

Responsible-Industry



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Executive Summary

This report is based on a systematic review of the current discourse on Responsible Research and Innovation (RRI), both academic and policy-oriented. It has a twofold yet interrelated purpose: 1) to evaluate its usefulness for industry, and 2) to identify underrepresented areas in the discourse that could potentially aid its applicability in Industry. On this basis, we will make a number of recommendations as to underrepresented areas that need to be included in the discourse, and areas that need to be developed further if we are to foster RRI in Industry.

Section 1 provides the background and objectives for this report. **Section 2** provides a short overview of RRI and identifies the dimensions that are typically emphasized in the Policy-oriented and Academic discourses respectively.

Section 3 is the main section of the report, and identifies 18 areas in which there is need for further research – because they 1) embody RRI principles that are more or less inapplicable to industry or otherwise too abstract or vague, 2) they hold promise for industry application yet has reserved comparatively little attention in the discourse, or 3) they hold particular promise for coupling RRI dimensions to Industry incentives. The 18 domains relate to democratization and inclusion; lessons that can be learnt from the field of corporate-social responsibility; certification and standards; codes of conduct; the importance of distinguishing sectors; operationalization of public good and well-being; underrepresented academic disciplines and frameworks; underrepresented societal needs; workplace environment; ethics education; support infrastructure; market demographics; new and emerging forms of research and innovation; new forms of consumer power and online tools; public relations, branding and consumer power; workplace equality; science communication and open access; and finally politics and power. Our most important suggestions are **highlighted** in the text.

We will not provide concrete solutions to any of these problems in this short report, but many of the areas identified will be the subject of further investigation in our RESPONSIBLE-INDUSTRY project, both empirical and theoretical. Our more constructive recommendations will be developed on this basis and will be presented in later task deliverables – primarily tasks 3.3 (“Models for RRI in Industry”) and 3.4 (“Lessons Learned and Recommendations”). Although this is primarily intended as a platform for the further research to be carried out in our RESPONSIBLE-INDUSTRY project, we believe that this report will also be useful and potentially agenda-setting for RRI researchers in general as well as the European Commission

1 Background

This report is based on a systematic review of the current discourse on Responsible Research and Innovation (RRI), both academic and policy-oriented. It has a twofold yet interrelated purpose: 1) to evaluate its usefulness for industry, and 2) to identify underrepresented areas in the discourse that could potentially aid its applicability in Industry. On this basis, we will make a number of recommendations as to underrepresented areas that need to be included in the discourse, and areas that need to be developed further if we are to foster RRI in Industry. We will not provide concrete solutions to any of these problems in this short report, but many of the areas identified will be the subject of further investigation in our RESPONSIBLE-INDUSTRY project, both empirical and theoretical. Our more constructive recommendations will be developed on this basis and will be presented in later task deliverables – primarily tasks 3.3 (“Models for RRI in Industry”) and 3.4 (“Lessons Learned and Recommendations”). Although this is primarily intended as a platform for the further research to be carried out in our RESPONSIBLE-INDUSTRY project,¹ we believe that this report will also be useful and potentially agenda-setting for RRI researchers in general as well as the European Commission.²

The background for this report, and the RESPONSIBLE-INDUSTRY research project as a whole, stems from the fact that the RRI discourse has predominantly been designed to be applied to publicly funded research and innovation (R&I) activities. This is problematic because it actually neglects the *majority* of research and innovation activities, namely R&I carried out by privately funded industry. This is particularly important because industry R&I typically lies much

¹ Cf. <http://www.responsible-industry.eu/>

² We would highly appreciate feedback on this report from other RRI researchers, especially regarding underdeveloped areas that should have been included or pointers to important contributions within the areas identified in section 3. We should emphasize that RRI scholars will notice that several topics currently under debate are not included in this report, but this stems from our emphasis on underdeveloped and underrepresented areas, rather than topics with which the community is already hard at work. Please direct any correspondence to j.h.soraker@utwente.nl.

closer to market, and such mature innovations have a stronger potential to strongly influence our lives.

Both EU R&I funding (in FP6, FP7 and Horizon 2020) and national funding programs of EU member states (e.g. the United Kingdom, Norway and the Netherlands) are linked in various ways to policy objectives that include economic, social and environmental criteria (Von Schomberg, 2013). For privately funded R&I, it is not possible for the EU to make the same demands. After all, the funds and resources for this type of R&I are (more or less) private, and the legitimacy of public regulation of private industry is inherently complex and controversial. It is relatively uncontroversial that the state can regulate privately funded R&I to prevent it from doing social, economic or environmental harm. Making demands in terms of public goods, however, quickly becomes (perceived as) inconsistent with principles of free enterprise, private property rights, freedom of contract, and further economic and political rights (Maier & Nelson, 2007, p. 55) – all of which have been argued to be important driving forces for research and innovation.³ Similar concerns have also been raised with regards to scientific autonomy (cf. Guston (2012)). Hence, this report seeks not only to identify lack of applicability or gaps in the discourse, but also to do so with an eye towards concrete self-interested incentives. Thus, a red line through this report will be to align the RRI discourse with the question of how to incentivize private industry to conduct their research and innovation in such a way that it benefits the public, rather than merely regulate harms to the public and/or try to “enforce” RRI by means of sanctions. The corresponding challenge lies in identifying tools, principles and incentives that will subject privately funded R&I to criteria of responsible research and innovation – *preferably* without being a hindrance to research and innovation, and *ideally* as a win-win

³ It is of course far from uncontroversial to what extent these principles really *do* promote research and innovation. Although it is beyond the scope of this report to discuss the most fundamental socio-political conditions of R&I, some of these principles will be addressed in section 3.

situation in which RRI principles not only benefits the public but also the industries themselves.

It should be emphasized that this report presupposes a rather pessimistic, Friedmanian view of market forces and industry incentives, one in which the first and foremost concern of industry is to increase its profits (Friedman, 2007). This is certainly not the case for all of industry, and there are several examples of corporations that willingly and explicitly aim to conduct their research and innovation in a responsible manner as an end in itself (Brebels, De Cremer, Van Dijke, & Van Hiel, 2011; Heugens, Kaptein, & Oosterhout, 2008). In such cases, the primary question is not *why* to act responsibly but *how*. This will be briefly addressed in 3.10, but more in-depth research on this is carried out in several parallel EU projects, in particular SATORI (*Stakeholders Acting Together On the ethical impact assessment of Research and Innovation*), which aims to develop common methods, standards and approaches for the ethical assessment of research and innovation within Europe.⁴ Hence, this report will focus more on the issue of how to foster RRI even in corporations that explicitly or implicitly ignore any responsibility to promote public good beyond the maximization of profit, hence the focus on incentives.

Before proceeding, it should be pointed out that it is inherently difficult to distinguish between publicly and privately funded R&I, and this is much more of a spectrum than a clear-cut divide. Universities and public research institutions often carry out or partake in industry-funded projects, and industry often partakes in publicly funded research and innovation. Making matters more complicated, the clarity of this distinction also differs from sector to sector. For instance, our focus within industry lies with ICT for health, demographic change and wellbeing, a sector in which public funding and considerations of public goods plays more of a role than many other sectors.

⁴ Cf. <http://satoriproject.eu/>

2 The RRI discourse

In order to situate the observations and recommendations in section 3, it is important to first provide some information about ‘RRI’ and related fields for those unfamiliar with this discourse. We will keep this short, however, since there are already several excellent summaries out there (cf. ‘further reading’) and since the focus of this report lies with more constructive observations and recommendations in section 3. Readers already familiar with these discourses can skip straight to the next section.

2.1 What is RRI?

“Responsible Research and Innovation”, often abbreviated to “RRI”, is a recent expression that is being used by the European Commission to denote part of its research and innovation strategy. The term is being used in EU policies, funding programs, funded research project, and increasingly also in the academic literature, both in Europe and abroad. The term is meant to refer to approaches to research and innovation that take into account ethical criteria and societal needs. A frequently cited definition of RRI is that by philosopher and EC policy officer René von Schomberg:

“Responsible Research and Innovation is a transparent, interactive process by which societal actors and innovators become mutually responsive to each other with a view to the (ethical) acceptability, sustainability and societal desirability of the innovation process and its marketable products (in order to allow a proper embedding of scientific and technological advances in our society).” (Von Schomberg, 2012, p. 50)

Von Schomberg further argues that RRI “should be understood as a strategy of stakeholders to become mutually responsive to each other, anticipating research and innovation outcomes aimed at the “grand challenges” of our time, for which they share responsibility” (Von Schomberg, 2013, p. 51)

RRI is described in a similar way in recent official statements by the European Commission, and upheld as a key concept for its Horizon 2020 Research and Innovation programme:

“RRI is an inclusive approach to research and innovation (R&I), to ensure that societal actors work together during the whole research and innovation process. It aims to better align both the process and outcomes of R&I with the values, needs and expectations of European society.”⁵

RRI has been taken up in European policy in recent years, but as Owen, McNaughten and Stilgoe (2012) explain, RRI has historical roots in earlier discussions of research integrity and research ethics, work on the ethical, legal and social implications of research in areas such as genomics (so-called ELSA research), technology assessment, and anticipatory governance (Owen, Macnaghten, & Stilgoe, 2012). Van Oudsheusden (2014) also emphasizes earlier work directed at public engagement, which has been part of certain forms of technology assessment, anticipatory governance, and other approaches aimed at making science more democratic and increasing public participation and deliberation.

