

## International mutual learning process

Deliverable D9.3





## **JERRI – Joining Efforts for Responsible Research and Innovation**

### **Deliverable D9.3**

#### **The role of boundary-spanning organisations in value-based change**

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## PURPOSE

Within the JERRI project, the two largest Research and Technology Organisations (RTO) in Europe, Fraunhofer (FhG) Germany and TNO Netherlands, have the ambition to further develop their organisational structures and practices towards "Responsible Research and Innovation (RRI)". RRI can be understood very broadly as a set of thematic angles, concepts, virtues, tools and practices designed to closer align both the orientation and the outcomes of research and innovation (R&I) processes with societal needs and values. In this context, the work package called "International mutual learning process" (WP 9) has carried out in-depth case studies of two outstanding organisations outside of Europe, the Chinese Academy of Sciences (CAS) and Arizona State University (ASU). Two international mutual learning workshops and three reports shall help to share insights from the international cases, offer interpretations for implications in the European context, support international mutual learning between the participants of this exercise and to inspire institutional change at Fraunhofer and TNO.

The report at hand is the third in a row and it offers a review of the second international mutual learning workshop which took place in the The Hague on 10 April 2019. The workshop brought together experts in value-based (organisational) change, change agents from the organisations studied in JERRI and other relevant examples around the globe. The aim was to create an opportunity of exchange about organisations' change processes and the transformative developments around the globe affecting them. We speak of "value-based" change, first to underline that RRI is a normative concept and second to include change processes in research and innovation around the globe, which are connected to societal needs and values too, but are not necessarily referring to the term RRI.

The workshop assembled an impressive group of organisations worldwide and knowledge about organisational change and RRI around the globe, which was developed not only in JERRI, but also in other H2020 projects such as RRI Practice or RRING. In this deliverable report we present a 10-point summary that subsequently, with the participants from the Hague workshop, shall be further developed into a manifesto for the role of Research and Technology Organisations (RTOs), as well as Research Funding Organisations (RFOs) in the change towards responsible research and innovation.

## EXECUTIVE SUMMARY

### *The role of boundary-spanning organisations in value-based change*

This 10-point summary of JERRI's second international mutual learning workshop (on 10 April 2019 in the Hague) shall subsequently, with the participants from the Hague workshop, be further developed into a manifesto for the role of Research and Technology Organisations (RTOs), as well as Research Funding Organisations (RFOs) in the change towards responsible research and innovation.

- 1. Boundary-spanning organisations in innovation systems are particularly able to move forward the essence of RRI.** Boundary-spanning<sup>1</sup> organisations do not only reach out to different sectors, but at the same time regard these boundary-spanning activities as a part of their mission. Coming from the background of the JERRI project, we believe that Research and Technology Organisations (RTOs) with their links to industry and society at large can act as catalysts for RRI. Research Funding Organisations (RFOs) with their links to policy and the different research and innovation actors belong to that group as well. There was a wide range of organisations present at the workshop, including large universities and national academies, which understand themselves as bridges serving different communities and hence can also be regarded as boundary-spanners. This may also apply to many other organisations.
- 2. We call European policy makers not to give up RRI:** When launching RRI as a political concept and framework programme funding for RRI, Europe has perhaps been among the first to address major changes in our societies, which are marked by an increasing demand for environmentally sustainable and ethically responsible technology innovations. Certainly Europe has been the first to address this with a political approach, to give momentum to changes in research and innovation. Meanwhile, RRI has become an important reference point for actors in- and outside the European Union, e.g. not only widely visible in China's current five-year plan, but also in changing impact agendas and new funding policies like in the Nordic countries, the Netherlands, the UK and in Australia.

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<sup>1</sup> Boundary spanners help connect different cognitive frameworks in professional networks (Randles 2017: 29.)



3. **Understanding RRI as a change process makes it compatible with other approaches to transformative change** such as the SDGs (Sustainable Development Goals). Moreover, while some may argue, that RRI is rather a change process oriented towards aligning research and innovation with societal demands, *instead* of a set of thematic elements<sup>2</sup>, we found the five thematic keys of the JERRI project to be helpful access points for setting up organisational change processes at FhG and TNO. This finding is validated by results in the RRI Practice project. In countries, which have existing traditions such as technology assessment, ELSI/ELSA (Ethical, Legal, Social Issues/Aspects of science), ethics boards or gender mainstreaming (like Germany or the Netherlands), RRI fell on "prepared ground" (which does however not mean that RRI was not contested there). In countries where these traditions are less strong (some in Europe as well as some around the world), the thematic keys of RRI are of less relevance and transformative change processes are operationalized somewhat differently, e.g. by reference to the SDGs.
4. **National funders need to take over RRI, as European funding breaks off.** As the current prospect for a further political push for RRI at the European level is rather negative, in particular as the programme in support of RRI (Science with and for Society) dies, national funders need to take over. The EPSRC UK, the Research Council of Norway, or NWO in the Netherlands are some examples that are already in place.
5. **Many organisations in research and innovation systems worldwide face a change in their "license to operate", and this often can leverage proactive engagement.** Changing legal and/ or governmental requirements are an important driver for organisations to change. At the same time, many organisations become proactive, either because they anticipate that their "license to operate" might change or because they are expecting RRI to underpin their excellence or to gain higher reputation among their relevant audiences (e.g. to attract students, employees, clients and business partners).
6. **We, the boundary-spanning organisations which have already committed to a value-based change process can plant more "seeds of change" together.** Having studied organisational change, we have broadened our conceptual understanding of what it means to embark on value-based change

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<sup>2</sup> Ethics, gender equality, open access, science education, and public engagement. Often, governance is mentioned as a sixth theme, sometimes as a cross-cutting issue.



processes. Anything from "window-dressing" to "deep institutionalisation" is possible. Those who work for deeper embedding of RRI into organisations will require committed and persevering leadership at the top level. An additional necessary driving force are the change agents at mid-level management, who often are principal investigators of research groups, and who can spark bottom-up change. Both change agents at top- or mid-level might sometimes find themselves in a lonesome struggle, which is why networking, in particular teaming up in ad-hoc "coalition of the willing" becomes so important for them. There are also some existing networks suitable for this kind of exchange and joint action, such as the Virtual Institute of Responsible Innovation (VIRI) or the Transformative Innovation Policy Consortium (TIPC).

