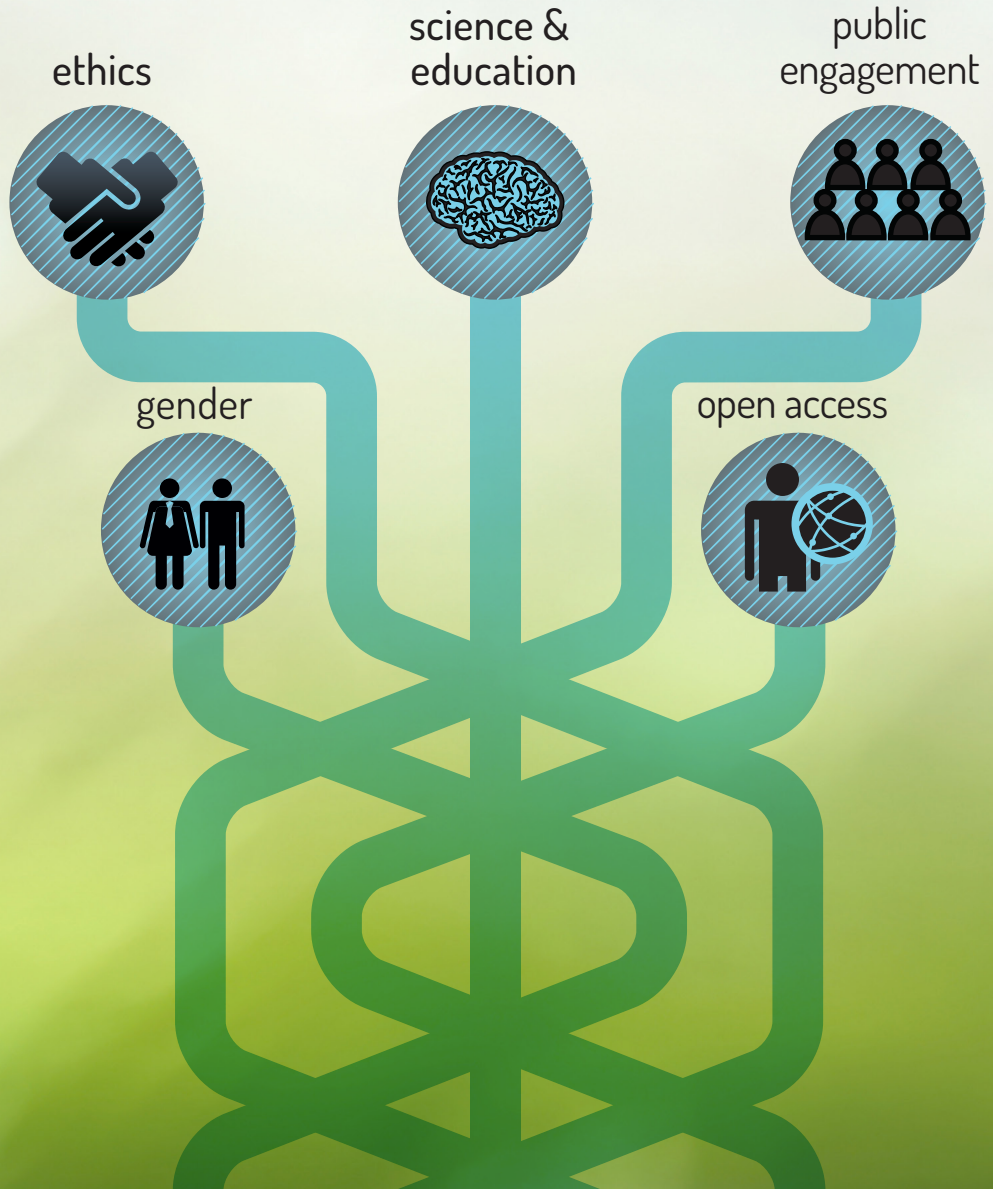
JERRI

JOINING EFFORTS FOR RESPONSIBLE RESEARCH AND INNOVATION

Fraunhofer concept on organisational RRI goal development

DELIVERABLE D2.1



JERRI – Joining Efforts for Responsible Research and Innovation

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PURPOSE

As Deliverable D2.1 of the EU project Joining Efforts for Responsible Research and Innovation (JERRI), this report outlines the project's concept on organizational goal development at Fraunhofer in the form of a description of specific methods and a procedural guideline. As part of Task 2.1 of Work Package 2 „Development of RRI goals at Fraunhofer", the concept represents a general approach to five workshop-based goal development processes within the Fraunhofer-Gesellschaft. The goal development processes are organised around five interrelated dimensions of Responsible Research and Innovation (RRI) – Public Engagement, Gender Equality, Science Education, Open Access and Ethics. It is based on a thorough analysis of the state of deep institutionalisation of rri practices within Fraunhofer along the axes of the deep institutionalisation framework developed in JERRI Deliverable 1.2.

EXECUTIVE SUMMARY

The EU project Joining Efforts for RRI[1] – (JERRI) is orchestrating a deep RRI transition process within the two largest European Research and Technology Organizations (RTOs), the German Fraunhofer-Gesellschaft and the Netherlands Organization for Applied Scientific Research (TNO). The process is conceptualised as an intense mutual learning process between the two organizations, a wider circle of RTOs and stakeholders across Europe. Thus, JERRI will exploit the unique mediating function of RTOs to catalyse RRI transition processes in industry, society and policy across the European research and innovation landscape.

The present report D2.1 'Concept on organizational RRI goal development' sets out a procedural guideline and describes specific methods to be used in five workshop-based JERRI goal development processes at Fraunhofer. The five processes are geared towards interrelated dimensions provided by the European Commission's concept of Responsible Research and Innovation (RRI) – Public Engagement, Gender Equality, Science Education, Open Access and Ethics. The concept builds on existing approaches and previous experiences with the identification and selection of stakeholders, foresight methods, and reflective stakeholder dialogues towards more responsible practices in research and innovation. It is based on a thorough analysis of the state of deep

[1] RRI stands for the Responsible Research and Innovation concept as developed by the European Commission. We use rri when talking of de-facto practices of responsible research and innovation.

institutionalization of rri practices within Fraunhofer along the axes of the deep institutionalisation framework developed in JERRI Deliverable 1.2. The corresponding goal development approach of TNO is described in Deliverable D3.1.

Section 1 provides some introductory remarks on the scope of the concept. Section 2 provides an analysis of the starting point of the transition process at Fraunhofer by analysing Fraunhofer's situation along the axes deep institutionalization framework developed in JERRI Deliverable 1.2. Section 3 depicts the project's goal development ambitions in the case of Fraunhofer. In section 4, the goal development itself is explained. It includes a general description of the Fraunhofer stakeholder identification and selection approach, the methods to be used for developing visions, organizational long-term orientations as well as goals for the JERRI pilot activities envisaged in Work Package 6. Complementary methods and activities supporting the goal development processes are outlined as well. Final conclusions are drawn in section 4.

The actual realisation in each case will presumably diverge from the general concept in several respects. We discuss these differences as well as the individual approaches of Fraunhofer and TNO in Deliverable D10.2 'Lessons learned for goal development'.

1 Introduction

The “Fraunhofer concept of organisational RRI goal development” presented in this report serves two purposes: Developing long-term orientations for organizational development towards RRI and, at the same time, defining operational goals for RRI pilot activities to be realized immediately within the duration of JERRI that are aligned with these long term ambitions.

The concept represents a general approach to five workshop-based goal development processes that are related to five RRI dimensions – Public Engagement, Gender Equality, Science Education, Open Access and Ethics (European Commission 2014, 2 f.). The fact that the five goal development processes at the Fraunhofer-Gesellschaft (in the following termed ‘Fraunhofer’) evolve around these RRI dimensions, but framed by the organization in a specific way (Teufel et al. 2016, 17 ff.), makes it appropriate to speak of ‘RRI-related topics’ rather than of ‘RRI dimensions’ in this context. In spite of engaging in five ‘parallel’ goal setting processes, these topics are interwoven at the level of the aspects to be discussed, at the level of the workshop participants, and at the level of the organization as a whole.

Against the background of this general approach, the realization of the five goal-setting workshops / processes is expected to take on slightly different forms. The differences will become fully obvious only in the realization itself and will be part of an ex-post reflection in Deliverable D2.2 ‘Description on specified RRI goals at Fraunhofer’ as well as in Deliverable D10.2 ‘Lessons learned for goal development’. Organizational differences between TNO and Fraunhofer and their different goal development approaches[2] will also be part of this reflection in terms of mutual learning.

Section 2 provides an analysis of the starting point at Fraunhofer for each RRI dimension. Section 3 depicts the project’s goal development ambitions in the case of Fraunhofer. In section 4, the goal development itself is explained, i. e. the identification and selection of stakeholders (3.1), the workshop methodology (3.2) and complementary approaches (3.3). Final conclusions are drawn in section 4.

