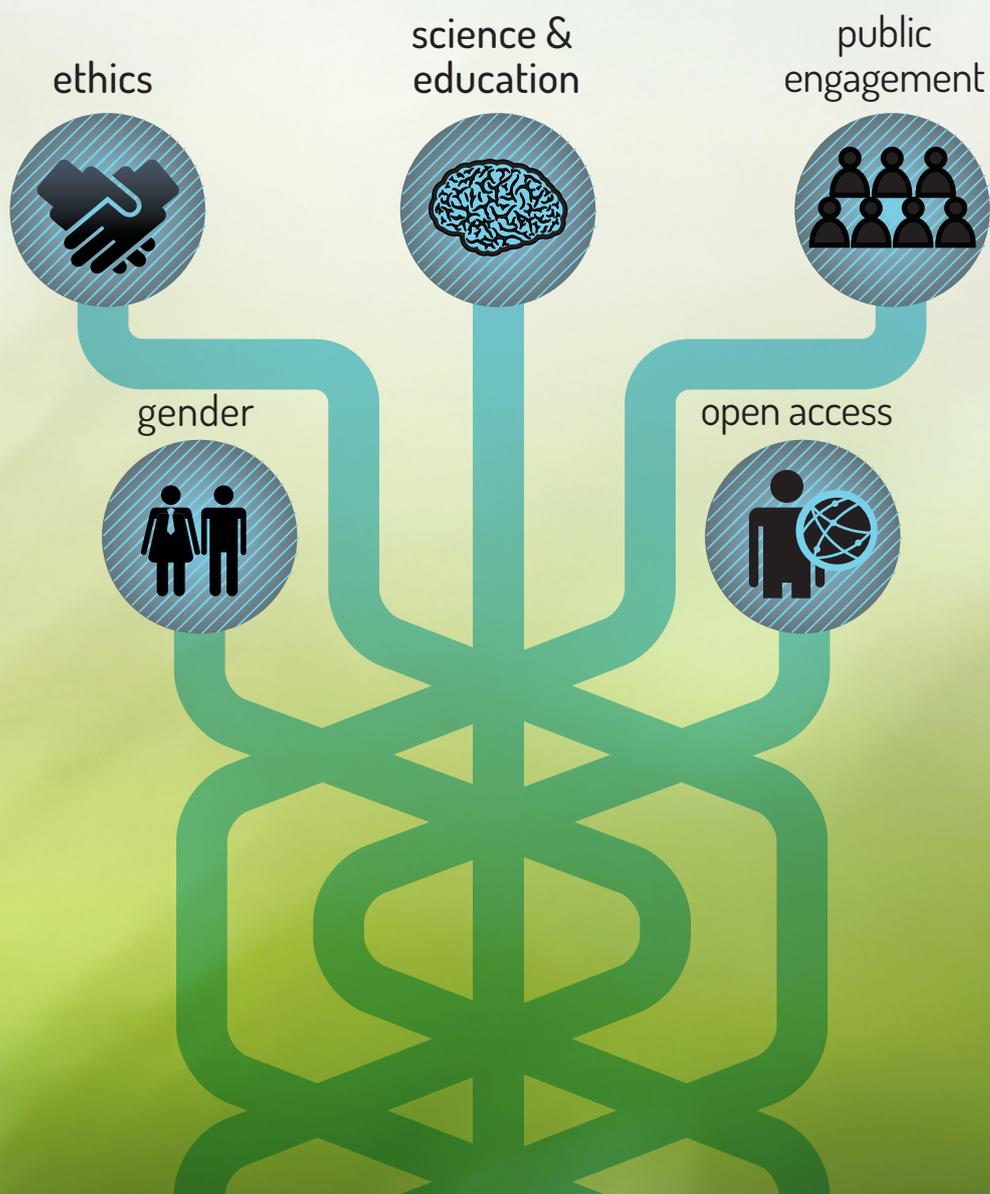


Review of RRI action plans

DELIVERABLE D6.2





JERRI – Joining Efforts for Responsible Research and Innovation

Deliverable D6.2

Review of RRI action plans

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EXECUTIVE SUMMARY

The JERRI project has been 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). As organizational change processes are long-term endeavours, they exceed the normal duration of projects. Therefore, even if the JERRI project is now nearly over, the transition process of our organization and our aspirations towards deeply embedding RRI will continue. One important instrument for navigating such a long-time transformation process is a long-term action plan across diverse realms of the organization. In a previous JERRI workpackage we developed such long-term action plans for the different RRI domains (ethics, gender, societal engagement, open access) through interactive roadmapping workshops with key internal and external actors. In the current report, we present an update to these transformation roadmaps. This update is based on the experience we made when implementing the RRI pilot activities in the four RRI dimensions that had been selected in order to initiate this long-term transition process. Mostly, these revisions turned out as only small updates to the original roadmaps. We feel that this indicates that our roadmaps can be regarded as a fairly robust heuristics for navigating our journey towards deeply institutionalized RRI practices. This report presents some of the most important updates. As already outlined in Deliverable 4.2, the most critical action lines are still located on the intra-organizational level. Besides **aligning RRI with the intrinsic motivation of the organization** (i.e. excellence and relevance in the Fraunhofer case) it is crucial to **build up RRI competences and capacities** on the right level of the organisation with a focus on reflexivity as a meta-competence. For this action line, our experiences from the pilot activities indicate the importance of **tailoring these capacities to the different demands and knowledge levels of the target groups**. Another important element of RRI competence that emerged even more strongly in the implementation phase are **mediation and translation abilities**. A third important action field is the **cultural frame of the organization to achieve** a shift in attitudes and mindsets rather than just compliance and use of guidelines. On the actor level, we emphasize the importance of connecting change agents within pioneering coalitions that can build up a critical mass for wider transformation. Finally, we strive to **generate research and innovation projects where RRI practices are naturally integrated** and jointly contribute to the relevance and excellence of the outcomes as a means to take the transformation process to a next level. In the overall R&I landscape we see **windows of opportunity** for fostering the change process: The increasing uptake of mission oriented research and innovation policy agendas that by definition require more reflexive R&I processes and the rising awareness of risks associated with emerging technologies which may both culminate in a legitimacy crisis situation for RTOs and increase the urgency to act.