2.2 The Policy Context

RRI has in recent years become an important component of European Union (EU) research policy. The term has become prominent in EU discourse since around 2010, and builds on a longer commitment in EU policies to stimulate greater responsiveness of science and innovation towards society’s needs (Guston et al., 2014, p. 2). RRI fits key policy priorities of the EU not only for its research and innovation agenda, but also for its social and economic agenda. Research and innovation are of key strategic importance for the European Union

⁵ Cf. <http://ec.europa.eu/programmes/horizon2020/en/h2020-section/science-and-society>

for creating sustainable, inclusive growth and economic prosperity and for addressing societal challenges.⁶ It is also partially encoded in the Innovation Union strategy of creating an innovation-friendly environment in the EU that will bring growth and jobs.⁷ An important element of the EU strategy is the belief that for research and innovation to be successful in its goals, it must be geared towards societal needs. It is moreover recognized that meeting such needs cannot solely be left to the market. There must be strategies in place at the policy level that help connect research and innovation processes with societal needs and that guide these processes towards meeting the grand societal challenges defined in EU policies.

The approach of RRI is inspired in part by the realization that traditional approaches to R&I policy do not sufficiently yield the benefits of R&I demanded by society. It is clear from the policy discourse outlined below that there is a need to move away from technology acceptance by way of marketing, the diversity of actors in R&I must be increased, and society must be involved early, continuously and iteratively in R&I processes. Furthermore, improved engagement of citizens to science, improved science literacy and education of all Europeans, enhanced presence of women in science, open access to scientific results, consideration of ethical aspects, and better aligned, responsible and more efficient governance of science are expected to ensure a R&I system that is more responsive to society's needs (European Commission, 2012).

To help develop a framework for RRI activities in Europe, the European Commission is currently considering several options, the most radical of which is improved coordination with the Member States with a legally binding initiative (European Commission, 2013). The most favored scenario, however, is an improved coordination with the Member States without a legally binding initiative, which involves actions such as setting incentives for RRI, national and

⁶ Cf. http://ec.europa.eu/europe2020/index_en.htm and http://ec.europa.eu/commission_2010-2014/president/news/documents/pdf/20100303_1_en.pdf.

⁷ http://ec.europa.eu/research/innovation-union/index_en.cfm

disciplinary Codes of Conduct for RRI activities and development of Standards on RRI. This report follows the latter scenario.

2.3 Dimensions of RRI

To clarify recurring and important dimensions of RRI, it is helpful to break it down into aspects, processes, activities and other dimensions that can be distinguished separately as being involved in RRI. In this section, we will first present what we take to be the EC interpretation of RRI and then distil frequently recognized dimensions of RRI in the academic literature.

2.3.1 RRI dimensions in the Policy Discourse

The RRI framework provided by the EC contains five to six different key dimensions: engagement, gender equality, science education, open access, governance and ethics. All these dimensions have their own policy context, and although RRI is a new concept, the components or dimensions of this concept have a long history, some more than others.⁸

1. Citizen engagement and participation of societal actors in research and innovation

This dimension specifies that all societal actors, researchers, industry, policymakers and civil society, have joint participation in the research and innovation process. According to the European Commission, RRI should aim at being inclusive, which asks researchers and innovators to involve diverse stakeholders (such as users, NGOs, etc.) in the process, to broaden and diversify the sources of expertise and perspectives (Stilgoe, Owen, & Macnaghten, 2013). Among the recommendations made by the European Commission regarding RRI

⁸ These dimensions are predominantly drawn from a comprehensive 44-page European Commission (2009) report on *Global Governance of Science* (Chairwoman: Žaneta Ozoliņa; rapporteurs: Carl Mitcham and Jack Stilgoe; Members of the Expert Group: Pamela Andanda, Matthias Kaiser, Linda Nielsen, Nico Stehr, and Ren-Zong Qiu)

(European Commission, 2009)⁹, we can find **Recommendation 5**, which affects the subject of engagement and governance: The European Research Area (ERA) research should be developed to promote critical reflection and discussion with regard to both the means and ends of science – by means, e.g., of selective research projects and public activities that require interdisciplinary collaboration and citizen participation, including reflection of the ways in which the principles of European governance and basic fundamental rights serve as appropriate and applicable guidelines for the practice of science.

2. Science literacy and science education

The aim of this dimension is to enhance the current education process to better equip future researchers and other societal actors with the necessary knowledge and tools to fully participate and take responsibility in the research and innovation process. The EU has set targets and goals for science education in Europe 2020 and Horizon 2020. The division between rich and poor countries on science is one of access, ownership and control, but it is also one of capacity – to research, innovate and educate (European Commission, 2009). According to Juma et al, the challenge of capacity building needs to be met with a clear approach based around investing in centers of excellence as a way of developing high-caliber national research capability; supporting innovation at the village level by nurturing local cottage industries, which are as important as large industrial initiatives; and building networks should to link the small enterprises at the village level (Juma et al., 2001). This will help towards the effort of building human resources and capital. Capacity building for science needs to also include capacity building for governance, to provide a strong foundation for collaborative research. One approach to capacity building is to involve international agencies such as UNESCO to assist in matters of training and the World Intellectual Property Organization (WIPO) in intellectual property rights.

⁹ Although these recommendations are primarily addressed to policymakers in the European Commission and member states, the authors “believe that they apply as well to the increasingly greater proportion of science and scientists within the private sector” (European Commission, 2009, p. 6)

3. Gender equality in research and innovation and gender dimension in research and innovation content

This dimension aims to eliminate the underrepresentation of women in science. The underrepresentation of women in certain scientific disciplines, as well as in decision-making positions in research, is well known and has indeed been a major concern for the European Commission since a number of years. Improving this is a central policy goal in ERA, and is the focus of many reports issued by the European Commission over the last decade.¹⁰

4. Open access to scientific knowledge

Among the recommendations made by the European Commission regarding RRI, the following affect the subject of *open access*:

Recommendation 2: Members of the society of science should be encouraged to become self-critical – by, e.g., required collaboration with complementary disciplines and non-scientists in order to better recognize the ways they are influenced by larger social contexts; and

Recommendation 3: All scientists should be required to make the results of their research as widely available as possible – by adoption of open access publication protocols. Open access is a key policy goal in ERA (European Commission, 2009).

5. Governance

This dimension encompasses the multiple processes of control and management that take place within and between states, in public agencies and private firms, or in any other social organization (Kjaer, 2004). Governance involves directing or setting goals, selecting means, regulating their operation, and verifying results. Citing a white paper on European Governance, the European Commission (2009) describes good governance as governance that enact

¹⁰ Cf. <http://ec.europa.eu/research/science-society/index.cfm?fuseaction=public.topic&id=1406> for the EC “She Figures” reports and other relevant documents.

precisely five principles: openness, communicating accessibly with the public; participation by citizens as much as possible in all policy formation; accountability clearly apportioned among EU institutions; effectiveness in achieving goals and objectives; and coherence among institutions and policies. The Commission also has put forward **Recommendation 6**: The European Union should seek to extend to the global level its leadership in working to harmonize the internal and external governance of science across national boundaries – by furthering research and discussion on the global governance of science and seeking to develop appropriate protocols and their application for global collaboration (European Commission, 2009).

6. Ethics

Finally, ethics concerns the compatibility of research and innovation processes and products with fundamental values. Among the recommendations made by the European Commission regarding RRI, we can find the following which affect the subject of ethics:

Recommendation 1: Within the society of science, practices of ethical governance should be promoted – by e.g., grant activity requirements, educational programs, research projects and related conferences or other appropriate means;

Recommendation 4: All ERA research projects, including collaborations with scientists in other countries, should seek ways to enact basic fundamental rights of dignity, freedom, equality, solidarity, citizens' rights, and justice in ways that also seek to respect and learn from the social and cultural contexts of non-Europeans – by, e.g., expert and public deliberations that develop and apply ideals of reconciliation (European Commission, 2009).

Although all of these dimensions aim to support the central objectives of RRI as understood by the European Commission, they have different heritages and statuses. The engagement, ethics and governance dimensions are constitutive of

RRI in the sense that they are central in most discussions and definitions of RRI in the academic literature. The open access, gender equality and science education dimensions, however, are more akin to specific policy objectives of the EC that have been defined in the context of RRI or have been subsumed under it. Specifically, gender equality and open access are part of the ERA strategy¹¹, and the EU has also set specific goals for science education in Europe 2020 and Horizon 2020. These dimensions are however less frequently mentioned in academic studies of RRI. They nevertheless have important roles in furthering the more general objective of RRI of better aligning R&I with societal needs, since a better inclusion of women in the R&I workforce, better open access policies, and good science education all contribute to a better fit of R&I with society. Finally, it is worth mentioning that many of these dimensions are also starting to become picked up in policy bodies outside Europe as well. For instance, the US Presidential Commission for the Study of Bioethical Issues recently released a report on responsible neuroscience in which “three of the Commission’s four recommendations focus on integrating ethical and societal perspectives with neuroscience” (Guston, 2014, p. 147).

2.3.2 RRI Dimensions in the Academic discourse

The six dimensions of RRI prioritized by the EC are partially different from the dimensions that are emphasized in the academic literature on RRI. This is the case because EC and academic interpretations of RRI have different aims. The EC does not so much aim at a coherent description of dimensions that jointly define RRI, but rather it aims to identify key policy priorities within the domain of RRI. In doing so, it includes under the banner of “RRI” previously existing policy priorities, such as open access and gender equality, even though these are rarely recognized as important dimensions of RRI in the academic literature. The academic literature, instead, aims to arrive at integral visions of dimensions of RRI that define key aspects of it from a conceptual point of view – and is naturally less concerned with the relation of these aspects to EC policy priorities.