- 7. We need to change our internal reward structures.** Introducing RRI or similar value-based approaches to a research organisation means regularly offering an additional layer to the organisation's vision and mission, and hence to its internal performance measurement and incentive system. This can create huge pressure on researchers, all the more as the RRI's call for co-creation of different disciplines and sectors is often at odds with classical mono-disciplinary working and publication cultures. Changing reward structures can really be a "seed of change", and moving jointly forward as a group of organisations is the way forward, as internal reward structures of organisations depend on the larger system and culture of research metrics (which is under debate as well, see for example the Leiden Manifesto for research metrics).
- 8. Train the next generation by including RRI into regular curricula!** Many organisations present at the Hague workshop have identified this as an important route for themselves. The synthetic biology research centre at the University of Manchester has now a PhD programme with an embedded RRI course in place. Some organisations have started to roll out a mandatory ethics training to everybody involved in research projects including student research assistants like the Arizona State University or the University of the West Indies. At Fraunhofer, for internal strategic research initiatives, there is now a ethical reflection process in place including societal issues.
- 9. We need to better understand the relationship of RRI and competitiveness.** Can RRI or a value-based approach (such as the SDGs) generate competitive advantage for an organisation or even a whole innovation system? Many organisations who have committed to such change processes are motivated exactly by this and are convinced that RRI underpins their excellence or that a



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value-based approach is the means to fulfill their mission. The H2020 project RRING studies RRI around the globe and will undertake a study of RRI and the competitive advantage.

**10. A global governance framework for a joint value-based approach?** One might also argue that we observe many examples, where researchers perceive the respect of sustainability issues and societal needs as restricting their freedom and thus hindering greater performance of science, innovation and the economy at large. From this perspective, only a global governance framework can pave the way towards a joint value-based approach in research and innovation. One way is to revive the European political approach of establishing a new paradigm of research funding and raise this to the global level. The Global Research Council seems to be an adequate forum, where such an initiative could take off. Ideally, such a debate does not only touch on new ways of research funding, but also revisits research metrics (see above). This would truly generate a huge transformative change.



## DELIVERABLE REPORT

### 1 International mutual learning in the JERRI project

Within the JERRI project, the two largest Research and Technology Organisations (RTO) in Europe, Fraunhofer (FhG) Germany and TNO Netherlands, have the ambition to further develop their organisational structures and practices towards "Responsible Research and Innovation (RRI)". RRI can be understood very broadly as a set of thematic angles, concepts, virtues, tools and practices designed to closer align both the orientation and the outcomes of research and innovation (R&I) processes with societal needs and values. In this context, the work package called "International mutual learning process" (WP 9) has carried out in-depth case studies of two outstanding organisations outside of Europe, the Chinese Academy of Sciences (CAS) and Arizona State University (ASU). Two international mutual learning workshops and three reports shall help to share insights from the international cases, offer interpretations for implications in the European context, support international mutual learning between the participants of this exercise and inspire institutional change at Fraunhofer and TNO.

The report at hand is the third in a row and it offers a review of the second international mutual learning workshop which took place in the The Hague on 10 April 2019.

#### 1.1 Idea and objectives of the closing workshop

The second International Mutual Learning (IML) workshop took place at the end of the JERRI project. The workshop focussed on organisational change processes, as this is what the four organisations Fraunhofer, TNO, ASU and CAS have in common. All four are confronted with transformative change in their environments coming from new technologies such as nanotech, synthetic biology or digitalisation and from changing needs and expectations of society. There are also a couple of other organisations around the globe that are on the same path and were also partly studied by H2020 research (e.g. RRI Practice, NUCLEUS). Thus we dedicated the second workshop to the exchange and networking between the four organisations studied by JERRI and other organisations, projects and experts.

The first IML workshop back in December 2016 was aimed very much at the exchange among the four JERRI organisations. At that time we shared activities and practices of the four organisations with the aim to mutually inspire organisational change processes.



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We realized that it was not at all easy to mutually learn from practices, because the internal logic and the contexts of the four organisations are completely different (even the difference between TNO and Fraunhofer is substantial). Therefore, one finding in this international mutual learning exercise was that international mutual learning has its limitations.

However, we found that the concept developed to analyse value-based change processes by Randles et al. indeed proved to be a universal tool to study organisational change worldwide. The concept called "Deep Institutionalisation" (DI) does not speak of "value-based" change, it rather differentiates between RRI and de-facto rri, both describing triggers and processes of change (see next section). DI highlights stages of profound organisational change processes and helps to analyse drivers and barriers of such processes (Randles et al. 2013, 2014, 2016). Thus, while the first workshop was on practices, an important element in maturation processes of DI, the second workshop was inspired by one of the important mechanisms of change: boundary-spanners (see next section for the term). In the context of this workshop our assumption is that participants are all boundary spanners, reaching out to different "worlds" like policy, industry or the general public. In that sense, the workshop was meant to be a networking event, where boundary spanners, who are a specific type of change agents, can connect to like-minded people in different types of organisations and in different regions around the world.

Building on what we learned in the JERRI project, we see that boundary-spanning organisations are particularly able to spark value-based change.