1 Purpose of the report in the JERRI Context

In the JERRI project, Europe's two largest Research and Technology organizations (RTOs) TNO in the Netherlands and the German Fraunhofer-Gesellschaft have joined forces to advance towards responsible research and innovation practices. In this mutual learning process we are supported by two research teams. Sally Randles from the Manchester Metropolitan University helped us to apply the theoretical framework of "deep institutionalization" to understand responsibility-oriented organizational change processes while the colleagues from the Institute for Advance Studies (IHS) in Vienna monitored the change process and thereby helped us to maximise the learning effects. At the current point in time, we are close to the end of the project.

The purpose of the current report is to present a revision of our long-term transformative RRI action plans that we first developed in WP 4. Now that we mostly completed the implementation of the pilot activities (WP 6), we want to make use of these experiences regarding our future aspirations towards RRI. Therefore, the guiding question of this report is in what way our roadmaps need to be adapted in order to achieve our long-term goals.

This document builds on several earlier steps presented in previous reports. The most relevant for the current deliverable are:

- Deliverable 4.1 in which we identified crucial barriers and enablers for organizational change towards a stronger RRI practice;
- Deliverable 4.2 presents the first version of our roadmaps/action plans for each RRI dimension. For each dimension we identified about 3 essential action fields that need to be worked on and arranged them in different time horizons (short, mid- and long-term).
- Deliverable 6.1 documents in detail the implementation process of the JERRI pilots and identified within every dimension the most important lessons learned and experiences from that process.

In the logic of the project, the pilot activities are only seen as a start for a long-term transformation process. In fact, the pilot activities only initiate a change process that needs to be continually maintained also after the project has ended (see Figure 1 below). In the following sections, we will outline for each RRI dimension by which strategies and approaches the transformative impulses of the pilot activities can be continued most effectively.

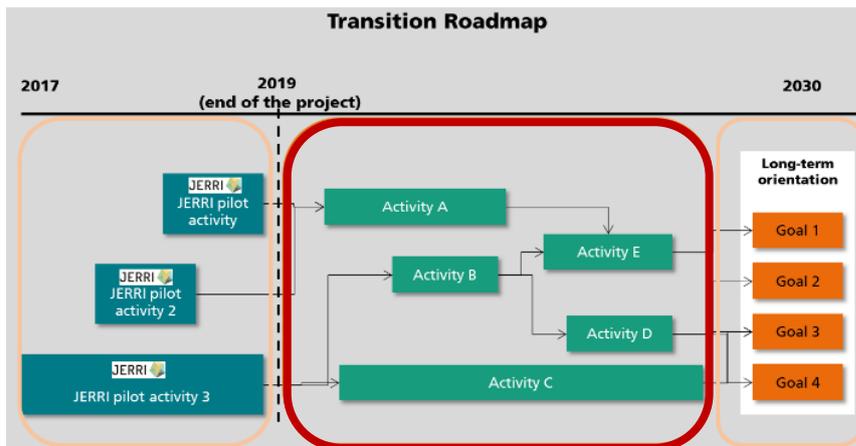


Figure 1: JERRI Framework Red Frame Focus of this Report

We hope that our results and insights will be helpful for other organisations and in particular, other RTOs, who may wish to engage in similar change processes.