¹¹ See http://ec.europa.eu/research/era/index_en.htm

A general problem with this discourse is that the lack of connection with concrete public policies is generally not compensated with concrete measures to be implemented in industry, hence leaving much of the discourse targeted at fellow RRI scholars instead of decision makers in industry and other stakeholders.

Academic interpretations of RRI tend to emphasize six dimensions as well. These dimensions are not necessarily incompatible with policy interpretations of RRI, which operate at a the more concrete level of policy, rather than at a conceptual level. We identify the following six dimensions:

- (1) *A proactive approach to R&I benefits.* RRI entails an active approach of R&I to society's needs. This approach is a break with the past in which R&I was left to the market and to the internal dynamics of the institution of science, and government saw its role as ensuring good conditions for these processes and regulating and mitigating negative effects for health and the environment. The new approach is to proactively shape R&I towards contributing to specific social benefits.
- (2) *Involvement of society in R&I.* To help ensure that R&I is more demand-driven, there should be a consistent, ongoing involvement of society, from the beginning to the end of the innovation process, with an effort to create collective agendas and distribute responsibilities. This involvement should include all stakeholders, including civil society and the general public, and should include deliberative processes of mutual dialogue, knowledge sharing and learning. This process of including stakeholders is called *engagement*.
- (3) *Anticipation and reflection.* To better include societal values and needs in R&I processes, there must be processes of anticipation and assessment of impacts, benefits and risks of R&I processes and products, so that informed choices and prioritizations can be made at an early stage. There should be iterative processes of learning about impacts and benefits along

the entire R&I chain that should include all stakeholders. In this way, social values and needs can effectively be included in R&I processes next to technical and commercial considerations.

- (4) *Transparency*. In order for R&I processes to allow for more involvement of society and better anticipation and reflection, they should become more transparent. Governments should be more transparent about their innovation strategies and trade-offs and assumptions, researchers and innovators should be open about R&I processes and possible impacts, risks and benefits, and all stakeholders should be open about their agendas and beliefs.
- (5) *Responsibility*. RRI calls for new, collective and distributed models of responsibility for R&I and its impacts on society. The notion of responsibility is often extended beyond that of the researchers or innovators themselves, including all stakeholders involved in the R&I process, including funders, regulators, industry, NGOs, and others who have different role responsibilities and engage together in collective responsibilities.
- (6) *Multi-stakeholder governance*. RRI calls for new approaches to governance. Classical approaches, in which governments regulate R&I and focus on risk assessment, are becoming increasingly intractable – especially for industry. New governance models focus on stakeholder engagement in R&I, involving multi-stakeholder governance models that include collective responsibilities for outcomes, voluntary accountability mechanisms, mechanisms for anticipatory governance, and greater reflexivity and responsiveness. Governments have a role in engaging all stakeholders in the R&I process, helping to articulate the collective agenda, and institutionalizing mechanisms of anticipation, reflection and responsiveness.

As can be seen, there is considerable overlap between the discourses but they both embody different challenges when it comes to their applicability to

industry. The policy discourse tends to rely too much on public institutions, which may have limited power when it comes to regulating industry. The academic discourse is more decoupled from concrete policies, but often fails to specify concrete recommendations that would have tangible and measurable effects on RRI in industry. As a starting point for investigating how to deal with these challenges, we now turn to a number of domains in which we believe that further research could help facilitate the appropriation of RRI principles in industry.

3 RRI and its Applicability to Industry

In light of the considerations above, the final section of this report aims to identify gaps and underdeveloped elements in the current RRI discourse that may hinder its appropriation in privately funded industry. These will for the most part consist of recommendations for further research, integration of existing research, as well as suggestions for how to couple RRI dimensions to Industry incentives. The most important conclusions will be highlighted throughout.

At a meta-level, we should keep in mind that RRI is still very much a work in progress, and there are no common quality standards or criteria for its development, even when it comes to how the different discourses and disciplines can work together (Jahn, Bergmann, & Keil, 2012). There is also a need for a more coherent approach for developing such common criteria or processes among the Member States (European Commission, 2009), as well as a need to reduce the considerable conceptual ambiguity and diversity when it comes to theoretical conceptualization and translation into practice (Owen et al., 2012). The discourse of RRI often remains rather generic and abstract, and often the component elements in various RRI frameworks vary.

Furthermore, current conceptions of RRI aims at more deliberative and democratic processes in research and innovation, social learning rather than political bargaining, and cooperative ways of dealing with social conflict. But how this can be successfully achieved is often left unspecified: *How are outcomes actually negotiated in interaction? On whose terms is participation established, and why? What, in fact, is 'public' about the 'public interest,' 'public expectations,' and 'the public,' and whose definition counts?* Much more work is therefore needed to show that proposed approaches in RRI are practically feasible and to make RRI a successful and workable approach that has institutional problem-solving capacity (van Oudheusden, 2014).

The approach of RRI has originally been designed to be applied to publicly funded R&I activities. Public funding is intended to promote public policy goals, so it is no surprise that publicly funded R&I comes with the expectation that it lives up to such goals. Both EU R&I funding (in FP6, FP7 and Horizon 2020) and national funding programs of EU member states is linked in various ways to policy objectives that include economic, social and environmental criteria. RRI can be seen as a comprehensive approach for linking R&I activities to a broad range of policy goals of the EU, that is now required to be used to a greater or lesser degree in nearly all EU-funded R&I. As mentioned, our challenge stems from the fact that public institutions cannot as easily demand of *private* goods that they are used for public ends. That said, these forms of regulations are not entirely uncommon, and there are several cases where governments have required private industry to (also) promote public goods – not so much by means of coercion but rather by means of soft laws, economic incentives, tax benefits and so forth – all of which can *stimulate* private industry to serve public goods. Still, these forms of stimulation require complex and international legal agreements, knowledge and adherence from industry, and potentially simplistic notions of the relation between means and ends. Thus, it seems that if RRI is to have a significant role in industry, one would have to look at other areas as well – and we will identify several such areas in the subsections to follow.

3.1 Democratization and Inclusion

In its publication on options for strengthening RRI (European Commission, 2013), the EC lists the following generic means of implementing RRI principles:

- considering societal needs and ethical aspects in research funding programs, e.g. through public and stakeholder dialogue;
- developing criteria for the early appraisal of research and innovation, e.g. technology assessments;
- establishing processes to better integrate societal needs in research and innovation, e.g. interdisciplinary approaches in sustainability science;

- setting up advisory bodies such as councils on ethical aspects of new technologies.
- generating public debate, which should be continuous, informed and supported by public engagement activities during the entire cycle of research and innovation and the governance process (European Commission, 2012).

These principles are all related to increasing the legitimacy of R&I through principles of deliberative democracy (Von Schomberg, 2012) and implemented through public engagement mechanisms. This directly links to activities such as participative or constructive technology assessment, and various forms of participatory design. There is a host of literature that discusses the justifications of public engagement and the way it is to be integrated into RRI activities (Est, 2011; Fisher, Mahajan, & Mitcham, 2006; Hinde, 2008; Macnaghten & Owen, 2011; Parkhill, Pidgeon, Corner, & Vaughan, 2013; Rowe & Frewer, 2000, 2005) and there are numerous ways of engaging the public in research and innovation (Rowe & Frewer, 2005).

This engagement is often expressed in terms of the stream-metaphor. *Upstream* engagement refers to engaging the public early in the research process, i.e. at the agenda setting stage. The EU project Voices, which was used to collect citizen input into the first call of H2020 is a good example and this idea is promoted by the EC (European Commission, 2013).¹² Following the stream metaphor, downstream engagement refers to inclusion of the public at a late stage to test acceptance and do user testing of a near-finished product. Google's *Glass Explorer* is a good example of this strategy, in which select individuals have been allowed to try out a near-finished prototype for the purpose of reporting user experiences back to Google.¹³ One problem with these is that the upstream agenda setting often occurs too early and initial concerns become irrelevant or

¹² Cf. http://www.ecsite.eu/activities_and_resources/projects/voices

¹³ Cf. <http://www.google.com/glass/start/explorer-stories/>

forgotten later in the process, whereas downstream regulation often occurs too late to be effective, especially because it is much more difficult to remedy basic problems when prototypes have already been made – both technically and economically. This is of particular importance to privately funded R&I, because it often depends on a fast turnover from research and development to market. To cover this gap between agenda setting and end-user involvement, *midstream* modulation has been proposed, which refers to the integration of stakeholders into the process of research and innovation itself (Fisher et al., 2006; Fisher & Rip, 2013). According to a recent report, it was demonstrated that midstream modulation “can be usefully deployed to enable project leaders to actively include [social and ethical aspects] in their R&D processes, thereby also measurably improving their R&D projects” (Flipse, van der Sanden, & Osseweijer, 2014, p. 12).