The workshop assembled an impressive group of organisations worldwide and knowledge about organisational change and RRI around the globe. While the DI concept stresses the role of individual boundary spanners, the experience with Fraunhofer and TNO in JERRI underlines the specific role of organisations, which carry out boundary-spanning as an organisational characteristic. Boundary-spanning organisations are those that not only reach out to different sectors, but that at the same time regard these boundary-spanning activities part of their mission. Coming from the background of the JERRI project, we believe that Research and Technology Organisations (RTOs) with their links to industry and society at large can act as catalysts for RRI. Research Funding Organisations (RFOs) with their links to policy and the different research and innovation



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actors belong to that group as well. There was a wide range of organisations present at the workshop, including large universities and national academies, which understand themselves as bridges serving different communities and hence can also be regarded as boundary spanners. This may also apply to many other organisations. Building on the JERRI experience, it seems that boundary-spanning organisations are particularly able to spark value-based change. Next to networking and exchange a particular idea of the workshop was also to identify ways of joint action for value-based approaches ("seeds of change").

To sum up, the objectives of the second and closing IML workshop were:

- Exchange of expertise and experiences with the international partners to realize mutual learning effects.
- Link the JERRI results about transformative organisational change to further actors, networks and platforms for debate.
- Better understand transformative changes in research, innovation and education in a global perspective and discuss evidence about their diverging or converging nature.
- Discuss the role of value-based approaches to R&I.
- Explore opportunities for a long-lasting mutual international exchange beyond the JERRI project (which will come to its end in May 2019).

## **1.2 The terminology we use**

### ***RRI, (de-facto) rri and value-based change***

RRI has been defined as a set of thematic angles, concepts, virtues, tools and practices designed to closer align both the orientation and the outcomes of Research and Innovation (R&I) processes with societal needs and values. As RRI as a term is not used universally, but is a European approach, Randles et al. (2013, 2014, 2016) refer to "de-facto rri" or "little rri" when describing equivalent approaches to responsible research.

In this report we speak of "value-based" change, first to underline that RRI is a normative concept, second to include "de-facto" rri, i.e. processes in research and innovation around the globe, which also link to societal needs and values, but are not necessarily referring to the term RRI, and third, because the aspect of (deeply institutionalized) change is a central element for RRI in organisational contexts. A more thorough discussion of RRI as a change processes can be found in section 3.



### ***(Deep) Institutionalisation of RRI***

The institutionalisation of RRI, which means that RRI becomes an integral part of the practices of an organisation, requires institutional change. This is why leadership, the culture of an organisation or incentives and rules need to be focussed on. Randles et al. (2013, 2014, 2016) have developed the concept of *Deep* Institutionalisation and with that a theoretical approach for better understanding these processes, their drivers and barriers. The four theoretical characteristics of DI are

- (1) the evolution of dominant *narratives* regarding rri, which do not replace but gradually sediment over existing ones;
- (2) *maturation* processes regarding rri, which involve gradual embedding into routines, everyday practice, systematised techniques, methodologies, procedures, incentive structures and performance metrics of actors;
- (3) systemic *consolidation* of rri, describing a situation where mature practices are not only localised experiments within the organisation, but instead are extensively shared by different professional groups within the organisation as well as "systemic overflowing" meaning that external partnerships are built on a mutual understanding based on the newly emerged values, and
- (4) vertical *multi-level alignment* of rri, referring to coherence of the organisation's activities with its external environment and with different governance levels (considering that powerful organisations have the scope to influence and shape the external environment).

### ***Change agents: boundary-spanners and other concepts***

Studies of value-based organisational change show that different types of change agents appear to be relevant factors in such processes.

*Boundary spanners* are those who are reaching out to actors with different cognitive frameworks, either by way of intrinsic motivation or because this is part of their function in the organisation (Randles et al 2017).

Randles also introduces the notion of the "*Ambidextrous Principal Investigators*" in the DI concept. These are change agents at mid-level or lower level management, who are often principal investigators of research groups, and who can spark bottom-up change, because of their freedom to operate.



*RRI champions* is a term used by the RRI Practice project (cf Alexei Grinbaum in his workshop contribution on 10 April 2019), and describes individuals in organisations who have a high reputation for their expertise in a field of relevance to RRI, e.g. ethics.

## **2 Value-based change processes in boundary-spanning organisations around the globe**

### **2.1 Country level**

Having studied organisational change of research performing organisations, which also have educational and/or innovation functions, in Europe, the US and China in the JERRI project, we find that context-specific elements of the national systems of innovation (and research, education) set an important framework. They seem to have become more distinct in the past years.

China's current leadership has ushered a more assertive role and a new political ideology with the aim to cement China's position as a superpower. The reform of the national S&T system to build up a national innovation system, launched in 2012, has put innovation at the core of national development, including a greater role for enterprises and markets, while keeping strategic steering and coordination by the government. The ecological challenge of the economic development has been addressed by stricter environmental policies since 2015, including high state investment in green technologies. The current five-year-plan refers to Responsible Research and Innovation, however priorities remain on growth and the well-functioning of the innovation system.

Decentralized policies characterize the US innovation system where private investments (by firms and venture capitalists) shape innovation bottom-up. By way of large-scale "mission-oriented" funding programmes, the federal level sets some strategic priorities for research and technological development such as DARPA (Defense Advanced Research Projects Agency) or the National Nanotechnology Initiative (NNI). This still leaves room for research performing institutions to strategically position themselves in the landscape, and, from the bottom-up, create their approach to research impact - a central theme in particular to legitimise public funding. Under the current Trump administration, public investment in science and technology have become highly



politicised, for example, the government has tried several times to marginalize the ARPA-E programme, which supports renewable energy technologies.

Also in Europe, society has become more divided, and debates about research and innovation policies have also become more politicised. However, one might say that the value-based approach of "Responsible Research and Innovation (RRI)" is an indicator of a "third way", because of the political approach connected to it. It builds on traditions like technology assessment, and promotes precautionary interventions to new technological developments, oriented towards aligning both the research and innovation process and its outcomes with the values, needs and expectations of society. RRI was invented as a political concept by the European Commission and in a top-down effort to mainstream research projects and research organisations funded by the European Commission. How this effort will impact the research, innovation (and education) landscape in Europe and whether there will be room for RRI in the future remains an open question.