2 Lessons learned: Revision of the RRI Transition Roadmaps

2.1 Introduction

In the following sections we will take a second look on our long term transition roadmaps based on the experiences that we made during the implementation stage of the JERRI pilot activities. In general, roadmaps provide a structure for reflecting on a timeline of developments across diverse realms or levels (Phaal et al. 2010). For the purpose of a long-term organizational change of Fraunhofer towards RRI, we used a normative roadmap approach. This approach is characterized by first sketching visionary goals "and then looking backwards from that future to the present in order to strategize and to plan how it could be achieved" (Vergragt, Quist 2011, p. 747). As indicated by Figure 1 (see red frame), the focus of this report is on the time after JERRI and on the question of how to establish an organizational context in which the pilot activities, and the capacities that have been built during the JERRI project, can continue and realize their full potential in order to achieve these visionary goals.

For adapting our strategy we have to take several factors into account. As organizational theory and also our theoretical framework stated, organizational changes are often quite chaotic and do not always go as planned. In fact, the outcomes of change processes are often unpredictable (Randles 2017, p. 14). Furthermore, not only change processes show unintended developments and therefore have to deal with deviations and contingencies, but the same goes for large and complex organizations as a whole. For the case of Fraunhofer our practical experiences definitely confirm the assumption of our

framework, that "such organisations **may find themselves in state of near-constant flux and change as it grapples with multiple priorities and identities within wide pallets of possibilities**" (Randles 2017, p. 18). Given these conditions of both - organizational change processes themselves and the organisation as a whole - a long-term RRI action plan should be able to deal with such contingencies and therefore has to be to some extent flexible. Therefore, the action plan has to be understood rather as a heuristic for initiating and supporting organizational change, than an actual plan in its traditional sense that gives direct action instructions based on a clear causality. Being flexible in the means of goal realisation however, does not imply being opportunistic about the goals themselves. In fact, in the case of Fraunhofer the ambitious long-term goals have two critical functions. Firstly, it is necessary to have ambitious goals that aim high in order to realize at least small changes within the organization. Secondly, long-term goals serve as a guiding principle in order to not lose the path during these kind of long lasting transformation processes. In sum, our long-term goals and the so far established capacities that have been built during the implementation phase have the potential for "such organisations (...) [to; A. R.] make a strategic virtue of the ambiguity that arises from an institutional setting comprising multiple logics and identities" (Randles 2017, p. 19).

In the following sections, we want to further develop our dimension specific roadmaps. Beside the experiences on organizational transformation that we made during the JERRI pilot activities, we also will consider several other factors. As mentioned in D4.2 (Warneke, Röß 2018a), p.10) the level of organization which can be most influenced by a change project like JERRI, is the intraorganizational level. But of course organizational change will only happen if there are also transformational processes within the wider societal environment that cannot directly be influenced from within the organization. For the further transformation of Fraunhofer towards RRI it will therefore be important to effectively use developments and transformation processes occurring in the organizational environment. Accordingly, one aspect that should be considered in every roadmap is how to use environmental changes such as e.g. shocks or crises as *windows of opportunity*. In other words: How to build such a constructive relation to wider society that enables Fraunhofer to effectively use environmental transformation for organizational change processes. But not only external transformations should be considered. As already discussed in D6.1 one important factor/enabler is to connect the various RRI topics and activities with former projects, already established discourses (e.g. gender equality, sustainability) and networks or colleagues that have a similar agenda and therefore could trigger and support our own efforts concerning RRI. Especially it is important to identify ongoing changes and actions (the building of new networks, groups) that have happened independently from JERRI. As pointed out by our theoretical

framework: "Deeply institutionalised forms of responsibility would be systemically and relationally inter-dependent, moving from ad-hoc localised experiments to extensively shared routinized techniques, norms, standard and governance and regulatory instruments and structures, organising, ordering and coordinating practice and inter-organisation exchanges (including market transactions with clients and customers" (Randles 2017, p. 36).

In sum, the following revision of the dimension specific roadmaps will make suggestions to these critical questions and challenges.

2.2 Ethics

In our former analysis of organizational barriers and enablers (D4.1) and establishment of the action plan (D4.2) we mostly focused on the intraorganisational and the actor level. Like already mentioned this is no surprise, because these two levels can best be influenced by an organisation (Warnke et al. 2018, p. 15). Our long-term action plan for ethics (see Figure 2) emphasized four core activity fields to be considered for an overall transformation of the organization (see (Warnke, Röß 2018a)).