2 The goal setting approach at TNO is described in Deliverable D3.1: Concept on organizational goal development

2 The deep institutionalisation journey: Specifying Fraunhofer's starting point

As a guiding framework for the organizational change process, JERRI deploys the concept of deep institutionalization proposed by Randles et al (2014, 31-32) and further developed and specified for the case of RTOs in the context of the JERRI project (Randles 2017). According to this framework, deep institutionalization of responsible innovation involves "**effective transformation towards a set of articulated normative goals embedding values into practices and processes and orienting action towards those goals**." It emphasizes the critical importance of "the integration resulting from the alignment of multiple governance tools, devices, techniques and forms of agency to orientate and steer innovation towards expressed societal values and normative goals."

In order to foster such a deep institutionalization process within Fraunhofer, as targeted by the JERRI project, we first need to better understand where our organization is situated within this framework before embarking into the goal setting process that is meant to initiate this change process. In (Randles 2017) an analytical framework is proposed that allows organizations to analyse the degree of deep institutionalization along the following four axes.

i) The dominant narrative(s) of responsibility within the organization within a spectrum of six ideal type narratives

ii) The degree of maturation of responsible practices within the organization

iii) The extent of systemic inter-dependence, 'reach' and 'influence' of shared responsibility norms.

iv) The vertical alignment i.e. the relationship of an organization to its external institutional context.

In the following sections, we will outline a rough assessment of the situation at Fraunhofer along these four axes. For assessing the dominant narrative (axis i)) is seems best to look at the organization as a whole. For the other axes however, we decided to analyze the situation by RRI dimension as each of them has evolved in a specific way within the organization. We base our assessments on the analysis carried out in JERRI Deliverable 1.1. on "existing RRI practices" where documents were analysed and

interviews with key actors were carried out. As suggested in (Randles 2017) this assessment should not be seen as a final verdict. Rather provides a starting point to commence a systematic organisation-wide conversation with the consortium and other RTOs.

2.1 The six grand narratives of responsibility within Fraunhofer

In (Randles 2017) six ideal types of narratives of responsibility in research and innovation are outlined. Our analysis indicates that traces of all narratives can be found in Fraunhofer albeit to a different degree.

Narrative A: Science Republic

As an applied research organization, Fraunhofer is not very close to this narrative. The function as a mediator between fundamental research and real world solutions that is distinguishing Fraunhofer from other research organizations in Germany that conduct basic research is a core element of the Fraunhofer identity. Yet traces of Narrative A can also be found in Fraunhofer. In particular, the notions of “neutral production of scientific knowledge” and the ideal of “self-regulation with minimal interference from other actor groups” are certainly present in the organization. As an example, within the JERRI interviews responsibility was equaled with “good scientific conduct”. Similarly, the Fraunhofer code of conduct implies that the capacity to deal with risks is located within the organization when it states that: “We are aware of our responsibility in dealing with freedom of research and research risks and therefore encourage the responsible handling of research.”

Narrative B: Technological Progress - Risk Management of Emerging Technologies

This narrative is rather strong at Fraunhofer. As an example the code of conduct is stating “We are aware of our responsibility in dealing with freedom of research and research risks and therefore encourage the responsible handling of research” (p.23) and in another paragraph dealing with responsibility for the environment it is stated “We contribute to these objectives by means of responsible implementation of new technologies”. In the interviews, it emerged that the notion of ethics was often interpreted as setting ethical boundaries to research e.g. avoiding harm to humans or the environment (Teufel et al. 2016, p. 16)).

Narrative C: Participatory Society

This narrative is strongly present in the context of Fraunhofer's human resources policy. The notion of improving research quality by including a greater variety of perspectives into the research teams is highly present in the discourse of these actors. E.g. in the recently developed guiding principles it is stated that: "We emphasize the great variety and interdisciplinary cooperation of our institutes." This narrative is especially prevalent in the context of gender diversity. Substantial efforts are made to recruit more female researchers e.g. though special activities targeting young girls. The quest for participation and inclusion however does not extend much beyond current or potential Fraunhofer staff. The notion of including societal actors or ordinary citizens into research activities is viewed sceptically (c.f. ibid 35 ff.). What is emerging however is the idea of including users into innovation projects as early as possible e.g. through living labs or participatory design activities (ibid p 31 ff.).

Narrative D: Citizen Firm

Together with narrative B the "Citizen Firm" is the dominating narrative at Fraunhofer. In the official documents, the notion of combining economic and societal added value is highly prevalent. This shows clearly within the mission and guiding principles that were recently developed within a participatory process of employees from all 67 Fraunhofer institutes. In the very first sentence of the mission it is stated that: "We partner with companies to transform original ideas into innovations that benefit society and strengthen both the German and the European economy." In the guiding principles it says: "Through our research we contribute to the sustainable development of an ecologically sound environment, and an economically successful and socially balanced world."

Narrative E: Moral Globalisation

Whereas internationalisation is a longstanding strong element of the Fraunhofer identity, the idea of promoting wellbeing and justice globally is currently not very present. In the documents on Corporate Social Responsibility (CSR) however a trace of Narrative E can be found: "To us, Corporate Responsibility also means [...] regional community outreach and compliance with social and environmental standards in the supply chain." Also in the context of the sustainability network, efforts were made to develop activities and co-operations aimed at development of poor countries. Also very recently Fraunhofer contributions to the Sustainable Development Goals (SDGs) were systematically

screened. In a previous process strategic efforts to address global needs beyond today's market demands were explored.

Narrative F: R&I With/for Society

This narrative is currently not very dominant in the Fraunhofer official discourse. Nevertheless, a number of indications point to its growing presence beneath the surface. Especially in the context of the sustainability network (a bottom up initiative in which 20 Fraunhofer Institutes cooperate) narrative F is definitely around. In the Fraunhofer sustainability report, first presented in 2014 and related to activities of the sustainability network, it is stated that "as an application-oriented research organization, it's particularly important for us to stay in touch with politics, science and society. That's why we voice our opinions and maintain an active dialogue with our interest groups. What's more, we try to communicate our findings in an accessible way so that we can kindle enthusiasm for research." (Fraunhofer-Gesellschaft 2014, p. 16). According to the sustainability report of 2014, activities that are particularly related to the societal dimension are 'public communication', 'active dialogue' and 'programs that appeal to young people'.

In the most recent sustainability report, published in autumn 2016, it is stated that Fraunhofer increasingly seeks the dialogue with societal groups in order to absorb societal needs and to make research results socially effective. That means precisely to involve societal actors in innovation processes, policy consulting based on research, development cooperation and the communication of research results to a broader public (Fraunhofer-Gesellschaft 2016). The explicit objectives regarding 'society' are to conduct stakeholder dialogues across the institutes, active participation in the creation of a national and European research area together with actors of the science system and the establishment of a Fraunhofer business unit 'Fraunhofer for development' (Fraunhofer-Gesellschaft 2016, p. 37). Last but not least, the fact that the JERRI project was embraced by the Fraunhofer headquarters indicates that the notion of "science with and for society" is gaining clout within Fraunhofer.

Conclusion

Figure 1 provides an overview on the presence of the six grand narratives of responsibility within Fraunhofer, based on the insights of the JERRI analysis of existing practices, processes and discourses. In line with the assumptions of (Randles et al 2016), it becomes clear that different narratives are coexisting in the organisation. The analysis also revealed the dynamics of change at play. Narrative F, E and C seem to be

slightly on the rise while narrative B is facing some challenges and a sediment of narrative A seems to be a robust element. As highlighted by the authors (ibid.), this means that actors within Fraunhofer may well face situations with conflicting values, dilemmata and tensions emerging from the different rationales.

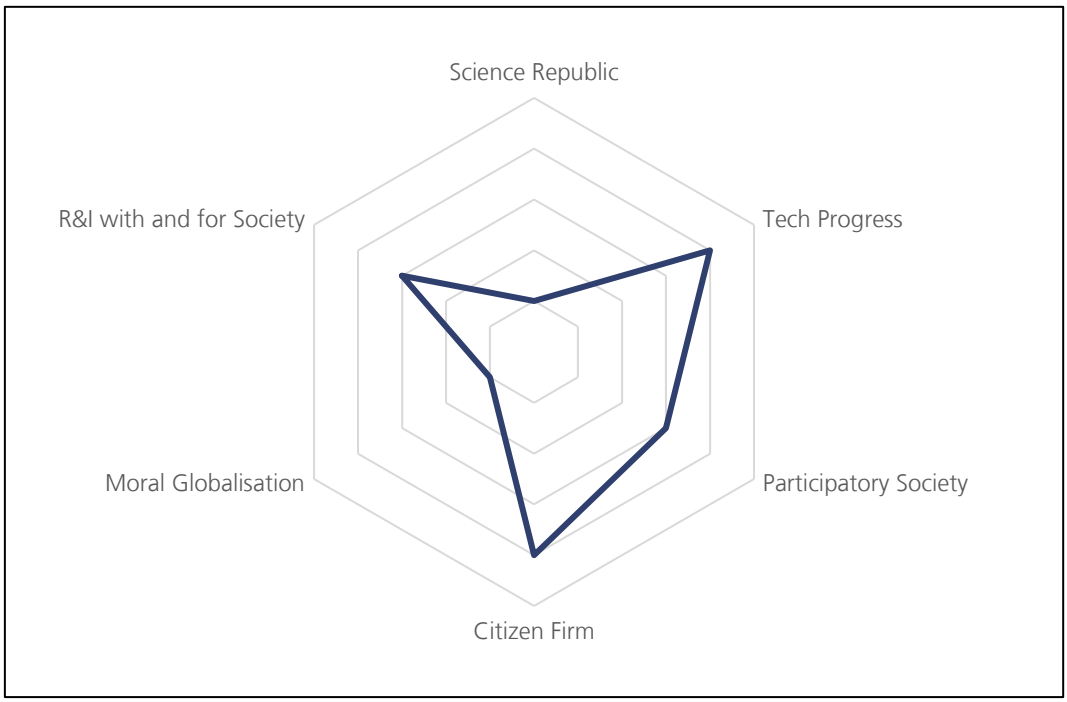

Figure 1: Establishment of the Six Grand Narratives in Fraunhofer

2.2 The degree of maturation of responsibility practices within Fraunhofer

The maturation of responsibility practices differs widely across the five RRI dimensions.