The RRI Practice project studied organisations in seven European countries (Norway, Germany, France, UK, Italy, Netherlands and Bulgaria) and in five non-European countries (Australia, Brazil, USA, China and India) and also found the cultural contexts to be highly different. In many cases such as Germany, or the Netherlands, long-established frameworks exist such as Corporate Social Responsibility (CSR) or Technology Assessment (TA). Here RRI met existing structures, which somehow helped to foster RRI, however the new concept was often not embraced (Grinbaum in his workshop contribution 10 April 2019).

Some countries politically adopted RRI, like Norway (and other Nordic countries), the UK and the Netherlands. They are working on paradigmatic changes in the evaluation and funding of research, e.g. the Research Council UK, where the Engineering and Physical Sciences Research Council (EPSRC) was the first agency to adopt an RRI framework in 2013, the funding measure and platform for RRI by the Netherlands' Science Organisation (NWO) or the new RRI-Hub approach of the Research Council of Norway in its strategic initiative for digital life. A shifting impact agenda can be observed in Australia, too, as for example documented in the RRI Practice's case study of the

RRI has become an important reference point in some countries. Don't give up the approach now!



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University of Queensland (Sehic/ Ashworth 2017: 37ff.). Officially, also China has adopted RRI politically by including it into its five-year-plan.

Brazil currently exemplifies the case where a political crisis results in great mistrust in established institutions, which also affects science. Citing country expert Marko Monteiro from the University of Campinas in his workshop contribution (10 April 2019): "The 2018 elections have deepened these trends. Anti-intellectual positions and revisionist agendas are now official government policy. Defunding [in place since 2014] has reached new levels, and there is a widespread sense of immobility and lack of perspectives for the future of public research." Here, RRI does not have the standing to be an accepted approach, which offers an example for reflection and consideration of alternatives.

## **2.2 Level of organisations**

The workshop assembled a wonderful group of organisations and experts whose reports we summarise very briefly in this section. We are also including some references to other organisations' experiences with change processes.

### ***Fraunhofer society (Germany) and TNO (Netherlands)***

In JERRI, TNO and Fraunhofer (Europe's two largest RTOs) experienced a process of organisational learning to become better at "creating impact for and with society". The understanding of RRI is that of "creating impact together with society that is both socially desirable, sustainable and ethically acceptable". The organisations have committed to start work on this direction, because they both perceive that it is required by their stakeholders and that it will enable them to renew their "license to operate" granted by society. They also see that RRI underpins excellence, as it offers better solutions through more perspectives and deeper reflection. Both TNO and Fraunhofer have set ambitious goals, developed long-term transition roadmaps, launched several pilot activities and exchanged lessons learned in key RRI domains (ethics, gender, open science, societal engagement, science education). Some of the most important insights are: Deep institutionalisation of RRI practices into organisational routines/culture requires change agents, leadership commitment, time, resources and a trusting environment allowing for experimentation. The process can and needs to be tailored to the organisation, as RTOs are different. Also, each RRI dimension is important in its own but most important is that they align to strengthen reflexivity of the organisation. RTOs face specific challenges, such as aligning RRI with traditional missions/established narratives, developing responsible value creation models and adapting to RTO needs e.g. confidentially and

efficiency (Warnke/ Nauta in their workshop contribution 10 April 2019). The experience from JERRI gives some confidence that it can be done through overcoming barriers in the external environment together with other organisations (see for that section 4).

**CSIRO (Australia)**

The Commonwealth Scientific and Industrial Research Organisation (CSIRO) is an independent RTO funded by the Australian federal government with about 5,500 staff in 55 sites across the country and a budget of more than 1 billion Australian dollars (approx. 650 million Euros). Its mission is best described as "our people work closely with industry and communities to leave a lasting legacy," according to Justine Lacey, director of CSIRO's Responsible Innovation Initiative (in her workshop contribution, April 2019). CSIRO is a boundary-spanner, as it is the key connector of institutions in the Australian system for some areas like Agricultural Sciences, Environment/Ecology, Plant and Animal Sciences, Geosciences, Chemistry and Materials Science.

**Basis of Science Program**

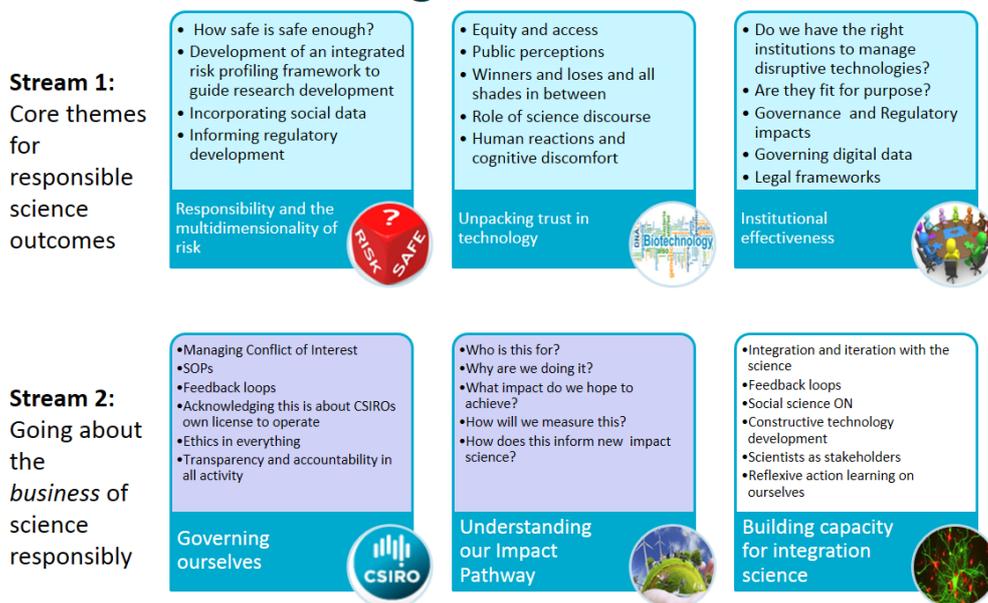


Figure 1: CSIRO's Responsible Innovation Science Programme (Lacey 2019).