1. Strengthen individual competences (mid-term)
2. Establish transparent processes for ethical choices within research work (mid-term)
3. Soften goal conflicts: Establish ethics as a positive element of excellence and quality rather than an additional burden.
4. Drive forward deep cultural change: strengthen a culture of actively dealing with ethical questions. (long-term)



Figure 2: Transition roadmap for ethics

In the light of our experience from the implementation phase, we want to make some light revisions and add some details to that picture. The first two activity fields were directly addressed by our two pilot activities - the ethical screening and the ethical discussion format. In Deliverable 6.1 we outlined the challenge to manage different levels of ethical knowledge among the researchers. For our mid-term goal to strengthen individual competences this implies that there will be no one-size fits all approach. Like outlined also in Deliverable 6.1 ethics should be regarded as a "boundary object" (Star, Griesemer 1989) that takes on different meanings in different contexts. This does not necessarily have to be a disadvantage; rather it enables ethics to serve different functions for the organization. In JERRI we adopted a broad notion of ethics as the capacity to systematically reflect on societal impacts and to recognize value conflicts, which goes far beyond the need of respecting established compliance and integrity standards. To establish this capacity among Fraunhofer researchers we need to work with a more individualized approach. This means for our future efforts and specifically also for the roadmap to differentiate between a general basis of ethical knowledge among all Fraunhofer researchers and a deeper level of ethical expertise that only a smaller number of staff member needs to acquire who will then function as facilitators of ethical reflection processes among their groups. This differentiation of the goal of **strengthening individual competences** implies that also the resources we developed to underpin these competences (i.e. the ethical discussion format and the ethical guideline) must be tailored more precisely. As already announced in D6.1 we therefore

plan to develop different guidelines for different target groups. For the larger group we want to make sure that there is a basic level of **ethical competence** within their research work by delivering ethical reflection guidelines for several fields of technology. Building on that, we understand **ethical expertise** as the ability to dive deeper into technical-ethical discourses and also to go beyond the status quo of already established normative principles and to anticipate upcoming moral conflicts of technology development. Our long-term goal is to establish this kind of ethical expertise on different levels and within different functions of the organization. This kind of ethical expertise is especially necessary within new fields of technology, like AI, where ethical principles are yet to be developed. Furthermore, these ethical experts can also be involved to further **establish transparent processes for ethically relevant choices within research work** (our second goal), again such processes are also highly necessary for emerging technology fields.

Besides that, the question of ethical competences should not be limited to the field of research and scientists, but should also include other units and function, especially the field of human resources and communication teams. Ethics, understood as a boundary object, can serve within the communication field to frame new fields of technology in an ethically informed way right from the start and within the human resources domain to integrate ethical expertise into the recruitment and training programs.

Within the third activity field, which aims at **softening goal conflicts and establishing ethics as a positive element of excellence and quality**, we experienced during the implementation stage that one success factor for this is the amount of available resources. We learned from our pilot activities that the willingness to spend parts of the budget for further ethical reflection, for example in form of additional ethical work packages increases as soon as such an ethical work package gets extra funding. Therefore, we are planning to develop a concept for the managers of the internal funding programmes that regulates the conditions of extra funding for ethical reflection work packages. We think that the provision of extra resources will be a crucial step towards a greater acceptance of ethical reflection as a quality aspect of research. As one JERRI follow up measures Fraunhofer started to finance ethical reflection processes based on the JERRI format for its internally funded key strategic initiatives (KSI) in particular for the one on biotransformation which will serve as a pilot for the other eight strategic initiatives.

Of course, providing sufficient resources for RRI activities alone will not lead to an overall organizational transformation. In the fourth activity field of our ethics action plan we emphasized the need for a change in scientific culture, in which the reflection of normative implications will be a self-evident part of research projects and in which an

intrinsic motivation for ethical reflection prevails. We encountered the cultural aspect of our transformation aspirations during the implementation stage within various contexts. One crucial factor is for example the big challenge to create a constructive conversation atmosphere during ethical discussions and consultancies. In order to achieve this, a culture within the organization is needed that supports interdisciplinary and horizontal thinking and cooperation. The reservations between different professions, especially between natural science/engineering on the one side and social science/humanities on the other must be further dismantled. In our renewed action plan, we give this issue a stronger attention. First with a stronger communication strategy, that promotes outstanding example cases of ethical conduct that show how a project can benefit from the integration of ethics. Secondly and most important for an overall cultural change towards a greater appreciation of research ethics we aim to strengthen our mediation and translation abilities and capabilities. This is key for an interdisciplinary and collaborative working and research culture and for effectiveness of communication measures because only if we know how a unit/researcher/project should be addressed collaboration attempts will be successful. As already outlined in D6.1 the ability to translate ethical aspirations into different institutional logics of the organization can create a "pervasive inter-dependent system with an overflowing" (Randles 2017, p. 62) with a transformative effect.