The least mature dimension is "**societal engagement**". As indicated in the framework, it is continuously evolving and actors continuously bring up elements of narratives C and F into the established B and D perspectives. However, first indications for a maturation into process are visible in the formal inclusion of this aspect into the sustainability reporting and the establishment of the Fraunhofer Center for Responsible Research and Innovation (CeRRI), which is focuses on participatory methods.[3] The integration of **ethics** has matured a little further resulting in several formal processes such as the ethics

[3] https://www.cerri.iao.fraunhofer.de/en.html

action plan and institutions such as the ethics helpline. In contrast to the societal engagement dimension, these activities are situated at the central level with the headquarters and receive attention at the highest board level. Still, as emphasized by several interviewees, the integration into everyday practices of research planning and conducting is but in its infancy. To which degree these ethic tools are used varies also from institute to institute depending on the kind of research areas they are focused on. Especially institutes and researchers who are dealing with ethically sensitive topics like animal testing or medicine research have a stronger demand for such tools and offers.

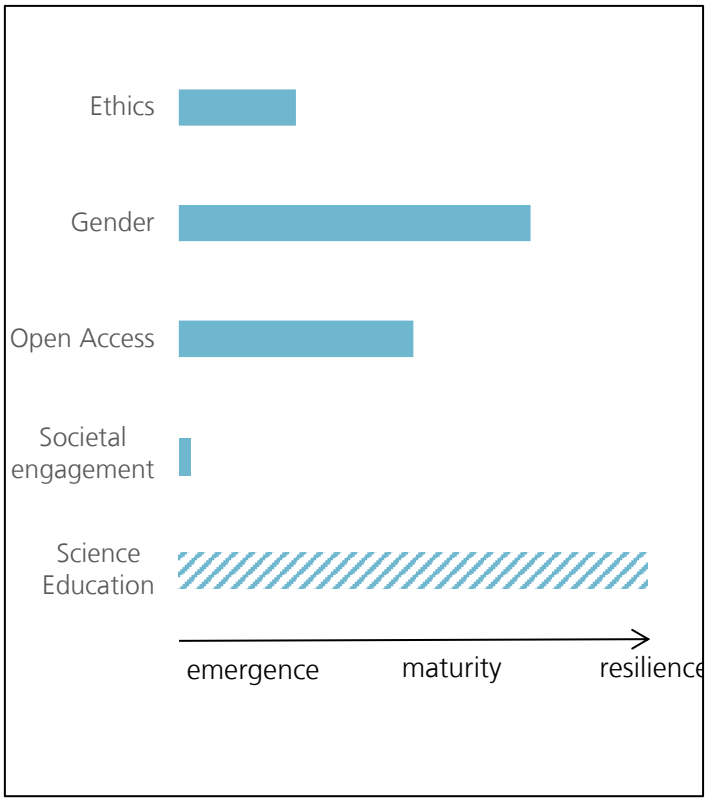

Figure 2: Degree of maturation of RRI dimensions at Fraunhofer

In the case of **Open Access,** the situation is similar as in ethics. Formal processes are in place and practices are clearly maturing. Nevertheless, the integration of open access into everyday research practices is only just on its way.

In the case of the **Gende**r dimension, the situation seems even more pronounced. Processes are highly mature and many institutions are in place and well functioning both at the central and institute level. Several elements such as the existence of the equal rights officer with substantial rights to act on behalf of gender equality in almost all

institutes are so well established that they can hardly be questioned any more. At the same time, interviewees clearly indicated that gender biases are still deeply engrained into the organizational culture and often practices at the institute level are still counteracting gender equality.

Finally, the dimension of **science education** could be seen as resilient as it is well established with several processes and institutional routines in place that are unquestioned within the organization and embedded into everyday practices on all levels. At the same time, it seems that activities in this dimension are operating less within the RRI narrative of empowering society to engage with science but rather address the legitimate concern of the organization to secure human resources.

2.3 The degree of systemic consolidation of responsibility practices at Fraunhofer

This axis of the deep institutionalisation framework captures the extent of systemic inter-dependence by indicating how far the responsibility-oriented norms and values are shared across different parts of the organization. In a fully-fledged 'system' of responsible innovation, different heterogeneous actors would share a common language of responsibility albeit translated locally into different professional languages and norms of professional virtue, ethics and action (Randles et al. 2016, p. 36). A particular mark of a deeply institutionalized system would be, the **'overflowing' into new spheres of economic and professional life beyond the place and actors where the transformative impulse originated, and beyond the imaginations, expectations or strategic influence the originators, thus taking on an autonomous self-perpetuating dynamic.** (ibid p. 37 citing (Callon 1998) bold in the original)

The deep institutionalization framework proposes four possible states of systemic consolidation:

A/ Ad-hoc experiments, demonstrations, and creative institutional design

B/ Niche integrated normative networks

C/ Pervasive inter-dependent system with overflowing

D/ New taken-for-granted unreflexive institutional logic, no longer reflexively questioned or challenged (co-exists with earlier logics)

At Fraunhofer, the situation within the five RRI dimensions partly mirrors the maturity level discussed above. For "**societal engagement**" the organization faces a situation between A and B with several ad-hoc experiments under way often pushed by individual institutional entrepreneurs in a creative manner and first normative networks emerging in the form of the sustainability reporting. For **ethics,** we find the integration into standards and routines slightly more progressed. This is partly due to the fact, that some aspects such as animal testing, research with humans, as well as dual use and foreign trade are heavily regulated so Fraunhofer has formal routines in place to comply with these regulations. Also, established institutions such as the ethics helpline and the formal action plan indicate a higher degree of embedding into the institutional fabric. At the same time as expressed by several interviewees (Teufel et al. 2016) a shared understanding of ethics across the organization is lacking. The participatory development of a new mission and guiding statements, which took place in 2016, can be seen as a push in this direction. In addition, the establishment of a wider notion of ethics that is encompassing a reflexive responsibility for "relationships between technical, social, economic and ecological systems and their impact on the future"[4] is only just emerging. In **Open Access and Gender** Fraunhofer seems to be approaching a pervasive interdependent system (C). In both cases, there are also emerging signs of systemic overflow. In the case of open access, it seems that a common framework of "open" thinking is emerging across diverse spheres under the broader heading of open science and open innovation notions that include much more than "only" freely accessible publications but extends to open research data and inclusion of users into innovation activities. One could argue that the notion of "openness" functions as a boundary object that is aligning ideas across diverse contexts as described by (Star, Griesemer 1989; Leigh Star 2010). In the case of gender, we see an emerging alignment with the wider discourse of "diversity" which is prevalent in other parts of the organisation. In the gender dimension we can also clearly observe "contested divisions of labour over who should take responsibility for what" (Randles et al 2016 p 36) as responsibilities between the equal opportunity officers at institute level and the central level human resource management are being negotiated. As Fraunhofer has a fairly standardized programme of training for new staff members, one important measure of systemic consolidation is in how far „Normative orientations would inform and influence the training programmes and syllabi of apprentice professionals" (ibid.). At the moment, it looks like

4 https://www.fraunhofer.de/en/about-fraunhofer/corporate-responsibility/research-and-development/ethics-and-scientific-responsibility.html

none of the RRI dimensions has been fully integrated into these programmes except for very basic aspects such as anti-corruption and scientific integrity in the case of ethics and basic information on gender equality activities. For the case of gender equality however, serious efforts are being made to integrate awareness of gender bias into the training programmes of junior and senior leadership. For ethics, similar efforts are under way in the context of the JERRI project albeit for more specific groups of senior level research managers. Finally, for the case of **science education** we can diagnose situation D where a taken-for-granted institutional logic i.e. “Fraunhofer needs to actively foster STEM competences in society especially for young girls to secure the inflow of excellent junior scientists” is no longer questioned or challenged. Activities operating within another rationale (Narrative F) are emerging but not under the umbrella of “science education”.

