices are essential to assessment practices, these cannot do without the inputs of broader publics, both for their substantial value contents and for democratic legitimacy.

**(3) Lessons from Data Protection Regulation**: *Regulators see the lack of regulation as reason for urgency. To them, the specifics of the assessment practices are not of primary importance but rather the imposition of regulation overall*

*Regulators and users of assessments* tended towards making pragmatic judgements based on what they regarded as the pressing needs and requirements of the situation. First and foremost regulation must be imposed on powerful actors in the field, and here assessments are but one part of the equation. Both the DPAs and data protection lawyers are preoccupied with how to extend regulation into fields of business, IT and administration. As such, they seem less concerned about the specifics of the assessment practices, i.e. whether they are conceived as DPIAs or PIAs; of chief importance are the imposition of regulation and the building of new regulatory capacities. This also entails starting from the state of affairs of law (in Europe) as a regulatory tool, and not as (also) a bottom-up emergent phenomenon. As such data protection fits better (than privacy) since it is concerned with the expansion of positive rights rather than the (gradual) realisation of negative right to privacy as a human right. This is not necessarily in contradistinction to or disagreement with those favouring such engagements (i.e. human rights law and STS on governance), but stems from positioning oneself within the regulatory approach of the EU and relevant member states.

**(4) Lessons from Privacy Impact Assessment**: *Assessors worry about the inherent reductionism of the present GDPR proposal (Parliament version). The argue in favor of privacy IAs rather than DPIAs, and possible expansions towards broader impacts of surveillance on social groups*

*Assessment practitioners* are concerned about the character of the assessments themselves. In general there was lament about the present state of directions (especially the Parliament/LIBE proposal for GDPR), seeking to reduce assessments to dealing with data protection only and disregarding privacy (and, in the extension of this: also disregarding surveillance impacts on groups and sociality). Here the criticism is not so much with the new risk assessment and management practices themselves: these are generally seen to be necessary and to have the capacity for raising awareness within the organisations that implement them. Rather, the critique is that these practices are being shaped too narrowly and should be more encompassing. The main tools for this would be privacy scholarship, ethics and social science.

**(5) Lessons from previous attempts towards risk management in the field of environmental governance**

*From the perspective of Science and Technology Studies (STS)*, there are a number of critical lessons to be learned from previous experiences with risk management and assessment not presently taken into account. There is a strong tendency for risk discourses to overstep their legitimate boundaries and to be deployed also in areas where they do not belong. Regulators and assessment practitioners promoting DPIAs may be ignoring the power of the risk discourse, especially the impacts of strong tendencies towards quantification. The risk discourse is likely to encompass the language of rights by turning privacy in yet another interchangeable source of risk, and to obscure the underlying relations that are being produced. The fundamental notion introduced here is that risk, in spite of its scientistic coating, is always inherently normative and relational. It is important to investigate historically the kinds of risk assessment and management practices that have preceded privacy and data protection impact assessments: Technology Impact Assessments (TIA) and Environmental Impact Assessments (EIA). Also important is a due appreciation of the very character of the risky objects being assessed: whereas “life” in the early welfare state was a relatively manageable object, later transitions to “environment” were much harder to quantify. How will then efforts towards risk managements of “privacy”, or even “freedom” fare?

***(6)* Lessons from law: *Legal concepts as conductors for assessment processes ~ Due process, proportionality & privacy harms***

Although many of the above considerations and recommendations can be taken on their own, our main recommendation is that the role of law in accommodating the new and emerging practices of DPIAs be more seriously considered. There are indeed a number of lessons that can be draw from legal principles and procedures, as we briefly outline in this section:

From the perspective of *human rights law*, assessment practices could trap rights inside a regulatory and legalistic cage. Contributions from ethics, privacy scholarship and social science may not be able to counter this tendency but rather insert themselves on top of them and enhance them: many have argued that ethics and ELSA (ethical, legal and social aspects) remove the values from rights discourses in other areas (health, bioethics). This is likely to happen also in this field. Assessments based in organisational techniques, and using social science, ethics or privacy literature may dislocate the seat of assessments (towards risk assessors and privacy impact assessors), and away from the main legitimate actors in the field. Assessments should

take into account lessons from human rights case-law by the appropriate courts (i.e. ECHR and others).