One problem when it comes to the applicability of this dimension is that the discourse is usually decoupled from the concrete and messy ways in which R&I is actually carried out, hence may not be applicable to concrete circumstances. Value-sensitive design, Privacy by design, Impact assessments, Anticipatory Ethics, Technology assessment and user engagement are all important tools for RRI, but they may not always dovetail nicely with the actual practices. Indeed, the RRI discourse appears to pay little attention to concrete design and development methodologies, even when these are implemented as standard practices in industry. With regard to our application domain ICT, there is a large range of different design methodologies, such as waterfall, prototyping, iterative and incremental development, spiral development, rapid application development, and extreme programming.¹⁴

¹⁴ Cf. <http://www.itinfo.am/eng/software-development-methodologies/>

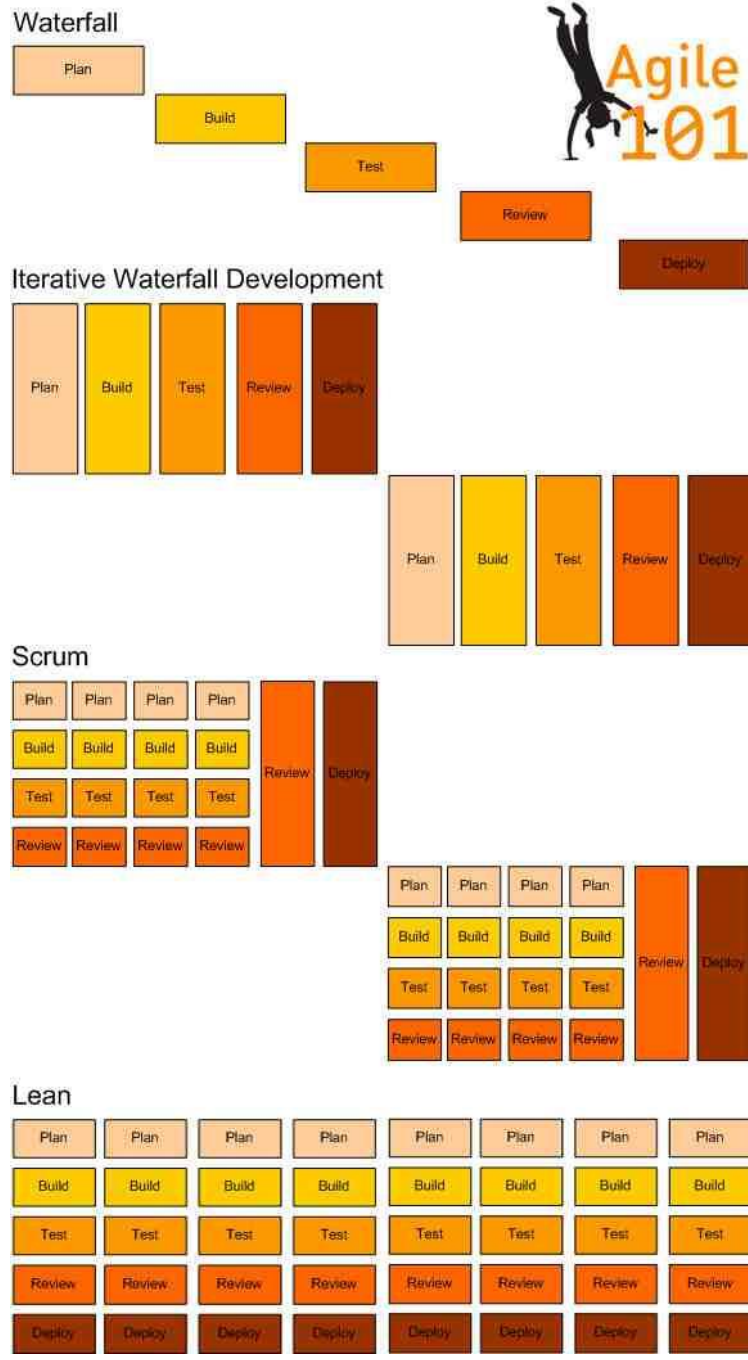


Table 1 Tara Whitaker's illustration of the differences between four central software design methodologies (source: <http://www.allaboutagile.com/agile-vs-waterfall-vs-iterative-vs-lean-software-development-in-pictures/>)

These methodologies differ substantially when it comes to the order of planning, building, testing, reviewing and deploying – which in turn will determine how and when stakeholders can and should be involved, and how and when to evaluate risks throughout the process. For example, a ‘Scrum’ methodology has

several recurring points of evaluations whereas a ‘waterfall’ model places risk evaluation earlier in the process with less opportunity to reevaluate further “downstream”. Regarding applicability of the discourse, the entire “stream” metaphor presupposes a more or less linear process of R&I which may bear little resemblance to actual practices. As pointed out by several scholars, it seems evident that the choice of design methodology will have a major impact on when and how RRI principles can and should be implemented, yet little research exists on how to tackle this problem. This also clearly shows the need for interdisciplinary research, since the implementation of the corresponding RRI principles require a deep knowledge of actual R&I practices – messy and ad hoc as they may be.

All of this becomes even more complicated when considering other ways in which the public takes a role in the conduct of the research such as citizen or crowd-sourced science (Hankins, 2012). In an industrial context this would seem to be similar to open innovation approaches (Hippel, 2006), where customers are used as co-developers. This could be seen as an additional *obstacle* to implementing RRI dimensions, since it will typically include non-professional stakeholders. These may be even further removed from principles and tools of RRI –certainly when it comes to their institutionalized forms in the shape of certification or codes of conduct (cf. 3.3 and 3.4).

All of this is particularly important given one of the most widely discussed issues concerning professional responsibility, which is the ‘problem of many hands’ (van de Poel, Nihlén Fahlquist, Doorn, Zwart, & Royakkers, 2012). Another problem with the academic discourse in this regard is the general disagreement over which types of entities are to count as responsible subjects -- in particular whether companies should be regarded as such (Stahl, Eden, & Jirotko, 2013, p. 215). This problem is a result of the fact that many current engineering practices, ICT in particular, include so many individuals in the design process that it becomes difficult if not impossible to retrospectively identify whom should

answer and make amends for the outcome (Simon, 2014). In order to better understand whether and how academic frameworks of RRI can be applied to Industry, there is a need to evaluate them against the concrete methods that various types of Industry *actually* employ. Given the diversity of design methodologies and their more or less rigorous implementation, this is likely to entail that there can be no “one-size-fits-all” approach to RRI in industry, but that the most promising route is to tailor these frameworks for specific industry sectors *and* for differently sized organizations.

3.2 Lessons from CSR

More or less independently of the RRI discourse itself, industry has in recent decades developed the approach of Corporate Social Responsibility (CSR), an approach that has many of the same objectives as RRI. CSR is a form of self-regulation aimed at ensuring the active compliance of businesses with the spirit of the law, ethical standards, international norms, and (in some cases) furthering social goods beyond the interest of the firm and that which is required by law. CSR is not designed to apply to R&I specifically. It is intended to apply to all activities of firms, including contracting, marketing, production, accounting, investor relations, and so forth. R&I is therefore only one of the possible activities of firms to which CSR strategies are applied.

As stated in the EU Call for developing governance for the advancement of Responsible Research and Innovation (H2020-GARRI-2015-1), “existing initiatives such as Corporate Social Responsibility (CSR) have set first steps but improved business governance is needed that deeply embeds creativity, scalability, responsiveness, “glocality”, circularity and societal engagement”¹⁵. The difference between CSR and RRI may be overstated, however, as indicated in

¹⁵
<http://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/topics/2409-garri-2-2015.html>

the table below, in which the central RRI dimensions are mapped onto corresponding topics in CSR:

RRI dimension	CSR dimension
Engagement Involvement of society in R&I	Stakeholder engagement (Multi-stakeholder approach/Multi-Stakeholder Initiatives (MSIs))
Gender equality	Worker Rights; Human Rights
Science Education	Sustainability, Sustainable Development, Welfare, Community Investment, Human Rights, Social Impacts
Open Access Transparency	Sustainability, Sustainable Development, Stakeholders Engagement, Philanthropy, Welfare, Human Rights, Corruption (Transparency)
Ethics	Business Ethics
Governance	Corporate Governance, Legal Compliance, Business Ethics
A proactive approach to R&I benefits	Sustainability, Sustainable Development, Community Investment, Stakeholders Engagement, Welfare, Human Rights
Anticipation and reflection	Sustainability, Sustainable Development, Environmental management/environmental impacts, Social Impacts, ESIA, Business Ethics

Table 2 Correspondence between RRI and CSR dimensions (based on unpublished research by Agata Gurzawska)

CSR clearly meets some of the objectives of RRI. It is a way of doing business responsibly. It actively seeks to adhere to ethical standards and societal norms. It seeks to involve stakeholders and to anticipate impacts. And the more expansive versions of CSR see firms as having a role in promoting social goods beyond their own interests (Besley & Ghatak, 2007).

To what degree CSR, as currently understood, is an acceptable interpretation of RRI for industry requires further investigation, particularly when it comes to whether strategies and dimensions of RRI are already being incorporated into CSR strategies, the extent to which CSR can be extended and transformed to incorporate RRI objectives and dimensions, and the means by which this can be achieved. Broadly speaking, these means include self-regulation, governmental regulation, government-industry covenants and agreements, governments incentives and taxation, public-private partnerships, and the use of codes and certifications. Although several interesting RRI research projects that take CSR into consideration are being carried out,¹⁶ the long history of CSR and its explicit attention to Industry incentives needs to be better integrated with RRI research in order not to reinvent the wheel. In particular, the question of Industry applicability could learn a lot from the explicit CSR acknowledgment of the need for marketplace incentives. We will return to several CSR-related issues that could and should be more strongly implemented in RRI below, in particular the two that appear the most straightforward to implement, certifications (3.3) and codes of conduct (3.4).