Conclusion

Figure 3 gives an overview of the situation of systemic consolidation of dimensions at Fraunhofer according to this first characterisation attempt. It is interesting to note that the assessment is similar to the one for the maturation degree discussed above but not equal. E.g. while the gender dimension can be said to be more mature than the open access one as it has a longer tradition and more institutions and processes in place, the degree of system consolidation is equal. At the same time, it becomes clear that different situations may lead to the same assessment. E.g. gender has a higher degree of embedding but open access has more overflow so they both end up in the same category.

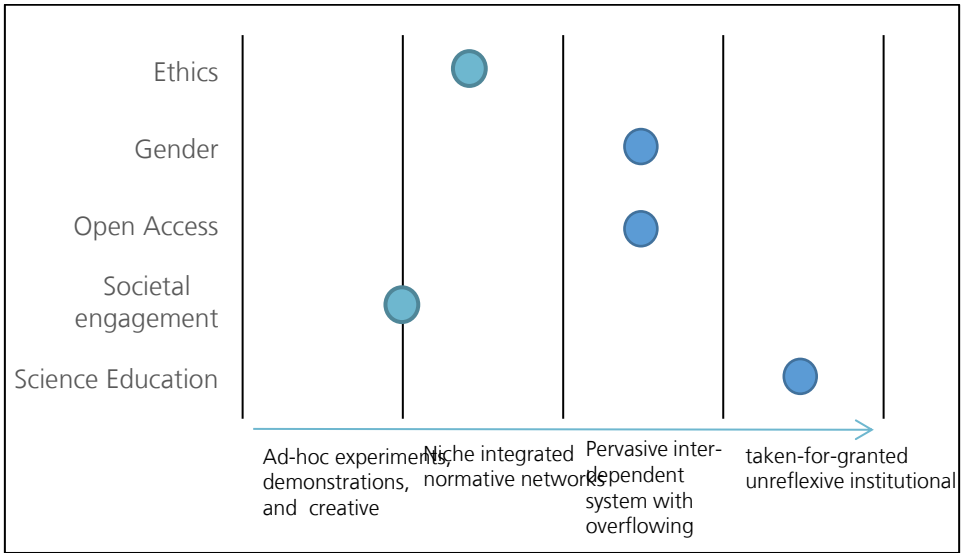

Figure 3: Degree of systemic consolidation of Fraunhofer per RRI dimension

2.4 Vertical alignment

This axis approximates ***vertical multi-level coherence.*** According to (Randles 2017) it incorporates the following three aspects:

A/ Institutional context & external conditioning factors, trends, pressures, challenges and opportunities (including role of the state and other forms of 'shadow hierarchy')

This can reach from resonance to dissonance with the external context. At the same time, the organisation may have rather little interaction with the context, which could qualify as a neutral relationship.

B/ Intra-organisational translation and 'getting along' with multiple institutional logics, within different units and functions of large/complex forms of 'organisational pluralism'

This could vary on a scale from well to poor coping with organisational pluralism.

C/ Institutional entrepreneurship and/or forms and expressions of leadership and intermediation at different levels of the organisation

Such entrepreneurship could be encouraged and rewarded or discouraged and punished.

As the exploration of B and C requires an in depth study of the organisation and therefore reaches beyond the possibilities of the JERRI research programme, we are focusing our analysis on aspect A the alignment with the institutional context. In the case of Fraunhofer, the by far most important aspect of this context is the German federal ministry of education and research (BMBF) which is financing around 30% of the Fraunhofer budget directly[5] and another large share through competitive funding. Secondly, Fraunhofer covers around 40% of its budget through contract research for industry. Representatives of BMBF, Länder and German industry have important functions in the Fraunhofer board. Finally, the German innovation system and especially the landscape of other research organizations such as Max-Planck society, Leibniz and Helmholtz institutes forms an important organisational background as it is vital for Fraunhofer to fulfil its specific role within this system. Another important institutional environment factor is the European Commission and especially its research funding activities that contribute around 6% of the Fraunhofer contract research income through competitive funding.

As a large and powerful organisation Fraunhofer has a two-way relationship with a large part of its institutional environment. On the one hand, it is strongly driven by BMBF requirements through the yearly budget negotiations. At the same time, Fraunhofer is also influencing BMBF policies e.g. through taking an active role in the development of the German Hightech-Strategy. Also in the case of EC Research and Innovation strategy Fraunhofer is raising its voice through several channels such as e.g. open consultations. Against this backdrop, the situation in the RRI dimensions can be characterized as follows.

The activities in **science education** were developed largely autonomously in order to address intrinsic needs of the organisation. They are however in perfect resonance with the external context and especially well in line with BMBF and industry demands for more young people opting for STEM qualifications. The relationship is resonating.

In the case of **societal engagement** we find very little interaction with the institutional context. Rather, as described above, the activities are driven by individual institutional entrepreneurs. Only recently with the uptake of participation as one of the pillars of the German Hightech-Strategy has BMBF started to emphasize this aspect stronger. The relationship is neutral.

[5] Around 10% of this is contributed by the Länder

At the other end of the spectrum, we find the **gender equality** dimension, which is heavily pushed by BMBF. Repeatedly BMBF has insisted on Fraunhofer improving its share of female scientists and women in leading positions. Also the network of other research organisations play an important role here both for benchmarking and for exchange of successful measures. In the case of "gender in content", the activities of Fraunhofer were strongly driven by the requirements of the European Commission's framework programme. The relationship is resonating with a push from the context (outside in).

The Fraunhofer **Open Access** activities were also originally driven by EU requirements in Horizon 2020 which are also supported by BMBF. In the meantime however, Fraunhofer has become a pioneer in this area on its own account pushing also other players to move forward towards open science. The Fraunhofer OA group is highly active also on European level and leading negotiations with key players such as the publishing houses. The relationship is resonating with push from the organisation (inside out).

Regarding **Ethics,** one can also find both on the national (BMBF) and the European level trends and pressures, which are pushing Fraunhofer forward. While on the European level again the Horizon 2020 framework is setting some ethical requirements for funding, on the state level BMBF pushes the topic of ELSA (Ethical, Legal and Social Aspects) assessment for the research area of life sciences. Also, the other actors of the German research landscape many of whom have established more ethics related institutions than Fraunhofer are pressuring the organisation. These external influences do not affect every research area and Institute of Fraunhofer in the same way. The already mentioned sensitive areas like medicine research and life sciences are more driven by these requirements than domains like microelectronics of production technologies. The relationship is resonating with the impulse direction from the context.

Conclusion

Figure 4 gives an overview on the assessment of aspect A of the vertical alignment dimension. It is interesting to note that in order to make a meaningful assessment both the quantity and the quality/direction of the organisation with its context needs to be taken into account. This is especially relevant for a large and powerful organisation that is able to also push the environment.

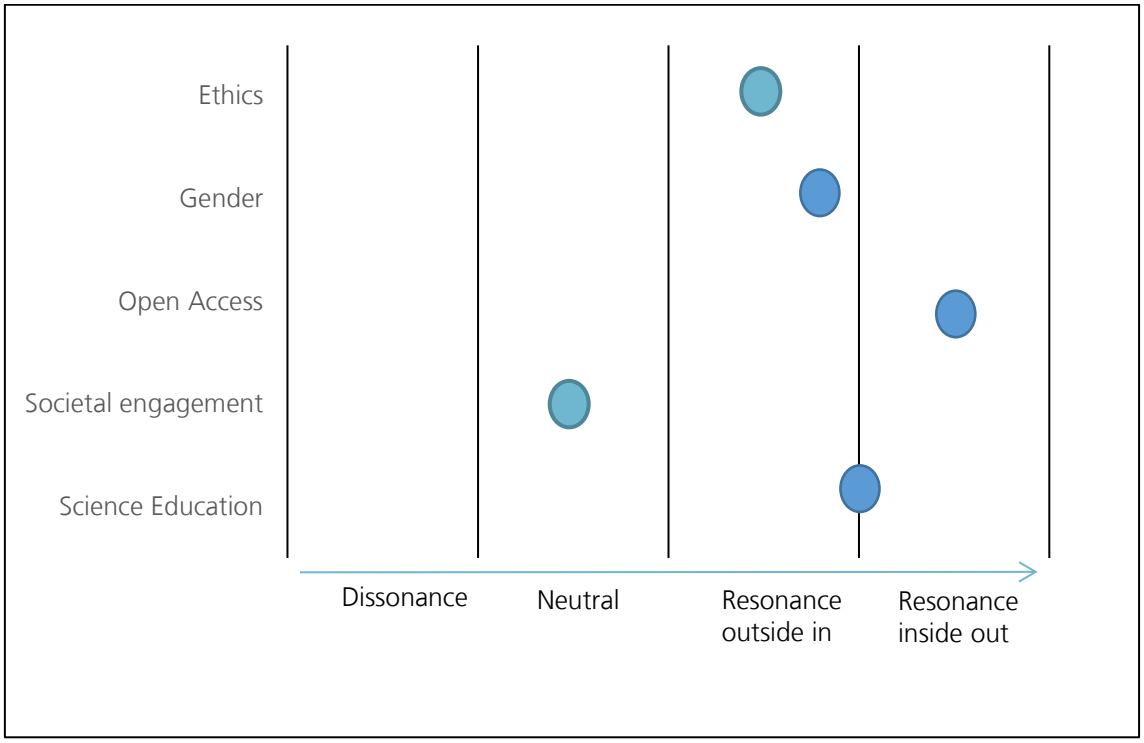

Figure 4: Overview degree of interaction with context 5 high interaction 1 low interaction

Summary: Localising Fraunhofer within the four way Matrix

The table below gives an overview of the assessments discussed above.