It is obvious that the success of such a cultural and overall organizational transformation depends also on the developments in the organization's environment. Especially the signals from policy and funding organizations resonate with RTOs like Fraunhofer. As mentioned in several reports before, the tensions between research and innovation policies that emphasize competitiveness and entrepreneurial skills on the one side and policies that aim for a stronger social responsibility is mirrored by conflicting institutional logics within the organization which increases the risk of de-coupling and shallow institutionalisation phenomena occurring. But of course this is not an issue a project like JERRI can very much influence. Rather we understood our efforts in ethics and also in the other RRI dimensions as the establishment of capacities that will develop their benefits in situations and cases of internal or external change or even crises. For the future we should therefore focus even stronger on such *windows of opportunity* inside and also outside of the organization. One such internal *window of opportunity* is the newly established Fraunhofer "Ethics Committee for Security-Relevant Research" that commences its work in 2019. This committee "will address research activities associated with considerable risks for human dignity, life, health, freedom, ownership, environment and peaceful coexistence. Security-relevant risks are inherent above all in scientific work where it can be assumed that knowledge, products or technologies will be created that

may be used to the detriment of, or damage to humans and the environment."¹ As also members of the JERRI team are part of this new committee, we see it as a further trigger to raise awareness for the normative and societal implications of the research that Fraunhofer is doing. An example for a possible environmental opening is the establishment of the new German Hightech-Strategy with its strong emphasis on mission orientated research and innovation and participatory approaches.

2.3 Gender

As outlined in D4.2 within the gender dimension our goals do not only address gender equality and diversity with respect to the staff but also the consideration of gender aspects in research content. Especially in WP4 (developing dimension specific action plans) we focused on this aspect because in the area of gender equality significant planning activities already exist in Fraunhofer so the added value of a JERRI roadmap would have been marginal. During the roadmapping activities, we had concluded that the key bottleneck for reaching this second goal is a stronger awareness of the relevance of gender aspects in research among Fraunhofer researchers. As indicated in Figure 3 we identified two main fields of action to foster such an awareness. The first activity line is dedicated to the **development of competences within the organisation** the second is about the provision of **guiding material for gender sensitive research**. One of our three pilot activities in the gender area was dedicated to this second task field. For this pilot activity, we identified and (further) developed existing checklists and case examples dealing with gender in research content in order to generate more attention for the relevance of gender aspects in research content.

¹ <https://www.fraunhofer.de/en/about-fraunhofer/corporate-responsibility/research-and-development/ethics-committee-for-security-relevant-research.html>