3.3 Certifications and standards

One pronounced difference between RRI and CSR relates to the use of standards and certifications as tools for promoting responsibility in industry. RRI suffers from a lack of tools devoted to assist Industry in implementing RRI principles. CSR instruments can significantly assist in the implementation of RRI since they are developed much more explicitly with private industry in mind –dealing with dimensions such as ethical acceptability, risk management related to social, ethical and environmental issues, and human wellbeing. Indeed, the European Commission in its report on options for strengthening responsible research and innovation has suggested that these tools could assist in the development of a common framework for RRI (European Commission, 2013). EU has also endorsed several such tools, but they need further promotion, as evidenced by

¹⁶ See e.g. <http://www.progressproject.eu/>, <http://www.great-project.eu/>, <http://res-agera.eu/>.

the fact that only 33% of 200 randomly selected large companies meet the Commission's call to use at least one of the following CSR tools: UN Global Compact, OECD, Guidelines for Multinational Enterprises and ISO 26000 (Schimanski, 2013). If an RRI certification is to be developed, it could build on a number of existing standards such as ISO 26000 and the ISO9000 family of management standards. As noted by Sutcliffe (2011), the Stakeholder Engagement Standard (AA1000SES) is promising insofar as it gives guidance on the quality of stakeholder engagement, and mechanisms such as the Global Compact, Global Reporting Initiative and the OECD Guidelines for Multinational Enterprises all emphasize stakeholder engagement. Still, as noted by Sutcliffe, they all need to be evaluated from an RRI perspective since they are very limited in that area despite having similar goals.

Most of these standards are certifiable by third parties, called certification bodies, and require from companies to develop and implement a management system. The aim of this system is to demonstrate companies' ability to operate their business activities in a way that meets societal and applicable regulatory requirements. The incentive for industry stems from potential collaboration partners requiring a company to have specific types of certification – which is especially important for industry that seeks to cooperate with governmental agencies, as well as companies who wish to safeguard their brand by only dealing with partners that have been certified in areas they deem important. Beyond genuinely ethical and competitive motives, there are also relational motives, i.e. the conception that practices endorsed by the institutional environment are the ones, which are perceived as legitimate forms of behaviour by society and this is why companies end up adopting them (Bartley, 2003; Delmas & Montes-Sancho, 2011; Glynn & Marquis, 2004; Waddock, Bodwell, & B. Graves, 2002).

These certifications can be quite expensive, however, which leaves them difficult to obtain for smaller companies, and – in their current form – the standards also

seem inapplicable to alternative and more small-scale forms of innovations, in particular when involving crowdsourcing and open source (Jelliffe, 2007). Thus, there is a need for developing certifications that are less economically and bureaucratically burdensome, which may require publically funded certification agencies instead of the current dominance of private certification bodies subject to market forces.

Another fundamental problem with certification is that they are mainly required for cooperation internal to industry, and primarily when such cooperation involves governmental institutions and/or public funding. On the basis of a literature review and their own empirical study, King, Lenox and Terlaak conclude that there is a need for more substantial research to better understand the strategic motives for adopting various types of certification: “why firms choose to certify, how certification influences behavior, and how outsiders interpret certification remain largely unknown” (King, Lenox, & Terlaak, 2005, p. 1091).

The motives for adopting certification *logos* is more straightforward, as they are intended to signal the adherence to various standards to the public and thereby provide a competitive edge. This also involves certification agencies that charge for the use of their logos and is dependent on consumers being informed about (as opposed to instructed) what the label entails. Related to this, several researchers have raised criticism of various types of abuse and manipulation of the certification logo industry, requiring reviews of “the market-based self-regulation of quality certification ... to put quality back in quality certifications” (Abdullah, Mustapha, Kaliannan, & Ali, 2009). Both types of certification are also typically concerned with very particular aspects of a product, such as its environmental impact or the origin of raw materials, so it is also a challenge to have certification play a role in more holistic assessments of RRI, taking the whole value chain into account – assessing both products and process.

The power of these kinds of standards, even when restricted to public procurement, should not be underestimated. Public procurement of goods and services amount to more than 19% of the GDP of the EU (European Commission, 2013, p. 45). Hence, **the alignment of public procurement with RRI principles – possibly by means of tailored certifications – could be a very important means of supporting and fostering RRI in industry.** Indeed, this approach holds particular promise when it comes to ICT for healthy ageing which are often procured by governmental institutions. By creating and stimulating a market for R&I carried out according to RRI principles, this can provide strong incentives simply by carrying out public procurement in line with RRI principles. The EC guidelines for public procurement (European Commission, 2010) could for instance be integrated with RRI principles to a larger degree.

Given the importance and promise of integrating CSR tools in order to make RRI more applicable and relevant to industry, we will not discuss this further in this report but refer to our separate deliverable produced by Konstantinos Iatridis (UCLan), in which we provide an exhaustive overview of standards, global initiatives and principles that significantly overlap with the aforementioned RRI dimensions (2.3).

3.4 Codes of Conduct

One of the tools that have become standard for fostering ethical awareness and responsibility in industry are codes of ethics. If we stay within the scope of our application domain ICT, the combined codes of ethics from IEEE-CS and ACM have become the standard in the field (in particular for *software* engineering) also internationally.¹⁷ The Information Technology sector also often makes use of frameworks and protocols common to engineers in general. One fundamental problem is that there is little international standardization of such codes, and their actual effect on R&I practices is uncertain and difficult to measure.

¹⁷Cf. <http://www.acm.org/about/se-code>

Furthermore, such codes have been produced by a myriad of organizations, locally, regionally and (to a lesser extent) globally. Just to illustrate this problem, the following is just a partial list of the many codes of ethics in ICT alone:

- [Australian Computer Society Code of Ethics](#) *Australian Computer Society*
- BCS, The Chartered Institute for IT [Code of Conduct](#)
- Canadian Information Processing Society [Code of Ethics](#)
- [Computer Society of India](#) *Computer Society of India*
- [Hong Kong Computer Society Code of Ethics](#) *Hong Kong Computer Society*
- [AITP Code of Ethics](#) *Association of Information Technology Professionals*
- [SAGE Code of Ethics](#) *System Administrators Guild*
- [NSPE Code of Ethics](#) *National Society of Professional Engineers*
- *Nederlandse Vereniging voor Registerinformatici*: <http://www.vri.nl/wp-content/uploads/2012/09/Gedragcode-VRI-17092012.doc>.
- [ACM Code of Ethics and Professional Conduct](#) *Association for Computing Machinery*
- [New Zealand Computer Society Code of Ethics](#) *New Zealand Computer Society*
- [Code of Online Business Practices](#) *Better Business Bureau*
- American Society for Information Science and Technology Professional Guidelines
<http://www.asis.org/AboutASIS/professional-guidelines.html>

There are other fundamental problems with using such codes for the purpose of advancing RRI in industry, as well. They are typically specific to a firm or industry and do not necessarily take into account the interests of external stakeholders. Their credibility is also limited as companies adhering to codes of conduct are usually subject to internal scrutiny and are not accountable to a broader constituency (Leipziger, 2010). As discussed in more detail below, it could also be argued that they are redundant, insofar as codes of conduct are typically integrated into international standards and certifications when tested and matured enough. **There is also a need for more research on the actual effect codes of ethics have on the workplace before we can make a judgment about whether it can and should be used as a tool for promoting RRI in industry.** Von Schomberg argues that “Codes of Conduct, in contrast to regulatory

interventions, allow a constructive steering of the innovation process. They enable the establishment of a proactive scientific community which identifies and reports to public authorities on risks and benefits at an early stage” (Von Schomberg, 2013, p. 67). Judging from the scant evidence available, there is reason to be pessimistic about this, however. For instance, Cleek and Leonard (1998) gathered evidence indicating that “corporate codes of ethics are not influential in determining a person's ethical decision-making behaviour” (Cleek & Leonard, 1998, p. 619). Even more critical, Long and Driscoll performed a comprehensive study of how legitimacy is derived from codes of ethics, concluding that their “primary purpose is to ensure employees minimally conform to the rules in society so that the organization is able to pursue its self-interests without interference” (Long & Driscoll, 2008, p. 187)

3.5 The importance of Distinguishing Sectors

Some of the RRI discourse seems to neglect the immense differences between different types of industry sectors, as well as different types of industry configurations. The size and organization of a company is perhaps one of the most important aspects here, since the ability and willingness to balance profit with RRI principles is clearly a function of the specific company's size and ambition. In particular, **there is likely a need for entirely different RRI tools and principles for large businesses compared to small- and medium-sized businesses**. As indicated above (3.3), certification can for instance be a costly process that is only viable for companies with a large turnover. Whereas large businesses can more easily absorb any expenses that come with certification, stakeholder involvement, ethics education and generally following responsible standards, the same mechanisms may be impossible for a small business to undertake.

Furthermore, there are also vast differences between industry sectors. Since RRI is clearly related to models of accountability, cooperation, localization, size, organizational structure, design methodologies and modes of production, the

ways in which to promote responsibility will necessarily differ from sector to sector. **There is a need for more research into how RRI needs to be tailored to different types of industry, and different types of organizational structures, and there may be reason to keep some of this discourse sector-specific.** That is, the question of how to foster RRI in *industry* may be too vague, and we should rather ask the question of how to foster RRI in particular types of industry.