	Open Access	Gender Equality	Ethics	Societal Engagement	Science Education
State of the maturation process	mature	resilient	Between emergence and maturity	Emergent	not assessable
Systemic Consolidation	Pervasive interdepend system with overflowing	Taken-for-granted unreflexive institutional logic	Niche integrated normative networks	Ad-hoc experiments	not assessable
Vertical Alignment	High resonance and active influence on the context	High pressure from the context but difficulties in realization	Medium pressure from context, resonance depends on specific research area	Low pressure and little interaction with the context	Resonance

As this is a highly qualitative assessment, a formal quantification seems hardly suitable. Still in Figure 5 we present a graph illustrating assessments in a way that is allowing a

qualitative comparison of the situation of the five RRI dimensions along the three axes of deep institutionalisation for Fraunhofer.

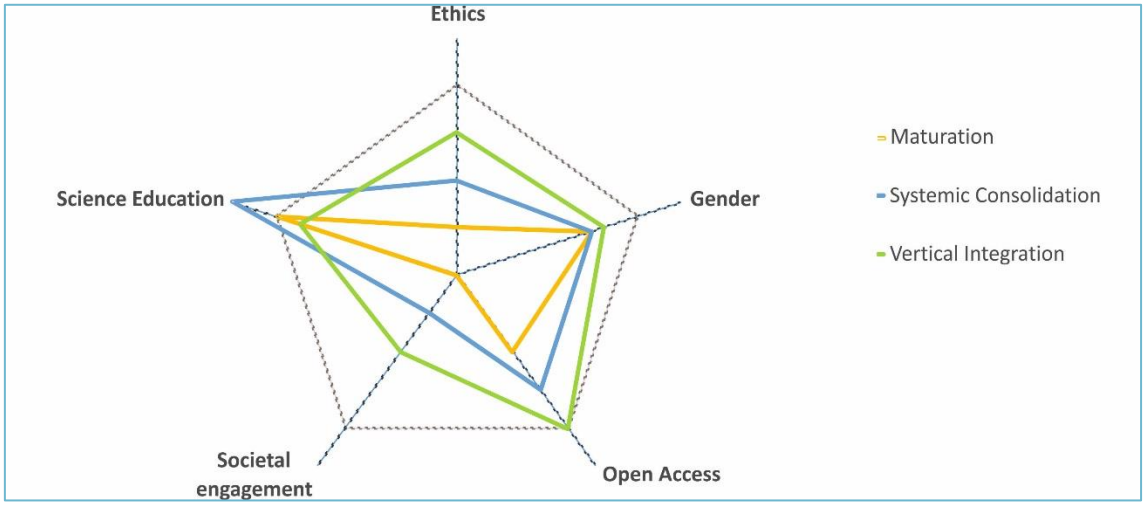

Figure 5: Overview assessment of the status of the three deep institutionalisation axes for the five RRI dimensions at Fraunhofer

3 JERRI goal development ambitions in the case of Fraunhofer

The "[...] *deep institutionalisation* of *responsible* innovation… involves effective transformation towards a set of articulated normative goals embedding values into practices and processes and orienting action towards those goals." (Randles et al. 2014, p. 32). In order to reach a long-term organizational ambition several "qualifying criteria of its uptake, such as 'taking care' of integrating perspectives from a wide range of societal actors" (Randles 2017, p. 4) should already be addressed when negotiating (possible) normative directions and goals.

Thereby, it can be assumed that, due to their size, range of research fields, functional differentiation and decentralisation, organizations such as Fraunhofer are highly "pluralistic [...] in terms of its responsibility-scope" (cf. (Randles 2017, p. 15). This assumption is supported by the empirical findings on the state of the art on existing RRI-related practices as set out in the deliverable report "Synthesis on existing RRI practices" (Teufel et al. 2016): Both between and within the RRI-related topics, the notion of responsibility and its relation to the field is framed differently by individual actors. Moreover, each field of activity shows its own history and degree of past "institutionalization", e. g. in terms of formal decisions and rules.

At the procedural level, a common approach to "visioning and goal" development should therefore at least address the following contingencies:

- The boundaries of the (stakeholder) system in which decisions and activities evolve (cf. section 3): These are sometimes hard to determine (e. g. in the case of activities related to "Societal Engagement") and sometimes less ambiguous (as in "Open Access"-related activities).
- The existence or absence of an organization-wide discourse: In some activity fields, more efforts need to be made to establish a (preliminary) common understanding and to sell the topic as such within the organization; in other fields existing discourses on how to further develop, improve, specify or broaden a topic should be addressed.
- "Hard facts" such as the existence and absence of formal authorisations to act: Depending on previous formal decisions as well as the time horizon and scope of the goals to be elaborated, formal decisions to enact them may either be needed or not and can either be taken in a short-term (as in the case of pilot activities) or need time even beyond the project period.

In order to cope with these contingencies, the concept of organizational goal development at Fraunhofer analytically and practically distinguishes between three elements for each topic:

- **JERRI visions**: As compelling images of the preferred future, they set out the highest aspirations of the involved Fraunhofer representatives and "external" stakeholders in the field and help to move towards a common understanding of the topic(s).
- **Long-term organizational goals (for activities beyond JERRI)**: They specify the long-term aspirations formulated in the JERRI visions. The long-term goals reach beyond the project duration and will take the form of informal propositions / orientations to act for Fraunhofer as a whole.
- **Short-term goals (for pilot activities within JERRI)**: Goals for the pilot activities should take into account both the proposed long-term goals and the state of play in the respective activity field. They should be formulated in a measurable way. Short-term goals should account for either the local (i.e. institute level) or the "global" nature of the pilot activities and, where needed, they should be suited to receive formal commitment within Fraunhofer as a whole.

4 Goal development concept at Fraunhofer

A concept for the development of visions, long-term and short-term goals requires defining the boundaries of the (stakeholder) system to which it is applied in advance. In other words, the question of "whose visions and goals" should be answered. Such a definition should address the principle of participation which is widely considered to lie at the core of responsible research and innovation[6] and to the qualifying criteria of its uptake (cf. section 2). Therefore, the visions and goals should outreach the boundaries of the organization and refer to both Fraunhofer and its external stakeholders. Chapter 3.1 describes the 'ideal type' process of stakeholder identification and selection, which may be deviated from depending on the contingencies of each topic.

6 For example, participation is part of 'responsiveness' as one of the „Four Dimensions of Responsible Innovation" conceptualised by Owen et al. (2013).

4.1 Stakeholder identification and selection

In order to identify the "relevant" stakeholders, we apply a process of stakeholder identification that is based on the "critical systems thinking" approach (Ulrich 2000); (Achterkamp, Vos 2007) for each dimension. This approach, which was drawn upon in previous projects (cf. (Haegeman et al. 2012); (Teufel, Erdmann 2015; Erdmann et al. 2016), particularly highlights the role of stakeholders "who are affected [by the process but] not [yet] involved" (Achterkamp, Vos 2007, p. 4). The result of this process is a set of concrete persons, representing different stakeholder groups internal and external to Fraunhofer, for each of the five RRI-related topics.

This process is followed by a selection of stakeholder groups and persons to be invited to each workshop. The necessity for this selection step results from several methodological and organizational limitations:

- First, the visioning and goal setting method can best be carried out with 10-15 workshop participants (cf. chapter 3.2), which normally reduces the number of individual stakeholders. Stakeholder groups that are expected to be affected in a very weak way may therefore not be selected.
- Second, stakeholder groups with institutional logics that strongly diverge from the ideas behind the topic, e. g. publishers with business models that are opposed to the idea of Open Access, may not be selected either.
- Third, organizational rules such as confidentiality may impede the involvement of certain types of stakeholders. In cases where it is not possible to involve external stakeholders in the workshops, interviews are carried out in the forefront to capture their perspectives and bring them into the workshop discussions.

In spite of the necessity of this necessary selection step, all stakeholders initially identified are retained in "stakeholder repositories" that will be further complemented in the course of the project.

For each of the five RRI-related topics, the process of stakeholder identification is carried out in brainstorming sessions in three steps with a total duration of about 2 hours. In consideration of the given resource constraints, each brainstorming session involves 2-3 Fraunhofer members: the person in charge for the pilot activities attributed to each topic and (a) further person(s) with knowledge of the stakeholder system, e. g. the

stakeholders of “Open Access at Fraunhofer”. The process of stakeholder identification involves the following three steps:

1) Individual brainstorming about stakeholder groups

Following a stakeholder typology that was already employed, e. g. in Haegeman et al. (2012), the individual brainstorming is guided by the following questions:

- Which stakeholder groups have an influence on Open Access practices at Fraunhofer (“Dominant stakeholders”) and how?
- Which stakeholder groups are or will be affected (positively or negatively) by Open Access practices at Fraunhofer (“Affected stakeholders”) and how?
- Which additional stakeholder groups may gain influence or legitimate claims on key dimension practices in the future (“Dormant stakeholders”)?