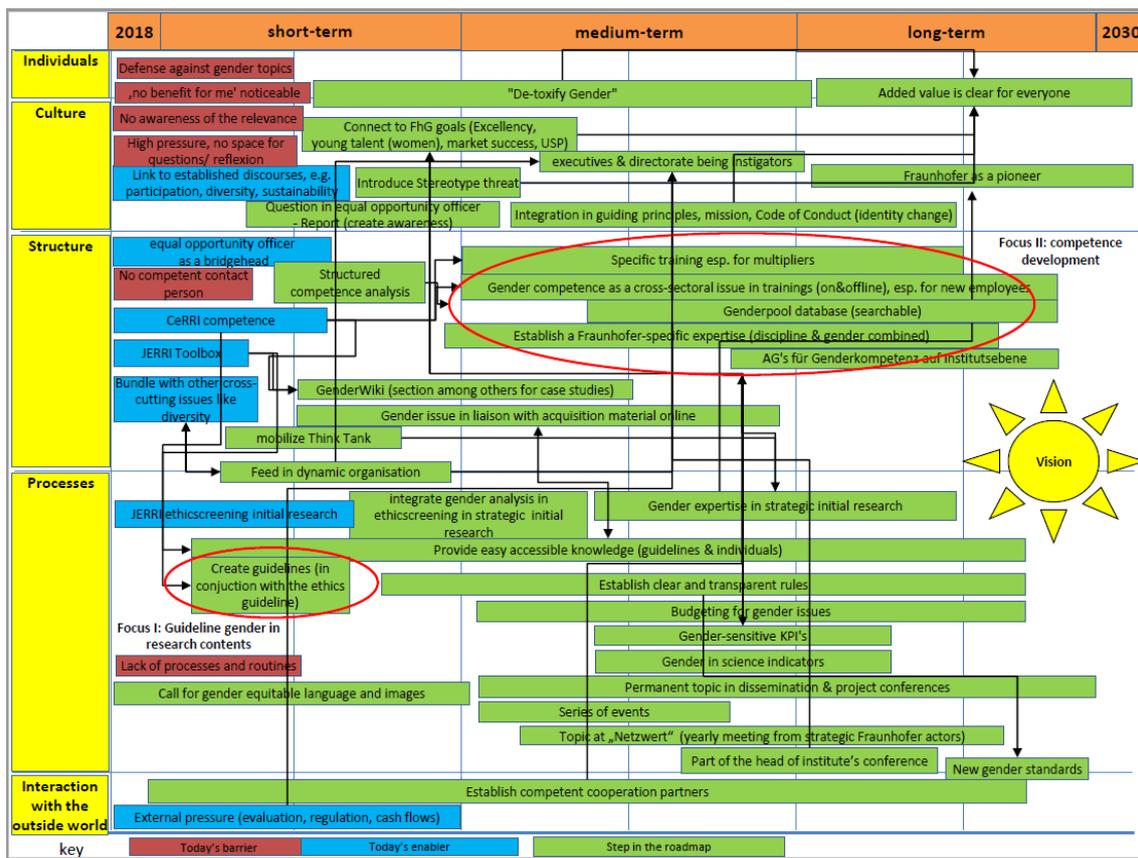


Figure 3: First version of the Transition Roadmap Gender in Research Content

Looking now back on the established roadmap for the gender domain we should pay more attention to two circumstances: (1) results from several former projects were available for the JERRI gender in research guideline but at the same time it turned out that these results were not used in the past. Probably this is a typical example in which a certain topic is recognized only by a small part of the organisation, and will not find a grip outside this community. Again, what is still missing for the topic gender in research content is an "overflowing effect" with a transformative impulse (Randles 2017, p. 36f.) for the overall organization. Accordingly there is a danger that our guiding material will sink into oblivion in a few years after the project has ended because it is not used due to lack of awareness about the relevance.

The second aspect we should give more attention in our future activities is to build up competences for gender in research content. It is obvious that both mentioned aspects interact in a way that a greater competence among Fraunhofer researchers would lead to a higher awareness and finally would lead to a higher acceptance and usage of already built resources like gender guidelines in the JERRI project and former project.

During several discussions with the dimension leaders we came to the conclusion that **the environmental level, meaning the interaction with the outside world, is the key for pushing the topic forward**. Similar to the topic of gender equality that also strongly responds to national and European policies, we also expect for gender in research content that only a higher pressure from external stakeholders would result in a better consideration of gender aspects in R&I. With higher pressure we do not only imply different conditions for funding. What also would be important and as already mentioned in D1.2 (Randles 2017, p. 27) is the changing of professional curricula in universities and statements from respected peer organisations such as the League of European research Organisations LERU whose papers on the subject were widely recognized. In sum, we should give the 'interaction with the outside world' more attention in our future aspirations. To give this aspect more attention, we are planning two concrete activities. Once we should give external changes and trends a greater awareness, because these can serve as a *window of opportunity*. Second, we should deepen our collaborations with external partners with excellent capacities and high awareness in this area. Figure 6 illustrates our revised gender roadmap, which contains new elements and new priorities (see red framed yellow boxes).