There are several important tendencies to be discerned in the ECHR law with regard to the relations between risks and rights. They make the case for the argument of deploying legal concepts as conductors for assessment processes. We can distinguish both procedural and substantial lessons from legal practices.
"[T]he incorporation of procedural lessons from legal practice can be expected to lead to the following mutual transformations between the concepts of risk and right:

1) The concept of **rights** could change through its encounter with risk as can already be witnessed in the case-law of the ECHR. This procedural turn to rights led to a focus on the quality of technological decision-making and obligations for access to information, participation of those affected and the possibility of contesting the decision.

2) Conversely, the quasi-objective physical concept of **risk** undergoes a normative turn through the articulation of the *values* at stake for those *publics affected* by these data processing technologies and its epistemic status as *contestable evidence* in legal settings.

3) Lastly, there is a *proportional* approach to the **risk–right relation**. Individual rights are mediated with risks to public interests by assigning each a proportional weight and by striking a fair balance between the different conflicting interests at stake in a concrete case.

In general we could try to summarize these three points by saying that *fair trial considerations* here come to apply to data protection impact assessment methods. This could transform these practices into due processes and contribute to the construction of due processing technologies of personal data." (van Dijk et al., 2015).
Due process can thus be considered an important principle for shaping the processes of data protection impact assessments. Furthermore, proportionality can be put forward as an important principle for ordering *assessment questions* and for certain *lessons* also drawn within STS research: Purpose specification, Legitimacy of purpose (legitimacy test), Fitness for purpose (suitability test), Alternatives **(**necessity test), Proportionality (as opposed to mere balancing).

Furthermore, apart for procedural lessons, substantial lessons can also be drawn from legal practices with experience in dealing with fundamental rights to privacy and data protection. When the new notion of a 'privacy risk' is taken seriously, the concept of **risk** also undergoes a normative turn through the incorporation of the legal requirements of privacy and data protection law. This becomes especially clear in the specification of the criteria for what will constitute such a privacy risk, leading to the emergence of *new types of harm* (emotional, social, and reputational) to be taken into account in impact assessments. It also becomes clear in the specification of the criteria of how these risks are identified, especially in relation to the types of expertise required for this and the required notion of probability, which is at the core of both the notion of legal and risk-based evidence (van Dijk et al., 2015).

## (7) A Balance of Exceptionalism and Generics in Technology Assessment

It is important to strike a balance between a *generic assessment methodology vs.* a *technological sector-specific methodology*. This issue came up in the DPIA research in the comparison between the DPIA Framework developed for RFID technologies and the DPIA Template developed for smart grids by expert groups. In its Opinion on the latter, the article 29 Working

Party concluded that the methodology was overly generic: the methodology for assessing the data protection impacts for smart grids was too similar to the one used for assessing the data protection impacts of RFID technologies: “The DPIA Template lacks sector-specific content. Both the risks and the controls listed in the template are of generic nature and only occasionally contain industry-specific guidance - best practice that could be genuinely useful. In a nutshell: the risks and controls do not reflect industry experience on what the key concerns and best practices are”.[13] Smart grid technologies are developed in *very different networks* from those implied in the RFID. In this sector we are dealing with large as well as small energy grids that cross the lines between communities, states and even continents. Often, they deal with critical infrastructure with all the consequences for security, and involve very large and powerful organizations, actors and stakeholders. In the RFID sector to the contrary, we are dealing with small highly mobile “ubiquitous” technologies in the retail sector.
Differences between technological networks or contexts of innovation thus necessitate differences in assessment approaches and formats and a focus on the specific risks in each sector. Each assessment process should partly be tailored to the specificity of the technological network of concern. This sector-specific focus for assessment should however not lead to a loss of sight of the more generic assessments lessons that can be drawn from other fields of assessment. This is a different way of expressing the point of *heritage*. Thus a balance should here also be sought that is both tailored to the specificity of assessing the risks to the *rights of privacy* within a certain *technological sector* and more *cross-cutting generic assessment lessons* (Van Dijk & Gunnarsdóttir, 2014).

[13] Article 29 Working Party, 2013. Opinion 4/2013 on the Data Protection Impact Assessment Template for Smart Grid and Smart Metering Systems. Brussels.