At this stage, stakeholder groups do not represent concrete actors, but groups of individual or collective actors that can be assumed to have similar goals and interests with regard to the topic at stake. For example, in the field of Open Access at Fraunhofer, stakeholder groups may be authors, librarians or research-intensive firms.

2) Group brainstorming about stakeholder groups

The group brainstorming about stakeholder groups involves a discussion of the stakeholder groups between all participants of the brainstorming session. The identification of further stakeholder groups is thereby stimulated by the attribution to the JERRI target groups[7]:

- Level 1 target group: Fraunhofer members (staff, institutes, ...)
- Level 2 target group: Professional “external” Fraunhofer dimension stakeholders
- Level 3 target group: EU 28 RTOs and similar research organizations
- Level 4 target group: EU level dimension stakeholders
- Further levels

3) Group brainstorming about concrete organizations/persons in each stakeholder group

7 Although the logic behind the formulation of target groups was to differentiate between different levels of mutual learning in the project, and hence not the respective actor’s influence or legitimacy, the categorisation is considered to be broad enough to be used for this brainstorming exercise.

Following the identification of stakeholder groups, concrete organizations and persons within each stakeholder group are identified in each brainstorming session and in subsequent desk research. The approach combines (1) the advantage of relying on existing networks/known persons to increase the likelihood of these persons to actually participate with (2) the search for further persons to ensure that representatives from each selected stakeholder group are invited. In cases where few persons within one stakeholder group are known or where persons are not available for the respective workshop, they are asked for further potential participants within their stakeholder group. Stakeholders are briefed about their role, in particular by pointing up the importance of their individual opinion[8], in the forefront to and within the workshop.

4.2 Workshop Methodology

Each of the five goal development workshops is carried out as a one-day workshop with 10 to 15 participants and at least two moderators from Fraunhofer ISI. According to the three goal development elements that are outlined in chapter 2, two major methodological components are employed in each workshop: The visioning method and the goal development method, the latter building on the results of the former.

4.2.1 Visioning method

Given the long-term character of institutionalisation processes in the field of responsible research and innovation (cf. (Randles 2017, p. 3), participative foresight methods (cf. for example, Miles 2010, (Guston 2014)) can not only create long-term organizational orientations but also help to align short-term goals/pilot activities in JERRI to such long-term orientations.

As individual and shared values are widely considered to lie at the core of goal development processes, the visioning method (cf., for example, (Wiek, Iwaniec 2014); (Neuvonen, Ache 2017) seems to be most appropriate to start the goal development processes in the workshop settings. A vision as an outcome of a visioning process can be considered as "[...] a communicative device, challenging and encouraging stakeholders to take on new responsibilities in advancing [the] ... envisioned and desired future. The central purpose of the vision is to collect and consider together the views of decision-makers, experts, and the general public." (Neuvonen, Ache 2017, p. 9). Rather

8 It can be expected that the participants' interests and opinions will partly deviate from the previously assumed interests of the stakeholder group they were attributed to.

than constituting the final result of each workshop, the visions serve to establish a shared meaning of each topic, e. g. “Societal Engagement at Fraunhofer in the long-term future”, and of the underlying values.

In the goal development workshops with representatives of Fraunhofer and its stakeholders within the respective activity field, visioning processes will be carried out in moderated group work. The processes will be guided by good practices gathered by Fraunhofer ISI in other visioning processes, e. g. in the MoRRI project, in which visions were described as an inspirational force pulling the present forward to the preferred future, thereby representing one’s values translated into the future and made real (Bezold et al. 2009, pp. 1, 4). The visioning processes will involve the following steps:

1) Evoking facts on the state of the art
2) Individual retrospectives on the individual “value history” of the participants within the field, e. g. how they developed their individual concept of “Ethics”
3) Creating a common understanding[9] of the topics / elements to be addressed
4) A discussion of possible barriers and a deliberate neglect of the barriers for the purpose of creating a vision
5) Individual/bilateral (group work) visions with a time horizon of 2030
6) Shared visions among more than two workshop participants (group work)
7) A shared vision among all workshop participants

When evoking facts on the state of the art (step 2), participants are encouraged to reflect on the question where Fraunhofer stands today in terms of the typology /4-way matrix of deep institutionalization (Randles 2017, p. 31).

Results in each activity field will be a common vision of the workshop participants, i. e. of the Fraunhofer representatives and “external” stakeholders, on the normative orientations of “Ethics”, “Societal Engagement” at Fraunhofer they want to follow. As both the formal acceptance and internalization by the organization as a whole must be viewed to take place within longer time horizons, these visions can only be a first step towards a widely accepted normative orientation of Fraunhofer in each activity field. Instead of being ends in themselves, they facilitate the formulation of long-term goals and they help to justify decisions on the pilot activities in Work Package 6.

9 Potential difficulties in seeking a common understanding e. g. as a result of asymmetries in stakeholders power-relations are addressed in two respects: First, the visioning method itself addresses this difficulty by negotiating the visions ‘botton-up’, i. e. by starting with bilateral negotiations and resulting in a plenary discussion. Second, notes on diverging opinions will be taken to make diverging perspectives explicit.

4.2.2 Goal development method

The development of both (propositions for) long-term organizational goals and short-term goals for the JERRI pilots will build on the visions that were previously developed in the same workshop. Therefore, elements from the Res-AGorA Co-construction Method (Bryndum et al. 2016, p. 55) and Responsibility Navigator (Kuhlmann et al. 2016, p. 135), which have proven to be effective for encouraging "[...] reflective processes to help diverse and contesting stakeholders make research and innovation more responsible [...]" (The Danish Board of Technology, p. 2), will be employed in the workshop settings. Moreover, existing good RRI-related practices identified in Work Packages 1 and 9 will be made transparent so that they can be fed into the goal development process. On the basis of the Co-construction Method, the goal development process will involve the following steps and guiding questions:

- *Exploration*: What are the challenges, conflicts and barriers that may arise if Fraunhofer moves towards the previously formulated vision?
- *Present/Investigate*: Which principles and dimensions (of the Responsibility Navigator) are considered to be relevant in order to tackle these issues, and in which way?
- *Concretise*: How can these solutions be formulated in terms of long-term (up to 2025/2030) goals? Which short-term goals can be derived for the pilot activities?

Unlike described in the manual for the Co-construction Method, results will be formulated at the level of goals rather than at the level of actions; the latter will be the main focus of the subsequent Work Package 4 "Action Plans at Fraunhofer".

4.3 Complementary approaches to goal development

4.3.1 Interviews with external stakeholders

For the topics where it is not possible to involve external stakeholders in the workshops, interviews are carried out in the forefront to capture their perspectives and bring them into the workshop discussions. As in an earlier stage of the project, interviews are either carried out by phone or, if economically justifiable, face-to-face. Interview partners are selected by the same process as the potential workshop participants (cf. section 3.1). To capture several (and potentially diverse) perspectives and opinions, at least three interviews with representatives from different stakeholder groups are carried out. Audiotapes will be used to capture and document the relevant information and citations.

A semi-structured interview guideline (Annex I) is used to structure the interviews and "to be open for new information outside the current analytical framing" (Teufel et al. 2016, p. 10) at the same time.

4.3.2 Survey on Open Access for research data

The Open Access pilot at Fraunhofer will presumably provide the infrastructure for referencing the specific part of the research data being the base for scientific publications, and for storing this data. For this purpose, a survey on research data management is carried out between 23 February 2017 and 16 March 2017 by Fraunhofer IRB within the Fraunhofer. The results form the basis for further requirements for developing and implementing appropriate infrastructures and services regarding research data management. As part of Work Package 2 of the JERRI project, they will be fed into the goal development process for Open Access at Fraunhofer.

The survey is addressed to FIMs (science information managers), researchers and responsible IT managers. It aims to gather extended knowledge of the state of the art practices on research data management within the Fraunhofer Institutes. The survey is carried out as online survey. For the 66 science information managers and for the researchers, the invitation is disseminated by email by two directors of Fraunhofer institutes via mailing lists. For these target groups, the mailing list of the so called "wissenschaftlich-technischer-Rat" (scientific-technical council, 30 persons) is used with a request to redistribute the survey. At present, no numbers are available on how many researchers will actually be contacted. The responsible IT managers (125 persons) are addressed directly.

The survey contains both closed and open questions to get a comprehensive, descriptive picture of the common practices of research data management at the institutes. Annex II contains the English pre-final version of the questionnaire addressed to the researchers. For the other target groups, only German versions of the questionnaire are used. The data is gathered anonymously; a link between person and survey results won't be possible. The analysis of the survey will be documented in a PowerPoint document and shared with all interested participants, the JERRI project members and interested stakeholders. Full details and results of the survey will be included in Deliverable D2.2 'Description on specified RRI goals at Fraunhofer'.