The organisation started the Responsible Innovation Initiative in September 2017 as an add-on activity to the CSIRO Future Science Platforms, which are "multi-year



investments in frontier science to help reinvent and create new industries for Australia", and to build the next generation of researchers (Lacey 2019). The programme currently operates 10 platforms and has established interdisciplinary cross-business unit programmes to support them. The RI is also set up to support the 10 initiatives in particular as regards the following objectives: To achieve a new CSIRO capability for characterising the social risks and benefits of future science and technology, new domestic and international research partnerships in responsible innovation, and a globally established reputation as a responsible research organisation of the 21st century. The RI science programme is organised in two parts, which are dedicated to strengthen the responsibility of both the process and the outcome of CSIRO's research (see figure 1).

#### ***Norwegian Research Council***

The Research Council of Norway was set up in 1993 integrating five funding organisations which corresponded to themes from different ministries. This is important as, in the beginning, the merger led to organisational silos which could only be overcome after an evaluation and restructuring in 2001. Perhaps because of this history, RRI has been adopted by the RCN as an open process of learning. With reference to the RRI AREA framework pioneered by UK's EPSRC in 2013, including anticipation, reflection, engagement and action (Owen et al. 2013), the RCN began to develop RRI in four of its programmes. Currently, it is taking a new step with the Digital Life Strategic initiative, which shall help to move RRI out of a programme and project context to set something up which connects the RCN and relevant actors and activities in the field. To this end a virtual "Center for Digital Life Norway" has been created as a national center for biotechnology education, research, and innovation. It connects existing players in the field in a hub- and node-structure (see figure 2) and runs a research school and several research projects. This is seen as a huge chance to foster RRI (cf Egeland et al. 2018: 68).



**FIGURE 4: Schematic structure of the National Centre for Digital Life consisting of a hub with associated nodes.**

Both the hub and nodes will be responsible for a varied transdisciplinary research project portfolio in collaboration with national and international partners (examples of such projects are illustrated by red frames). The hub will take a leading role in performing the national leadership (lighthouse) function with support from the nodes. In addition to doing cutting-edge science, the centre will take on important responsibilities in coordination and provision of infrastructure and competence at a national level.

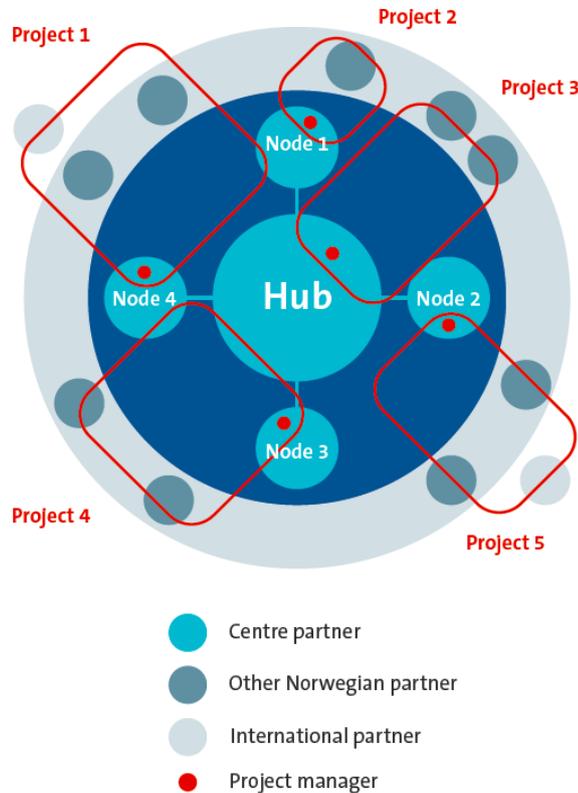


Figure 2: Norwegian National Center for Digital Life (RCN 2014)

### ***University of the West Indies***

A lively account at the workshop of how RRI is advancing in the Caribbean showed that developments take place with strong reference to European developments and that they cannot grow if Europe no longer supports RRI. The University of the West Indies is spread across many places on the Caribbean islands, posing an additional challenge for organisational transformation. A remarkable first step which has been taken is to roll out RRI issues to everybody involved in a research project by a mandatory online ethics training, which has to be refreshed by the researchers at regular time intervals (Persaud in her workshop contribution 10 April 2019).

### ***Arizona State University***

The story of ASU is that of the enormous power of leadership. Since Michael Crow became 16th President of ASU, the university has undergone a radical institutional transformation. Relating to the vision of a “New American University” (NAU), ASU has committed itself to more inclusion and widening participation of higher education as well



as to outreach activities, social embeddedness and impact-oriented research. ASU operates based on its values enshrined in a charter<sup>3</sup>, which is intensively communicated within the organisation and in ASU's external communication (Fisher in his workshop contribution 10 April 2019). This is not only an end in itself, but connected to a new business model. Identifying new streams of funding, radical decisions in investing in new transdisciplinary units and new hiring policies focussing on people with a mindset similar to ASU's design aspirations were the main instruments for implementing institutional change. There are also incentive structures in place to foster ASU's charter, which add to existing ones rather than replacing them and which sometimes creates tension, e.g. with classical excellence indicators such as high-impact journal publications (cf Berghaeuser/ Daimer 2018).