3.6 Operationalization of public good and well-being

Swierstra and te Molder argue that “Policy and technology actors seem to focus “naturally” on risk rather than on technology’s social and ethical [as a] result of the way discourses on technology and policy are structured in technological, liberal, pluralistic societies. Risks qualify as “hard” (i.e., objective, rational, neutral, factual), other impacts as “soft” (i.e., subjective, emotional, partisan, value-laden) and are therefore dismissible” (Swierstra & te Molder, 2012, p. 1049). The problem is that the “public good” is such a vague and multi-faceted dimension that it is hard for industry to effectively take them into account when considering the costs and benefits of various processes and products. Von Schomberg also holds that the normative ideals of RRI cannot “appeal to concepts of the good life [but must] appeal to the normative targets that we can find in the Treaty on the EU” (Von Schomberg, 2013, p. 57). Theoretical conceptions of the “good life” do tend to be either too thick (hence paternalistic) or too thin (without substantial implication), so von Schomberg does have a point. **What is needed, therefore, is a more concrete operationalization of the public good. A promising candidate to this effect can be found within recent developments in empirical research on subjective well-being,** such as positive psychology and happiness economics (see e.g. (Frey & Stutzer, 2010)). With a more robust, concrete and empirically supported conception of well-being, it may be easier for companies to take this more explicitly into account, and to more readily evaluate how their products will affect the well-being of stakeholders – not only hard impacts like injury, damage to property and the like, but also the effect they may have on users’ everyday well-being. This could

indeed be part of the solution to going beyond industry-regulation of harms. Despite the central position occupied by “public good” in both EU and academic discourses, comparatively little work has been done on how to operationalize these values, and how to make them concrete enough to be of use for industry.

3.7 Underrepresented academic disciplines and frameworks

The academic RRI (and CSR) discourse seems to be driven by several closely related disciplines, in particular science and technology studies, philosophy, innovation studies, governance studies, and business studies (and cognates). There are several other fields that are underrepresented, however, for various reasons. As we will return to in 3.18, Van Oudheusden argues that both academic and policy-oriented approaches to RRI “largely ignore questions about the politics in and of deliberation, the authoritative allocation of values, and the institutional uptake of deliberative engagements” (van Oudheusden, 2014, p. 67)

Another somewhat striking gap, given the fact that we are talking about responsible *research* and innovation, is philosophy of science. As Gry Oftedal argues, “philosophy of science [should be] a central feature of RRI, not least because openness, transparency, and a broader involvement in research and innovation will require methods, assumptions, and values in research to be explicit, understood, and discussed” (Oftedal, 2014, p. 2).

When it comes to our application domain, ICT, the fields ‘ethics of technology’ and ‘computer ethics’ have a long history of tackling issues related to privacy, professional responsibility, workplace environment, value-sensitive design and a host of other topics that should inform the RRI discourse to a larger degree than what is currently the case. Other fields of study that could provide decades of research as input to the relatively more recent field of RRI include gender studies as well as disciplines like sociology, psychology, and political science. Several other disciplines are also mentioned in the other subsections. Of particular importance here is applied psychology, including positive psychology for the

purpose of operationalizing public good and social psychology for the purpose of better understanding how different workplace environments and R&I practices fosters responsibility (cf. 3.9). To facilitate these contributions, we need to better understand how to foster interdisciplinary research. **For future RRI research projects and corresponding funding instruments, there is reason to more explicitly promote (or require) more interdisciplinarity** – and to steer this research in such a way as to provide results that are useful beyond the academic discourse itself (Jahn et al., 2012; Taebi, Correljé, Cuppen, Dignum, & Pesch, 2014). In the other subsections, we also identify economists, applied ethicists and the engineers themselves as important contributors to the RRI discourse itself. **The field could, in other words, benefit substantially from more substantial contributions from political science and political philosophy, psychology, applied ethics, sociology, engineering, economics and other disciplines that are currently underrepresented.**

3.8 Underrepresented Societal Needs

In their report “Options for Strengthening Responsible Research and Innovation”, the *Expert Group on the State of Art in Europe on Responsible Research and Innovation* argue that there are several societal needs that have received relatively little attention in both academic and policy-oriented RRI discourses – and also receives little attention from researchers, companies and governments (European Commission, 2013). They argue that **there is a clear potential and need for the RRI discourse to more explicitly include underrepresented societal needs such as development policies, social cohesion, innovation in underdeveloped areas, poverty dynamics, rare and neglected diseases, and scarce resource management.** The reason these may have received comparatively little attention could be that they appear to be problems that are more common in third-world countries (hence treated under the heading of foreign aid instead of RRI), but the expert group points out that these also manifest themselves in modern European societies. As the authors also suggest, **these may hold particular promise when it comes to Industry applicability, since**

they may come with several easily recognized incentives insofar as they give rise to business opportunities for companies that may create virtuous economic dynamics in depressed areas or social sectors (see also Annex IV in the aforementioned report). This seems to be particularly relevant when it comes to the area of ICT for healthy ageing, where there should be several opportunities for relating underrepresented social needs with incentives (see 3.12).

3.9 Workplace environment

Another area that has received relatively little attention in the RRI literature itself is the workplace environment. This is unfortunate because this is an area in which employee well-being, productivity and responsibility may come together in mutually supportive ways and provide easily recognizable incentives that could foster RRI in industry. For instance, Harter, Schmidt and Keyes “demonstrate that the presence of positive workplace perceptions and feelings are associated with higher business-unit customer loyalty, higher profitability, higher productivity, and lower rates of turnover” (Harter, Schmidt, & Keyes, 2003, p. 205). Although there are mixed findings, there are several studies supporting this so-called “happy-productive worker” hypothesis, which demonstrate that there are profit maximizing incentives for increasing employee well-being (Zelenski, Murphy, & Jenkins, 2008). This is only one part of the picture, however, and there is comparatively little research demonstrating whether happy and productive workers additionally demonstrate increased responsibility and ethical awareness. There are two possible directions of causation at play here. First, Giacalone and Promislo argue that “decrements in well-being result from stress or trauma stemming from being victimized by, engaging in, or witnessing unethical behavior, or even from being associated with individuals involved in such behavior” (Giacalone & Promislo, 2010, p. 275), based on data from psychological, criminological, and epidemiological sources. In other words, working for a company that is perceived as unethical, by oneself and/or the public, can lead to decreased well-being, which in turn leads to decreased productivity. A second causal relation could go from employee well-

being to ethical awareness. Although there is a lot of research showing strong correlations between ethical behavior and subjective well-being (Diener & Ryan, 2009; Giacalone & Promislo, 2012), it is more difficult to establish a clear causal direction from one to the other. **More research is needed to better understand the causal, not merely correlational, relationship between ethical behavior, well-being, and productivity. This may turn out to be the key for RRI in industry,** but then it is important to further investigate the hypothesis that industry should act more responsible *because* this leads to increased employee well-being *and* increased productivity.

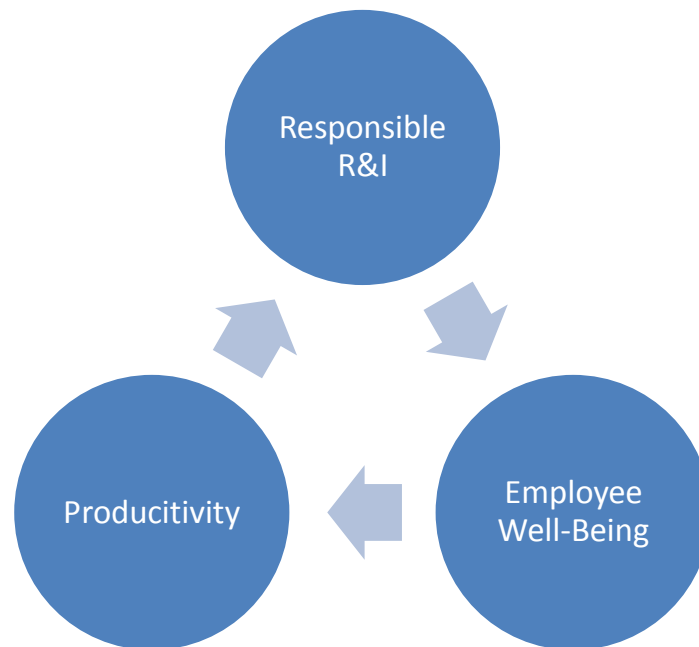


Table 3 *If there is a causal relationship between RRI, employee well-being and productivity, this could act as strong incentive for RRI in even the most self-interested Industry.*

3.10 Ethics Education

As mentioned in the introduction, it is important to consider even the most ruthlessly profit-maximizing management when considering the applicability of RRI to industry. This is clearly not the case in all of industry (Brebels et al., 2011; Heugens et al., 2008), so it is also important to provide tools, principles and education to leaders who do not ask *why* they should engage in RRI but *how* to

do so. As mentioned, this is the topic of several other FP7 projects so we will not address this topic at length here. It should be mentioned, however, that there is some empirical evidence that having gone through ethics education increases ethical awareness and ability to make all-things-considered decisions (Luthar & Karri, 2005). This research remains inconclusive, however, because of the difficulty of measuring long-term effects, and a rather narrow focus on medicine and finance.