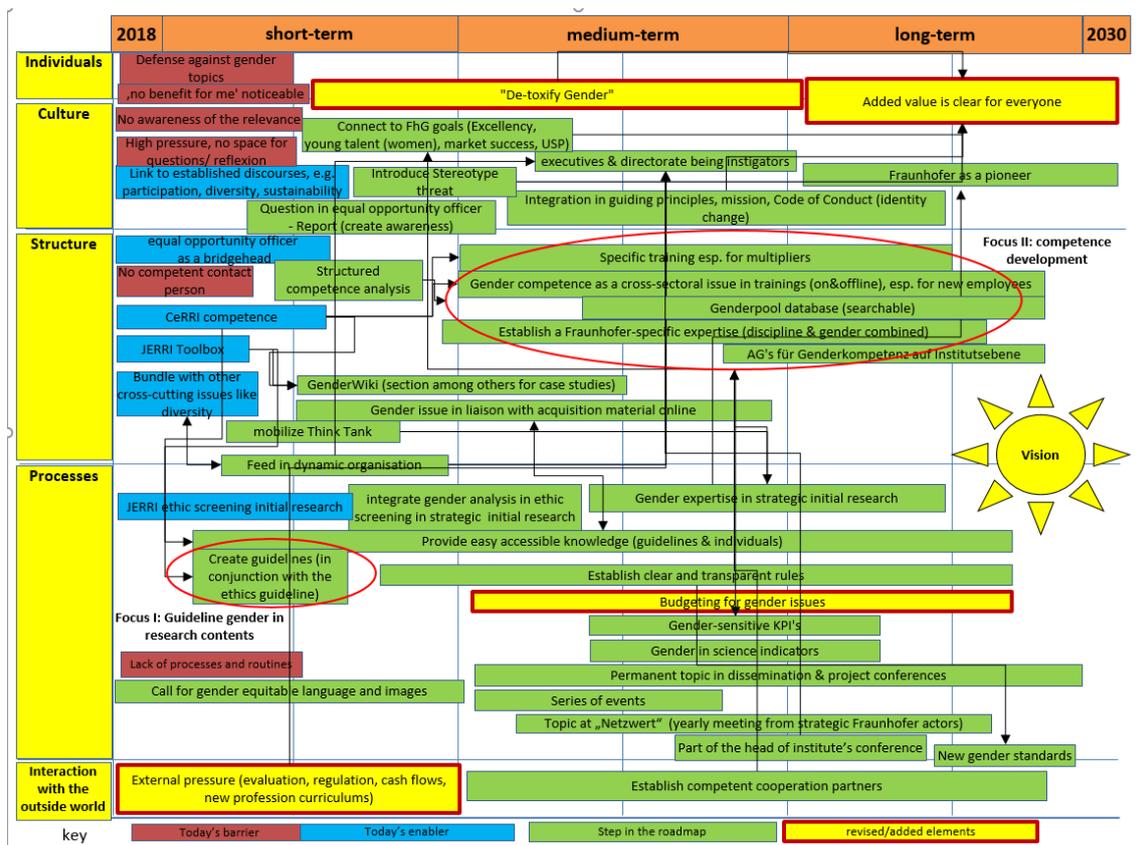


Figure 4: Revised Version of the Roadmap Gender in Research Content

2.4 Societal Engagement

In the original roadmap for Societal Engagement (SE) we also emphasized the importance of **Positioning and Networking in the environment** in order to further institutionalize SE (see (Warne, Röß 2018a). Besides these strands of activities, we also identified the area of **Competence Building and Bundling** and a bottom-up cultural change within Fraunhofer as crucial steps towards our vision. Figure 5 shows the original roadmap and highlights both activity fields (see Red Frame).