### ***Chinese Academy of Sciences***

The Chinese Academy of Sciences (CAS) is the highest research institution and the key player in China's S&T landscape. CAS has been involved actively in the science community globally and holds a significant position. A new legal framework required CAS to commit to science popularisation back in 2002, which has been a driver for change. During the past decade CAS has committed proactively to other rri fields such as open access. Organisational change was smaller at CAS, where new units were added to the Institute for Policy and Management (IPM), one of the central boundary-spanning units at CAS with close links to the national S&T policy (cf Daimer et al. 2017). Recently, the institute has been renamed the "Institute for Sciences and Development" (CAS-ISD), which, according to the report of director Rongping Mu, present at the workshop, highlights the institute's outreach function, doing "science for policy" now instead of "policy for science". At the same time, performance metrics oriented at mere publication output generates a competitive culture among researchers, which poses a barrier to further organisational change and the development of rri (Mu in his workshop contribution 2019).

### ***SYNBIOCHEM at the University of Manchester***

The University of Manchester's Synthetic Biology Research Centre (SYNBIOCHEM) has established an embedded RRI programme in the course of a £10.3m research centre award from UK Biotechnology and Biosciences Research Council (BBSRC) and the

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<sup>3</sup> ASU Charter, mission and goals, <https://www.asu.edu/about/charter-mission-and-values>, last accessed 10 May 2019.



Engineering and Physical Sciences Research Council (EPSRC) for 2015-2020. The BBSRC endorses RRI like EPSRC based on the AREA framework (Anticipate, Reflect, Engage and Act, cf. Owen et al. 2013). In SYNBIOCHEM this is operationalized in structural and procedural aspects. An interdisciplinary group is embedded in the centre, with the tasks to analyse RRI aspects and to facilitate collaboration and deliberation. It applies different modulation strategy processes (upstream, midstream and downstream, see figure 3). RRI has also been embedded into the regular curriculum of the Bio-Design Engineering PhD programme 2019-2027, which, to our knowledge, is the first PhD programme to do so. For SYNBIOCHEM, the key challenge is to maintain RRI research and momentum in the phase when synthetic biology moves from the lab to the market, which requires addressing issues like industry attention to public acceptance, risk and uncertainty (environmental release), biosafety, sustainability, regulatory and policy issues (cf Shapira in his workshop contribution 10 April 2019).

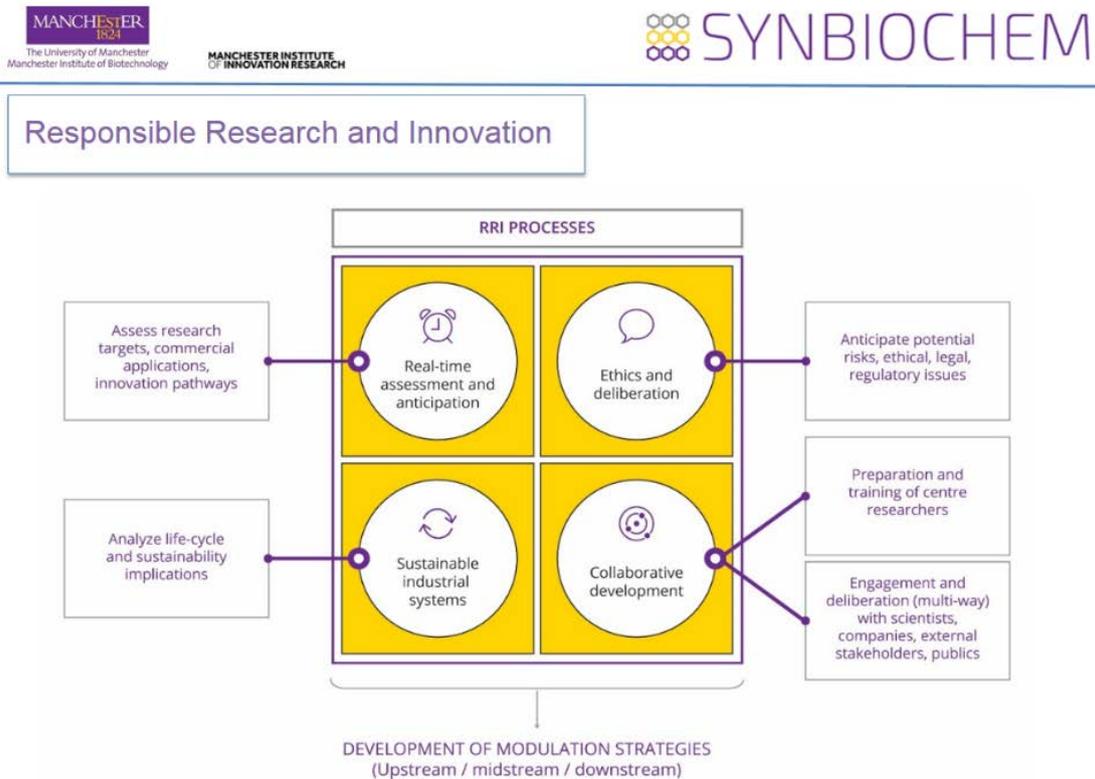


Figure 3: RRI process elements in SYNBIOCHEM (Shapira 2019).



**Fraunhofer**



### ***Wageningen University***

Wageningen University, which has done extensive research contributing to the RRI concept (e.g. in Owen et al. 2013, Stilgoe et al. 2013) and to questions of how to embed RRI into higher education (Tassone and Eppink 2016), as an institution, has also endorsed a new rationale towards strengthening its relationship with society and contributing to societal challenges. This is a response to new requirements in the public funding of science aimed at economic and societal benefits and has been described by Phil Magnathen in the workshop as "science for society" or "responsibility 2.0". The next step towards "science with and for society" or "responsibility 3.0" has yet to be taken and would require the adoption of procedural aspects underpinning research for societal challenges, e.g. opening up to new ways of doing research, or giving more weight to performance criteria in support of RRI (Magnathen in his workshop contribution 10 April 2019).