Still, there is good reason to believe ethics education has a positive effect, which leaves the question of how to ensure that industry leaders and decision makers are properly educated. This is indeed one of the areas in which public policy can have a strong impact on private industry, insofar as publically funded education requires a strong ethics component. **More research is needed, however, when it comes to how ethics education can be made most effective, how to provide the corresponding support infrastructure (3.11), and how we can make sure that this has a tangible effect on the students' later careers.**

3.11 Support Infrastructure

Whichever recommendations we end up giving, their implementation will be dependent on a support infrastructure. Policy needs to be communicated, the community will need to be sustained, ethics education needs to be institutionalized, tools and methods need to be made available, curricula need to be disseminated etc. Important elements to this effect include (online) provision of tools and methodologies, collection of good practices, development and dissemination of curricula, mentoring schemes, and support systems for relevant networks and communities. A major challenge in this regard is to not only make such infrastructure available, but also to foster their use. **It seems that in order to make any RRI mechanism appropriated by industry, such mechanisms must not only be made available, but their existence, usage and benefits must be communicated to industry – which in turn also requires particular infrastructure**

for efficient communication with industry. How this is best achieved has so far received little attention in the literature.

3.12 Market Demographics

At the kick-off meeting for RESPONSIBLE-INDUSTRY, a presentation was given by Anne-Sophie Parent, Secretary General of AGE Platform Europe¹⁸, on the challenges facing elderly in society. When asked how to incentivize industry to take the interests of the elderly into account, the simple response was that industry needs to acknowledge that the elderly is a large, heterogeneous and powerful consumer group, and that industry tends to market their products towards younger demographics and corresponding needs and goods. Just to illustrate, Facebook was initially targeted at high school kids and young professionals, but has increasingly been taken over by the elderly. In the US: nearly half of people aged 65+ are now on Facebook.

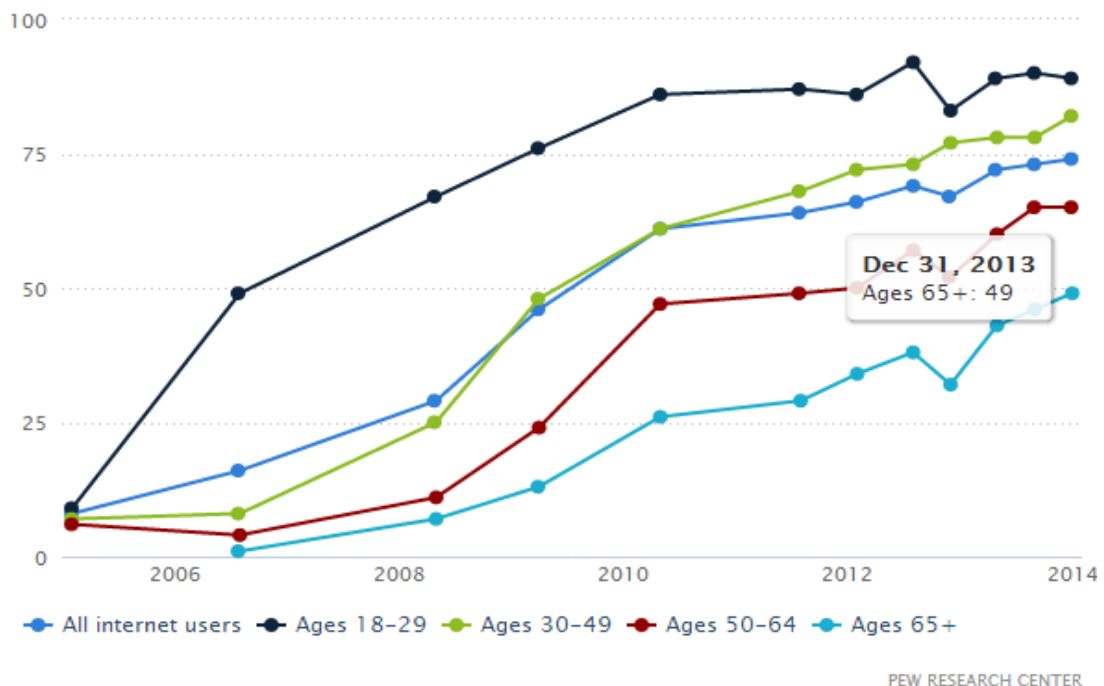


Table 4 Percentage of online adults who use social networking sites. Notice the dramatic increase in ages 65+ (source: <http://www.pewinternet.org/data-trend/social-media/social-media-use-by-age-group/>)

¹⁸ <http://www.age-platform.eu/>

This is not only a contingent and temporary situation. It is well known that the ratio of young and old will change quite dramatically in the years to come, meaning that products and services aimed at the elderly makes sense also from a purely self-interested perspective, since this demographic will increase substantially in the years to come. Indeed, there is already significant evidence that over the last several decades the spending power of the older section of the population has grown and will continue to do so (Kingman, 2013). Paying attention to the need and interests of the underrepresented demographics like the elderly is, in other words, an RRI principle that is also beneficial to the bottom line. This is an area in which RRI principles may lend incentives from advertising and marketing research, even though it may be questioned whether they should be coupled to such contingent and pragmatic ends.

3.13 New forms of R&I

The RRI discourse seems to predominantly concern itself with traditional platforms for innovation, based on traditional institutional structures with management, shareholders and employees. More recent platforms for innovation are hardly mentioned in the literature, particular when it comes to the emerging markets of crowdsourcing and crowdfunding. This may seem to be a negligible domain of industry, but crowdfunding platforms raised \$2.7 billion USD in 2012, estimated to have risen to \$5.1 billion in 2013. In 2012, more than 1 million campaigns were funded through crowdsourcing.¹⁹ This gives rise to a very different form of R&I, e.g. through platforms like KickStarter. They typically start from individuals having an idea, as opposed to client requirements, and require active interaction with the funders, before, during and after the development stage. The responsibility issues in this domain are likely to be different from more mainstream forms of R&I because user participation is intrinsic to the process and because the reputation of a company – based on their success with previous crowdfunding projects – largely determines the success of subsequent

¹⁹ Cf. http://www.huffingtonpost.com/2013/04/08/global-crowdfunding-rises-81-percent_n_3036368.html

projects. Indeed, the RRI dimensions of citizen engagement, science literacy and open access (cf. 2.3.1) are in some ways intrinsic to crowdfunding, so this could be an area from which the RRI discourse could benefit, as an object of study and venue for experimentation.

This is an interesting domain, also because it shows how policy shapes the industry landscape. Crowdfunding was largely made possible in the US due to the JOBS act,²⁰ which removed several regulations that previously made it difficult to start a company on the backs of a large class of micro-scale funders. Again, this is an area in which governmental policy can dramatically change the framework conditions for especially small and medium-sized businesses.

3.14 New forms of consumer power and online tools

Following the 2008 financial crisis, we saw the emergence of groups like the occupy movement,²¹ which protested against income inequality and the way in which especially large corporations run their business in such a way as to disproportionately benefit the wealthy, undermine democracy, and disregard public values – all of which stand in stark contrast to RRI principles. The slogan of “we are the 99%” indicates that these issues are determined by a wealthy minority, but also that consumers have the power to change the ways of industry. There is also a close connection between these types of movements and social media, and services like Twitter and Facebook are increasingly used by consumers to call out what they see as unethical business practices. To take but one example, the Dutch bank ING recently announced that it would start using their customers’ purchase histories for the purpose of tailored advertisements. The public responded with massive protests on twitter and Facebook, and ING retracted their decision only days later.²² This implies that consumer protest movements armed with social media may become an increasingly important

²⁰ Cf. <http://majorityleader.gov/uploadedfiles/JOBSACTOnePager.pdf>

²¹ Cf. <http://www.occupytogether.org/>

²² Cf. <http://www.ftm.nl/ing-trekt-big-data-plan-terug/>

“watch dog” in the future, and that this in itself could act as an important incentive for industry to act responsibly. As also pointed out by the ‘Expert Group on the State of Art in Europe on Responsible Research and Innovation’, “Anticipating and measuring the costs of stranded research and innovation (R&I) public investments in case of induced social unrest, ethical controversy and weak or non-existent demand will be beneficial in times of increasingly limited financial means” (European Commission, 2013). Although such unrest and controversy is more likely when public investments are involved, this is of course not a requirement – and the most important incentive for industry to research and innovate responsibly is probably to mitigate the risk of public opposition and protest. As stated and demonstrated in the report, there are “countless examples of innovation that have been contested by societal actors because of ethical concerns or because of their failure to meet societal needs” (ibid).

In addition to this, there are also several services online intended to monitor industry practices in various ways. One prominent example is Ethical Consumer, which is an independent, not-for-profit, multi-stakeholder co-operative with a mission to make global business more sustainable through consumer pressure – mainly by providing more than 200 interactive, online ethical product guides, many of which correspond closely to RRI dimensions.²³ Initiating and/or supporting online consumer guides that reflect RRI dimensions may be a promising venue for increasing transparency and accountability in a way that cannot be ignored by Industry.

²³ Cf. <http://www.ethicalconsumer.org/buyersguides.aspx>

Brand	Rating out of 20
Global Seesaw	16
New Internationalist shop	16
Animal Aid shop	15
Oxfam	14.5
Cebra	14.3
Green Tulip	14
Nigel's Eco Store	14
Viva Shop	13.5
Nkuku	13.3
Amnesty Shop	12.5
Ethical Wares	12.5
Evolution	12.5
Green Shopping	12.5
Shared Earth	12.5
Ecotopia	11.5
RSPB shop	11.3
Traidcraft	11
Fairtrade Warehouse	7.8
Ethical Superstore	7
Hive	7
Natural Collection	7
WWF	6.5
Made Closer	6.3
John Lewis	0
The Co-operative electrical	0

Customise the scorecard ratings

- +Environment: [Slider]
- +Animals: [Slider]
- +People: [Slider]
- +Politics: [Slider]
- +Product sustainability (+ve): [Slider]

Click the + icon to expand categories

Save → To save your personal score settings and use them elsewhere around the site, please [Log In](#).