4.3.3 Advice from the JERRI Advisory Board

The JERRI Advisory Board will be asked to comment on the results of the goal development workshops. Their topic/dimension-related, professional feedback will be considered in the formulation of long-term goals and the goals for the pilot activities.

5 Conclusions

This Deliverable D2.1 ‘Concept on organizational RRI goal development’ of the JERRI project sets out a procedural guideline and describes specific methods to be used in the five JERRI goal development processes at Fraunhofer. As part of Work Package 2, these interrelated processes evolve around the five dimensions provided by the European Commissions’ concept of Responsible Research and Innovation (RRI). The concept builds on existing approaches and previous experiences with the identification of selection of stakeholders, foresight methods, and reflective stakeholder dialogues towards more responsible practices in research and innovation.

Accordingly, results comprise a general description of the Fraunhofer stakeholder identification and selection approach and the methods to be used for developing visions, organizational long-term orientations as well as goals for the JERRI pilot activities in each dimension-related field of action. Further, complementary methods / activities supporting the goal development processes are outlined as well. The actual realization in each case will previously diverge from the general concept in several respects; these differences as well as the individual approaches of Fraunhofer and TNO will be compared in Deliverable D10.2 ‘Lessons learned for goal development’.

The theoretical framework of “deep institutionalisation” has proved highly valuable for better understanding the situation of institutional entrepreneurs in Fraunhofer when pushing forward RRI trajectories. On the one hand, they hinted at potential tensions and dilemmas such as conflicting old and new narratives within the organisation. At the same time they have pointed towards inroads for change across the five RRI dimensions. As highlighted by {Randles 2017} these assessments should not be seen as an end in itself. Rather they will be used as the entry point for discussion with actors within and around Fraunhofer in the upcoming interactions in workshops and interviews. The assessments will then be revisited in the respective reports.

6 Publication bibliography

Achterkamp, M. C.; Vos, J. F. (2007): Critically Identifying Stakeholders. Evaluating boundary critique as a vehicle for stakeholder identification. In: Systems Research and Behavioral Science (24), pp. 3–14.

Bryndum, N.; Lang, A.; Mandl, C.; Nielsen, M. V.; Bedsted, B. (2016): The Res-AGorA Co-construction Method. In: Lindner, R., Kuhlmann, S., Randles, S., Bedsted, B., Gorgoni, G., Griessler, E., Loconto, A., Mejlgaard, N. (Eds.): Navigating towards shared responsibility in research and innovation. Approach, process and results of the Res-AGorA project. Karlsruhe, pp. 55–61.

Callon, M. (1998): The laws of the markets. Oxford [u.a.]: Blackwell (Sociological review Monographs).

Erdmann, L.; Eckartz, K.; Moller, B.; Tercero, L.; Teufel, B.; Fuchs, M.; Machacek, E.; Thorsøe, K.; Petavratzi, E.; Brown, T.; van der Voet, E.; Falck, E.; Bisevac, V.; Hofmeister, T.; Quental, L.; Katalin, S.; Radwanek-Bak, B.; Arnbom, J.-O. (2016): MICA Deliverable D2.1. Stakeholder Report: identification & analysis.

European Commission (2014): Responsible Research and Innovation. Europe's ability to respond to societal challenges. Publications Office of the European Union. Luxembourg.

Fraunhofer-Gesellschaft (2014): Sustainability Report 2013. Executive Summary. Fraunhofer-Gesellschaft zur Förderung der angewandten Forschung e.V. München. Available online at https://www.fraunhofer.de/content/dam/zv/de/ueber-fraunhofer/Nachhaltigkeitsbericht2013/Sustainability-Report-2013-Fraunhofer-Gesellschaft.pdf, checked on 25.10.2016.

Fraunhofer-Gesellschaft (2016): Nachhaltigkeitsbericht 2015. Executive Summary. Fraunhofer-Gesellschaft zur Förderung der angewandten Forschung e.V. München. Available online at https://www.fraunhofer.de/de/ueber-fraunhofer/profil-selbstverstaendnis/nachhaltigkeitsbericht-2015.html, checked on 21.10.2016.

Guston, D. H. (2014): Understanding 'anticipatory governance'. In: Social studies of science 44 (2), pp. 218–242. Available online at http://journals.sagepub.com/doi/pdf/10.1177/0306312713508669, checked on 22.02.2017.

Haegeman, K.; Pérez, S. E.; Marinelli, E.; Warnke, P.; Teufel, B.; Degelsegger, A.; Weiss, G. (2012): Communication Strategy – Deliverable D6.2. Report of the Forward Visions on the European Research Area (VERA) project. The VERA consortium. Sevilla / Karlsruhe / Wien.

Kuhlmann, S.; Edler, J.; Ordóñez-Metamoros, G.; Randles, S.; Walhout, B.; Gough, C.; Lindner, R. (2016): Responsibility Navigator. In: Lindner, R., Kuhlmann, S., Randles, S., Bedsted, B., Gorgoni, G., Griessler, E., Loconto, A., Mejlgaard, N. (Eds.): Navigating towards shared responsibility in research and innovation. Approach, process and results of the Res-AGorA project. Karlsruhe, pp. 135–159. Available online at http://responsibility-navigator.eu/wp-content/uploads/2016/01/Res-AGorA_Responsibility_Navigator.pdf, checked on 27.07.2017.

Leigh Star, S. (2010): This is Not a Boundary Object. Reflections on the Origin of a Concept. In: Science, Technology, & Human Values 35 (5), pp. 601–617. DOI: 10.1177/0162243910377624.

Miles, I. (2010): The development of technology foresight: A review. In: Technological Forecasting and Social Change 77 (9), pp. 1448–1456. Available online at http://ac.els-cdn.com/S0040162510001794/1-s2.0-S0040162510001794-main.pdf?_tid=2d3eea1a-f8e0-11e6-922f-00000aab0f6b&acdnat=1487755419_e44a29cdf3d0bda8ba9d82377f92bee8, checked on 22.02.2017.

Neuvonen, A.; Ache, P. (2017): Metropolitan vision making – using backcasting as a strategic learning process to shape metropolitan futures. In: Futures (86), pp. 73–83.

Owen, R.; Stilgoe, J.; Macnaghten, P.; Gorman, M.; Fisher, E.; Guston, D. (2013): A Framework for Responsible Innovation. In: Owen, R., Bessant, J., Heintz, M. (Eds.): Responsible innovation. Managing the responsible emergence of science and innovation in society. Chichester, West Sussex: John Wiley & Sons, Ltd., pp. 27–50. Available online at http://www.synbicite.com/media/attachments/1119966361-3.pdf, checked on 24.10.2016.

Randles, S. (2017): JERRI – Joining Efforts for Responsible Research and Innovation Deliverable D1.2. Deepening ‘Deep Institutionalisation’. Available online at http://www.jerri-project.eu/jerri-wAssets/docs/deliverables/wp-1/JERRI_Deliverable_D1_2_Deepening-Deep-Institutionalisation.pdf, checked on 14.12.2017.

Randles, S.; Dorbeck-Jung, B.; Lindner, R.; Rip, A. (2014): Report of the Roundtable at S.NET Boston 2013: 'Where to next for Responsible Innovation?'. In: Coenen, C., Dijkstra, A., Fautz, C., Guivant, J., Konrad, K., Milburn, C., van Lente, H. (Eds.): Innovation and Responsibility: Engaging with New and Emerging Technologies. Berlin: Akademische Verlagsgesellschaft AKA GmbH, pp. 19–37.

Randles, S.; Laredo, P.; Loconto, A.; Walhout, B.; Lindner, R. (2016): Framings and networks: six grand narratives of de facto rri. In: Lindner, R., Kuhlmann, S., Randles, S., Bedsted, B., Gorgoni, G., Griessler, E., Loconto, A., Mejlgaard, N. (Eds.): Navigating towards shared responsibility in research and innovation. Approach, process and results of the Res-AGorA project. Karlsruhe, pp. 31–36. Available online at https://indd.adobe.com/view/eaeb695e-a212-4a34-aeba-b3d8a7a58acc.

Star, S. L.; Griesemer, J. R. (1989): Institutional Ecology, `Translations' and Boundary Objects. Amateurs and Professionals in Berkeley's Museum of Vertebrate Zoology, 1907-39. In: Social studies of science 19 (3), pp. 387–420. DOI: 10.1177/030631289019003001.

Teufel, B.; Erdmann, L. (2015): Akteurs- und Netzwerkanalyse. Arbeitspapier im Arbeitspaket 1 (AP 1.3) im INNOLAB Projekt: „Living Labs in der Green Economy: Realweltliche Innovationsräume für Nutzerintegration und Nachhaltigkeit“. Available online at http://www.innolab-livinglabs.de/fileadmin/user_upload/Benutzerdaten/Publikationen/INNOLAB_AS1_3_LivingLab-Akteurs-und-Netzwerkanalyse.pdf, checked on 22.02.2017.

Teufel, B.; Lindner, R.; Gransche, B.; Goos, K.; Steen, J. N. M.; Emmert, S.; Joignant, A. (2016): JERRI - Joining Efforts for Responsible Research and Innovation. Deliverable D1.1. Synthesis on existing RRI practices. Unpublished Report.