For sure, there are more organisational change processes ongoing than we could capture with the workshop and this brief report. For example, the H2020 project NUCLEUS<sup>4</sup> has launched a number of organisational experiments in- and outside of Europe.

## **2.3 Drivers of change - and challenges**

Summarizing what unites the studies and examples of organisational change, the following drivers and challenges of value-based change in research performing or funding organisations emerge:

Changing policy signals are an important driver for organisations to change (Grinbaum 2019). Some experience new legal frameworks as a trigger for change, such as the requirement for "science popularisation" introduced in China. For public organisations, (annual) budget negotiations with their governments also have an important influence on the organisations' operations. For example, Arizona State University (ASU) has responded to the requirement to increase its number of enrollments with a highly inclusive enrollment policy. Other organisations become proactive, because they anticipate that their "license to operate" might change. Changing impact agendas and new funding instruments as in UK, Australia, the Netherlands and the Nordic countries can be seen as having caused major changes within research performing organisations.

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<sup>4</sup> <http://www.nucleus-project.eu/>.



At the same time, many organisations become proactive, either because they are expecting RRI to underpin their excellence or to gain higher reputation among their relevant audiences (e.g. to attract students, employees, clients and business partners). This is the case for Fraunhofer, TNO, CSIRO, ASU and many others. RRI Practice found this as well and it was echoed throughout the day by other organisations too. It seems that in this regard, it is particularly important that the organisations want to be perceived as offering solutions to societal challenges, as being responsive to societal needs. The aspect of organisational change might not be as much in the limelight here for all and there is a risk that RRI is a mere window-dressing activity, when reputation is a large motivator.

The example of ASU shows that deep institutional change took place not only because of changing legal requirements (see above) but also for competitive reasons: As a matter of fact, responsible research is no end in itself but also related to a business model and unique features that increase the legitimacy of a university. Consequently, responsible research and societal impact is closely linked to organisational and economic success. The design aspiration and the particular strategic orientation of ASU have helped to develop the unique selling point of the university in a competitive university and research sector. New research areas and topics have helped to tap new streams of funding and facilitated a remarkable growth process. Responsibility and success represent two sides of one coin and strengthen the legitimacy of the university and research in general.

Many organisations in research and innovation systems worldwide face a change in their "license to operate", and this can often leverage proactive engagement.

Those who work for deeper embedding of RRI into organisations, will require committed and persevering leadership at the top level. An additional necessary driving force are the change agents at mid-level management, who are often principal investigators of research groups, and who can spark bottom-up change. These are mechanisms described by the deep institutionalisation concept (Randles et al. 2013, 2014, 2016), validated by the empirical work in JERRI.

Challenges organisations face internally are how to share responsibility beyond boundaries, i.e. to connect to policy, society and industry, based on shared values.



Internal dialogues are also a constant challenge. All organisations have parts, which remain untouched by the described change processes. Finally, internal reward structures are a rather persistent challenge, as often internal opposition prevents major changes. Therefore new incentives oriented towards valuing responsible research and innovation arise as an additional layer of the structure, increasing the diversity of performance criteria for the individuals and groups in the organisation.

### 3 Links to European RRI

Existing rationales and long-standing experience in rri-relevant fields are the points of departure for many organisations, such as Technology Assessment, CSR, ELSI/ ELSA, research integrity or gender equality plans. In the past years, sustainability as a topic and the sustainable development goals have also become important requirements or proactively chosen reference points for many organisations. Therefore, the five thematic elements of RRI have often perceived to be limiting the scope, in particular when discussing these topics at a global level. Broadening the scope and including rri aspects can help to make RRI/ rri a boundary object of such discussions and analyses.

Moreover, highlighting the aspect of institutional<sup>5</sup> change, which is one of the most important targets of RRI processes and therefore understanding RRI as a change process, can help to build bridges too. While some may argue that RRI is rather a change process oriented towards aligning research and innovation with societal demands instead of a set of thematic elements, in the JERRI project we found the five thematic keys to be helpful access points for setting up organisational change processes at FhG and TNO.

Understanding RRI as a change process makes it compatible with other approaches to transformative change such as the SDGs.

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<sup>5</sup> Institutional change is an umbrella term, including organisational change, but also the change of other "rules defining the game", such as decision-making processes, incentive structures, regulations, codes of conduct and even including soft aspects, such as the culture of an organisation or implicit rules.



So, while the aspect of change and (to some extent) the thematic elements help to link the RRI concept to other discussions of transformative change, the discussion at the workshop highlighted that RRI centers around technological innovation and perhaps less on social innovation (Magnathen 2019). There was also the observation shared that RRI was more easily introduced to newly emerging contested technologies, such as nanotechnology and synthetic biology. Here, it is being used in the early stages of development, but apparently it is a challenge to keep momentum for later stages closer to commercialisation (Shapira 2019).

In connection with this, the question was raised which role companies have and whether or what kind of relationship there is between RRI and competitiveness? Can RRI or a value-based approach generate competitive advantage for an organisation or even a whole innovation system? Many organisations who have committed to such change processes are motivated exactly by this and are convinced that RRI underpins their excellence or that a value-based approach is the means to fulfilling their mission. The H2020 project RRING studies RRI around the globe and will undertake a study of RRI and the competitive advantage.

We need to better understand the relationship of RRI and competitiveness

#### **4 "Seeds of change" by joint action of boundary-spanning organisations**

We, the boundary-spanning organisations which have already committed to a value-based change process can plant more "seeds of change" together. Having studied organisational change, we have broadened our conceptual understanding of what it means to embark on value-based change processes. Anything from "window-dressing" to deep institutionalisation is possible. Those who work for deeper embedding of RRI into organisations, will require committed and persevering leadership at the top level. An additional necessary driving force are the change agents at mid-level management, who are often principal investigators of research groups, and who can spark bottom-up change. Both change agents at top- or mid-level might sometimes find themselves in a lonesome struggle, and nobody can achieve change alone. Networking becomes



important, and in particular teaming up in ad-hoc "coalition of the willing", e.g industry, funders, CSOs, cities etc. that work together on important levers of change seems an attractive way forward (cf also Randles et al. 2018).