► Help

▼ How the Sliders work

← Less Important More Important →

Move the sliders to see how different issues affect the score table

Refine each category by clicking the + icons

Save your settings (you need to be signed in first)

► Key to expanded Score table

Table 5 Interactive product guide from Ethical Consumer, showing social and environmental records of companies

Closely related to this, we increasingly turn to the Internet for answers when we find ourselves with everyday dilemmas, yet there exist no comprehensive online tools to assist industry in their ethical deliberations. There are some software tools that can be used to address issues and support research and innovation, including the Software Development Impact Statement (SoDIS). As summarized by Gotterbarn and Clear (2004), this consists of four stages:

- (1) the identification of the project type together with immediate and extended stakeholders in a project,
- (2) the identification of the tasks in a particular phase of a software development project,
- (3) the association of every task with every stakeholder using structured

questions to determine the possibility of specific project risks generated by that particular association, and

(4) completing the analysis by articulating the concern generated by the associations, determining the severity of the risk to the project and the stakeholder, and recording a possible risk mitigation or risk avoidance strategy.

The resulting output identifies all potential qualitative risks for all tasks and project stakeholders. Another tool in this vein, but focused more squarely on Nanotechnology, is CodeMeter, an advanced spreadsheet that functions as an electronic self-assessment and learning tool based on the EC Code of Conduct principles and values.²⁴ The actual effect of such tools and the willingness of Industry to base decisions on them remain unclear, however.

3.15 Public relations, branding and consumer power

One of the most obvious incentives for a company to act ethically is to engage in various forms of philanthropy. We argue, however, that this should not be seen as part of the RRI discourse. The reason is simply that we are concerned with how to ensure that *research and innovation processes* are conducted in a responsible manner, and philanthropic activities will typically be external to the R&I itself. RRI cannot be a balancing act in which lack of attention to responsibility during R&I can be outweighed by philanthropic activities.

This is particularly the case since **the relationship between company branding and the actual R&I practices has not received much attention in the RRI literature.** This is another area in which increased interdisciplinarity could be helpful, since there is some research on this in the field of applied psychology. For instance, one comprehensive meta-analysis showed a strongly significant relationship between individual job satisfaction and individual performance (Judge, Thoresen, Bono, & Patton, 2001). Furthermore, “both qualitative and

²⁴ <http://www.nanocode.eu/files/NanoCode-CodeMeterToolReport.pdf>

quantitative data have indicated the importance of the supervisor or the manager and his or her influence over the engagement level of employees and their satisfaction with their company” (Harter, Schmidt, & Hayes, 2002, p. 269). In other words, a company’s reputation, to a large degree determined by their ethical and societal involvement, may have a strong influence on employees’ pride in their company, which in turn effects their individual performance. Philanthropic activities can of course contribute to a company’s reputation, but can hardly cover up visibly negative consequences from the company’s practices and end products. Still, **there is a need to better understand the relationship between employee loyalty, employee performance, and the company’s external image.** There is some research on this available in several fields of psychology and business studies, but this appears largely untapped in the RRI discourse.

Second, and perhaps more importantly, philanthropy, RRI and market incentives can come together in some cases. One example is Google’s Silver Surfer Towns project (<http://www.silversurfertowns.ie/>), an initiative to help communities in Ireland get their older residents online. The philanthropic element lies in the (supposed) added value of bringing families and communities together across digital divides; the RRI element lies in attention to designing their products for the elderly (the value of ‘inclusiveness’); and the market incentive comes from an increase in Google’s customer base. **Finding ways in which philanthropy can be coupled with RRI dimensions and market incentives holds promise for fostering RRI in industry,** and this relationship can be better understood by the means of case studies (which form part of RESPONSIBLE-INDUSTRY work package 1) .

3.16 Workplace Equality

Just as with philanthropy above, it may be argued that gender equality is irrelevant to RRI, since it implies that gender alone has an effect on whether a company engages in irresponsible practices. There is still a case to be made for an inclusive and diverse workplace when it comes to RRI in industry, however. First, **the mere fact that minorities are represented in the company is an**

important (even if insufficient) condition for having the voice of minorities represented. With regard to the application domain at hand, ICT for elderly, it may be important to have elderly represented in the workforce as well. Stakeholder involvement does not have to be limited only to the general public, in other words, but may to a large degree be facilitated by having a diverse staff that is more likely to recognize the needs and interests of those minorities and less likely to discriminate against said minorities, just in virtue of the fact that they are actively involved in everyday operations. Using the aforementioned stream metaphor, minorities in the workplace can represent those voices at all points of the innovation cycle.

3.17 Science communication and Open Access

As outlined above, one of the pillars of RRI relate to science communication and open access to scientific results. **There is relatively little attention paid to any self-interest incentives that can be derived from open access, however. It is important, therefore, to investigate how such practices actually benefit the industry itself.** There are several candidates for such incentives, especially in the sector of ICT. Most importantly, several companies – Google perhaps being the prime example²⁵ –, have benefitted tremendously from improvements made by the open source community. In many instances, this can be precisely the type of win-win scenario that RRI in industry needs, where the corporation itself benefits from making (aspects of) their products freely available without restrictions.

Open data is another important area of concern. There are several benefits to open data, but transparency is probably the benefit that lies closest to the goals of RRI. According to Ton Zijlstra, an independent consultant working on making companies release their data, there are several incentives for doing so, also for private industry. First, and most evident, others may find new uses for the data

²⁵ <https://developers.google.com/open-source/projects>

that in turn benefit the company itself. That is, by publishing data they can do interventions in their markets for the benefit of others in their supply chain that will yield them profit. For instance, Liander is a Dutch utility company with a monopoly on energy transport and therefore prohibited to innovate. They publish open data hoping it will lead to innovations by others, that they then can adopt/buy to improve their own work (cf. <http://www.liander.nl/opendata>). One could also imagine banks publishing open data on what they know about e.g. food markets, so that farmers can earn better money for their crops. That would reduce the risk on the farming credits the banks hold. If a bank has a large number of customers invested in farming, reducing the risk on their farming loans can be clearly beneficial.²⁶

As these examples show, the use of open data (relating to the RRI value of 'transparency') can be shown to have several incentives, but there is a need for making industry understand how (best) to open up their innovation process in such a way as to *strengthen* their competitive edge. With the current hype surrounding the benefits of 'big data', there is reason to be optimistic about this.

3.18 Politics and Power

The last but certainly not least important area we will address in this report relates to politics. Michiel van Oudheusden argues that the RRI discourse, at the level of both European Union policy and academic discourse, "largely ignore questions about the politics in deliberation (e.g. how actors craft RI through strategic use of argument and other advantage-seeking techniques), as well as the politics of deliberation (e.g. how RI privileges a process definition of democracy at the cost of participatory and representative perspectives) [and] forsake questions about the authoritative allocation of values (as in formalized, representative politics) and the institutional uptake of deliberative engagements more broadly" (van Oudheusden, 2014, p. 68). In other words, the RRI discourse

²⁶ I owe these points to personal correspondence with consultant Ton Zijlstra (<http://www.zijlstra.org/blog/about-me/>)

does not sufficiently acknowledge the view that science is not a neutral, disinterested practice but one in which actors seek to influence the outcomes through use of power – which is a common view in many other disciplines, such as Science and Technology Studies and philosophy of science. Since RRI dimensions like stakeholder involvement, governance and gender equality all give rise to complicated issues of power and politics, Oudheusden makes a convincing argument that we need to better understand how this plays out in the market, how politics may be an obstacle to responsibility, and to what extent political and strategic considerations could support responsibility. He further outlines a series of questions that are underrepresented in the discourse, most notably: Who is involved in designing solutions and who is left out? Who is a relevant stakeholder and who is not? When is a solution sufficiently ‘robust’? Are there inherent political biases in the way the RI agenda is set up, as scientists, politicians, civil society representatives, and citizens may resist dialog on the deliberative terms set by initiators of deliberation? To what extent are the actors disinclined to cede power to third parties, such as institutions and citizens? He further proposes three ways in which to remedy such shortcomings: (1) making visible how actors involved in deliberation actually negotiate the terms of their engagement; (2) opening up discussion among all involved parties on the politics of deliberative engagement, including the substantive biases inherent in RRI (e.g. ethical concerns outweighing economic concerns); and (3) acknowledging that contemporary conceptions of RRI are institutionally weak and that RRI has only a limited institutional problem-solving capacity, as deliberative outcomes cannot be enforced in the policy arena (van Oudheusden, 2014, pp. 80-81). Interestingly, van Oudheusden’s points seem to be even more relevant when applying RRI to industry, where the power issues may be even more complex and unpredictable than those that hold between governmental institutions and policy makers.

4 Concluding Remarks

In this report, we have identified several areas that may be essential to fostering RRI in industry, but which has either received insufficient attention or has been

carried out at a too abstract level to be applicable to industry. Some of these aspects will be investigated in later stages of the RESPONSIBLE-INDUSTRY project, but we also hope that they can provide pointers and ideas for other RRI scholars as well as the European Commission. We encourage anyone who have comments on this and/or are interested in our follow-up work to contact us (cf. <http://www.responsible-industry.eu/>)

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