The Danish Board of Technology: The RRI Co-construction Method: The Manual. The Danish Board of Technology; Institut für Höhere Studien Vienna; University of Twente; Fraunhofer ISI. Available online at http://responsibility-navigator.eu/wp-content/uploads/2016/01/RRI-Co-construction-Manual.pdf, checked on 21.02.2017.

Ulrich, W. (2000): Reflective Practice in the Civil Society: The contribution of critically systemic thinking. In: Reflective Practice 1 (2), pp. 247–268.

Wiek, A.; Iwaniec, D. (2014): Quality criteria for visions and visioning in sustainability science. In: Sustainability Science 9 (4), pp. 497–512.

Abbreviations

EC	European Commission
ERA	European Research Area
EU	European Union
FIM	Fachinformationsmanager – science information managers at the Fraunhofer-Gesellschaft
Fraunhofer IRB	Fraunhofer-Informationszentrum Raum und Bau / Fraunhofer Information Center for Planning and Building
Fraunhofer ISI	Fraunhofer-Institut für System- und Innovationsforschung / Fraunhofer Institute for Systems and Innovation Research
ISSI	Integrating Society in Science and Innovation
JERRI	Acronym for the project “Joining Efforts for Responsible Research and Innovation”
MoRRI	Acronym for the project “MoRRI – Monitoring the Evolution and Benefits of Responsible Research and Innovation”
Res-AGorA	Acronym for the project “Responsible Research and Innovation in a Distributed Anticipatory Governance Frame. A Constructive Socio-normative Approach”
RRI	Responsible Research and Innovation
RTO	Research and Technology Organization
TNO	Toegepast Natuurwetenschappelijk Onderzoek / The Netherlands Organisation of Applied Scientific Research

Annex I: Guideline for interviews with ‘external’ stakeholders

The following generic guideline will be adjusted to the respective topic.

A. Organizational and individual understanding of the topic's central concepts [e.g. 'ethical responsibility' or 'scientific literacy']:

1) How would you describe your organization's understanding of the concept [X/Y/Z]? How would you describe your individual understanding?

2) What are your organization's goals related to the concept of [X/Y/Z]? How are these goals pursued today?

B. 'External' perspective on the topic:

3) Which developments in Research and Technology Organizations are desirable?

4) Which requirements do you think Fraunhofer should fulfill?

C. Experiences:

5) What can be learned from your existing experiences to reach the mentioned goals?

Annex II: Open Access Survey carried out by Fraunhofer IRB

I. Collection of Research Data

1. I am familiar with the term of „Open Access“
    a. Yes
    b. No
    c. No answer
2. I am using the following services by Fraunhofer Competence Center Research Services & Open Science:
    a. Fraunhofer Publica
    b. Fraunhofer ePrints
    c. Publication Support

Filter 1aa: Collection of Research Data

The term “Open Access” contains not only free access to publications but also free access to research data. Do you collect research data during your projects?

a. Yes
b. No

Start of Filter 1AA – Collection of Research Data

3. Within what kind of projects do you collect research data? (Multiple)
    a. Projects in cooperation with industry partners
    b. Projects in cooperation with other research organizations
    c. Public third-party funded projects
    d. Institutional projects
    e. Projects run by the Headquarters, affecting several institutes
    f. No answer
4. What source does your research data come from?
    a. Empirical Observation and automatic measurement
    b. Scientific Experiments
    c. Mathematical and technical simulations
    d. Images of objects
    e. Surveys and interviews with persons
    f. Statistics and reference data
    g. Logfiles and usage data

   h. Text documents
   i. Sensitive data (data with personal references, medical data)
   j. No answer
   k. Other: (free text field)
5. What types of research data do occur?
   a. Images, graphical data
   b. Multi-dimensional visualization or models
   c. Audio-Records
   d. Video-Records
   e. Text
   f. Tables
   g. Databases
   h. Program and applications
   i. Subject- and instrument-specific data
   j. Other: (free text field)
6. What format the data does occur in? (Free-Text field)
7. What software do you need to generate data? (Free text field)
8. Is this software open source?
   a. Yes
   b. No
9. Where is this software stored at?
   a. Private Computer
   b. Computer at work
   c. Server of the working group
   d. Fraunhofer Private Cloud
   e. Fraunhofer Tempobox
   f. External at a scientific organization
   g. External at a commercial provider
   h. No answer
   i. Other:
10. How large is the overall size of your research data?
   a. < 1GB
   b. 1 -20 GB
   c. 21 -100 GB
   d. 101 GB – 1 TB
   e. >TB

II. Research Data during project phase

11. Where is the data stored at during the project phase?
    a. Personal Computer
    b. Computer at work
    c. Server of the working group
    d. Server at the institute
    e. Fraunhofer Private Cloud
    f. Fraunhofer Tempobox
    g. External at a scientific organization
    h. External at a commercial provider
    i. Other (free text field)
12. Are there clear rules of responsibility for the data during the project phase?
    a. Yes
    b. No
    c. No answer
    d. Free text field
13. Are the research data enhanced by metadata (descriptive data)?
    a. Yes
    b. No
    c. No answer
14. If yes: What kind of metadata is used? (free text field)
15. If yes, is there any standard used?
    a. Yes
    b. No
    c. No answer
16. Are the research data registered by a persistent identifier?
    a. Yes
    b. No

III. Research data at the end of the project

17. Where is the data stored after the end of the project phase?
    a. Personal Computer
    b. Computer at work
    c. Server of working group
    d. Server at the Institute
    e. Fraunhofer Private Cloud
    f. Fraunhofer Tempobox
    g. External at a scientific institution
    h. External at a commercial provider

i. Other:
j. No answer

18. Is there a defined process at your institute that describes how to handle research data?
    a. Yes
    b. No
    c. I don't know
    d. Other:
    e. No answer
19. What measurements regarding long-term preservation are taken? (free text field)
20. What requirements regarding long-term preservation do you have? (free text field)
21. I consider to share a part of my research data during the project (open data publication)
    a. Yes
    b. No
    c. I would like to do so in the future.
    d. I have no idea.
    e. Other: free text field
    f. No answer
22. I am willing to publish a part of my research data after the end of the project if certain conditions (clearance of copyright issues, reference methods are available, support and infrastructure are established) are met?
    a. Yes
    b. No
    c. I have to consider that
    d. No answer
    e. Free text field
23. If yes, what kind of data would you publish?
    a. Sensitive data whose protection is very important
    b. Data being the base for my publications
    c. Data requested by colleagues
    d. All research data that are funded by third-party funds
    e. Non-reproducible data
    f. In collaborative projects created data
    g. I would not use this service.
    h. No answer
    i. Free text field

24. What software is necessary for editing and reusing the data? free text field
25. This software is open source:
    a. Yes
    b. No
26. Have you ever published research data or referenced it in any database?
    a. Yes → Where? free text field
    b. No
    c. No, I didn't know about this opportunity.
    d. No, I do not plan to do so at any time soon.
    e. No answer
27. If no: Why not? free text field
28. Do you need infrastructure for storage and publications of research data?
    a. Yes:→ What kind of infrastructure is requested? (free text field)
    b. No

End Filter 1aa: Collection of research data

29. Have you ever downloaded "foreign" research data or cited it?
    a. Yes
    b. No, but I plan to do so.
    c. No, I didn't know about that opportunity.
    d. No, I do not plan to do so in the near future.
30. The impact of research data citations for scientific reputation will increase.
    a. I agree.
    b. I do not agree.
    c. I cannot assess this statement.

IV. Personal Questions

31. I am…
    a. Research associate
    b. Doctoral student
    c. Head of a working group
    d. Head of an Institute
    e. No answer
32. My institute belongs to the following group:
    a. IUK-Technologie
    b. Life Sciences
    c. Mikroelektronik
    d. Light & Surfaces

e. Produktion
f. Verteidigungs- und Sicherheitsforschung VVS
g. Werkstoffe, Bauteile – MATERIALS
h. No answer

33. I have knowledge about Research Data Management:
    a. Excellent knowledge
    b. Basic knowledge
    c. Few skills
    d. No skills
    e. No answer
34. If yes, in the following aspects:
    a. Metadata-Standards for Research data
    b. Licenses
    c. Legal aspects: Copyright, Data protection, research data within industry cooperation
    d. Technical aspects: formats, storage, long term preservation
    e. Demands of third-party funding organizations
    f. Activity in the area of research data management within the Fraunhofer-Gesellschaft
    g. No answer
35. The following support in the area of research data would be interesting for me:
    a. Consultation on general questions of Research Data Management
    b. Consultation on the publishing and citation of research data
    c. Consultation on technical questions (metadata, standards, long-term preservation)
    d. Support regarding / for specific matters (e.g. submission of a manuscript to a journal, that demands publication of research data)
    e. Support for data management plans
    f. I do not need any services regarding research data
    g. Other: (free text field)
    h. No answer
36. I am interested in getting the results of the survey
    a. Yes: email address
    b. No