We are sharing our (perhaps slightly subjective) reading of the outcomes of the workshop as a 10-point manifesto, thus hopefully facilitating its spread beyond the group who participated at the workshop. We are already in contact with further interested parties and we plan to share the outcomes also via a publication in the "Journal of Responsible Innovation". We will also share the outcome of the workshop with existing networks suitable for this kind of exchange and joint action, such as the Virtual Institute of Responsible Innovation (VIRI), the Transformative Innovation Policy Consortium (TIPC), the Global University Network for Innovation (GUNI).

There are four ideas in the manifesto, which we believe can truly become seeds of change. They are challenging and some might take some time until they become reality, but everything starts with a first step, and they can also build upon existing activities.

- **Train the next generation by including RRI into regular curricula!** Many organisations present at the Hague workshop have identified this as an important route for themselves. The synthetic biology research centre at the University of Manchester has now a PhD programme with an embedded RRI course in place. Some organisations have started to roll out a mandatory ethics training to everybody involved in research projects including student research assistants like the Arizona State University or the University of the West Indies. At Fraunhofer, for internal strategic research initiatives, there is now a ethical reflection process in place including societal issues.
- **National funders need to take over RRI, as European funding breaks off.** As the current prospect for a further political push for RRI at the European level is rather negative, in particular as the programme in support of RRI (Science with and for Society) dies, national funders need to take over. The EPSRC UK, the Research Council of Norway, or NWO in the Netherlands are some examples already in place.

We, the boundary-spanning organisations that already use a value-based change process can plant more "seeds of change" together



- **We need to change our internal reward structures.** Introducing RRI or similar value-based approaches to a research organisation means regularly offering an additional layer to the organisation's vision and mission and hence to its internal performance measurement and incentive system. This can create huge pressure on researchers, all the more as the RRI's call for co-creation of different disciplines and sectors is often at odds with classical mono-disciplinary working and publication cultures. Changing reward structures can really be a "seed of change", and moving jointly forward as a group of organisations is the way to advance, as internal reward structures of organisations depend on the larger system and culture of research metrics (which is under debate as well, see for example the Leiden Manifesto for research metrics). New indicators to capture RRI/rri-relevant aspects are at the core of debates in the field.
- **A global governance framework for a joint value-based approach?** One might also argue that we observe many examples, where researchers perceive the respect of sustainability issues and societal needs as restricting their freedom and thus hindering greater performance of science, innovation and the economy at large. From this perspective, only a global governance framework can pave the way towards a joint value-based approach in research and innovation. One way is to revive the European political approach of establishing a new paradigm of research funding and raise this to the global level. The Global Research Council seems to be an adequate forum, where such an initiative could take off. Ideally, such a debate does not only touch on new ways of research funding, but also revisits research metrics (see above). This would truly generate a huge transformative change.

## 5 Conclusion

Looking at JERRI's international mutual learning work package we are confident it has brought benefits in the following ways:

- We now have a better understanding of organisational change. Organisations are very different and change processes seem to be idiosyncratic, but we have seen that the theoretical concept underpinning our study, the "Deep Institutionalisation" approach, is a universal concept, not only applicable to RRI-based change in European organisations, but also to value-based organisational transformation processes worldwide.



- In the beginning, we believed that Fraunhofer and TNO could benefit a lot from a close exchange with the international partners organised along the five key RRI dimensions. This proved not to be fruitful as practices and approaches cannot easily be transferred into different cultural contexts and even Fraunhofer and TNO differ significantly. So the reports from the international case studies can rather be seen as a source of inspiration at a more strategic level of organisational change. For example, we now have a good understanding of how important leadership is in the process of transformation. The case of ASU has even alerted us to the issue that transformation might suffer setbacks, when the management changes. So, transformation seems to be a constant task for an organisation.
- The aspect of mutuality has not been so easy to implement, because of the differences between the organisations, but there are a few effects visible. Existing connections to the JERRI international partners have deepened, and Fraunhofer has become a member of the Virtual Institute of Responsible Innovation (VIRI), coordinated by ASU. New links have been established as a result of the second workshop, which will need further follow-up to deepen.
- The number of organisations present and discussed at the second workshop broadens the understanding we have about institutional change, and validates JERRI findings.

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## **ACRONYMS**

ASU	Arizona State University
CAS	Chinese Academy of Sciences
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CSR	Corporate Social Responsibility
DI	Deep Institutionalisation
ELSI/ ELSA	Ethical, Legal and Social Issues/ Aspects (in) research
FhG	Fraunhofer-Gesellschaft
Fraunhofer ISI	Fraunhofer Institute for Systems and Innovation Research
GUNI	Global University Network for Innovation
H2020	The European Union's Framework Programme for Research and Innovation 2014-2020
JERRI	Acronym for the H2020 project Joining Efforts for Responsible Research and Innovation
NUCLEUS	Acronym for the H2020 project Bringing RRI to life in universities and scientific organisations
NWO	Netherlands Organisation for Scientific Research
PI	Principal Investigator
R&I	Research and Innovation
RRI	Responsible Research and Innovation
RRING	Acronym for the H2020 project Responsible Research and Innovation Networking Globally
RRI Practice	Acronym for the H2020 project Responsible Research and Innovation in Practice
RFO	Research Funding Organisation



RTO	Research and Technology Organisation
SDGs	Sustainable Development Goals
S&T	Science and Technology
TA	Technology Assessment
TIPC	Transformative Innovation Policy Consortium
TNO	The Netherlands Organisation for applied scientific research TNO
VIRI	The Virtual Institute of Responsible Innovation