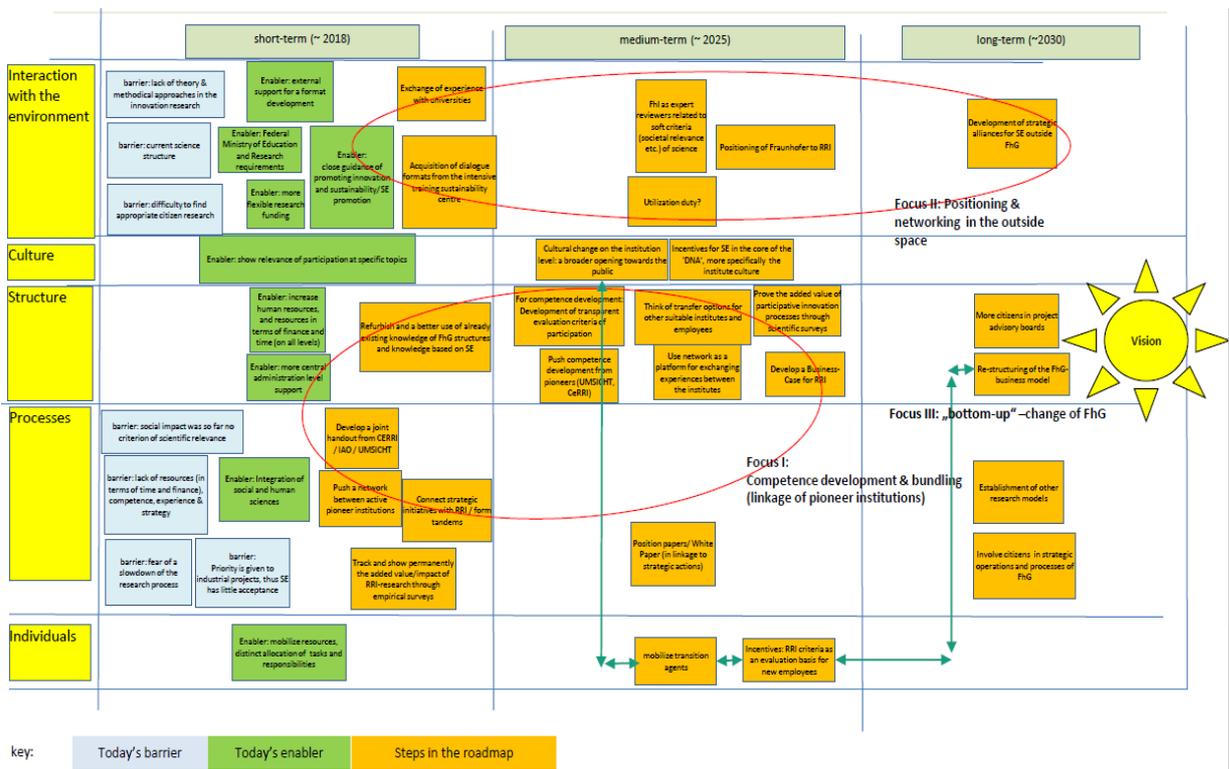


Figure 5: First version of the Transition Roadmap Societal Engagement

Our pilot activity - the Citizen's office/cafe - in which we organized and executed several meetings with citizens inside and outside of the Fraunhofer UMSICHT premises (see detailed description in D6.1) further developed the competence of participatory methods within Fraunhofer UMSICHT and also addressed the bottom-up cultural change. As another benefit of this JERRI pilot activity, Fraunhofer UMSICHT could also further build upon their position and visibility as a pioneering institute for SE within the Fraunhofer society. To some extent, one benefit of the JERRI activities and visibility is that UMSICHT was commissioned by the board of directors to conduct a Fraunhofer wide survey about attitudes towards sustainability orientation and Responsible Research and Innovation. This will also push the level of awareness of RRI within Fraunhofer and may foster leadership commitment towards RRI related change processes if the results indicate a strong interest among Fraunhofer staff in RRI or at least to some aspects of it.

Reflecting about the experiences of the pilot activities within SE it becomes clear that the structural level - both within the individual Fraunhofer institutes and also for the overall structures of the scientific system - must be given a higher priority than in our original roadmap. By structural level we mean especially the capacities and competences that are necessary to engage in participatory methods. This implies on the one side to increase resources in terms of finance and time for researchers and projects that deal

with SE approaches. Of course this structural issue cannot be solved by the Fraunhofer organisation/institutes alone but only in a joint effort together with actors from the national and international environment like funders or policy making organizations. Following up on this insight, we have already contacted our national funders in BMBF² to discuss with them critical issues for citizen participation that have emerged in the JERRI workshop. This proposal was highly welcomed by BMBF who had identified very similar issues in their recent participation initiatives. Besides the capacities, also the factor of competences has proven again to be key for reaching our long-term goals. Like outlined in D6.1 (see Warnke, Röß 2018b, p. 45) research that is based on participatory approaches is often 'chaotic' and follows other rules than traditional research. It therefore requires other or new skills, especially communication skills like mediating competences from the researcher. The development of such competences should be given more attention in our ongoing transformation process. Furthermore, in the case of SE capacities and competences are not only required by the professional researchers but also by the non-scientific participants. More precisely, non-scientific participants need to build up e.g. scientific literacy³ and must be equipped with more resources in terms of finance than has hitherto been the case. Only if these structural issues on the intraorganisational and environmental level will change, it will be possible to deeply embed SE into practice and to reach our long-term goals.

One step for further developing competence is still the linkage and cooperation between pioneer actors, both internally within Fraunhofer and externally. Beside UMSICHT another pioneering institutes within Fraunhofer are CeRRI⁴, Fraunhofer ISI and Fraunhofer IRB who is looking at participation from the perspective of Open Science and has started to systematically collect participatory activities within Fraunhofer and assembling them in a White Book. These institutes should deepen their cooperation with the goal to exchange experience and knowledge but also - and maybe even more importantly - to develop joint frameworks and guidelines in order to push forward the degree of competence within Fraunhofer and the wider scientific system. In principle, our original action plan already emphasized this, but the experience made during the implementation stage showed again how crucial the bundling and development of competences are. In the follow up to JERRI the four institutes that did not cooperate much before have deepened their relationship and started joint activities with a focus on citizen participation.

² German Federal Ministry of Education and Research

³ It shows again that we were right to put both dimensions of Societal Engagement and Science Education together. For further reasons of this decision please see D2.2 (Teufel, Röß 2017, p. 51 ff.)

⁴ Fraunhofer Center for Responsible Research and Innovation

One trigger that is able to further strengthen participatory competence and knowledge that has not been taken into account in our roadmap so far is the so called 'UMSICHT science award'. This award will be presented this year for the tenth time and aims at both scientific and journalistic texts, which did "an excellent performance in providing scientific results to society on current topics in the fields of environmental, process and energy technology"⁵. From the perspective of our roadmap the UMSICHT award should be regarded not only as an element to further establish competences by directly supporting and strengthening the dialogue between science and society but can also be seen as an enabler for an overall cultural change by putting new research incentives into the DNA of the institute.

Concerning the interorganisational level the situation differs substantially from that of the gender dimension. While especially the topic of gender equality is strongly enforced by policy and funding organisations, the pressure for participatory elements within R&I is actually pretty low. For our long-term action plan we should therefore look for other driving forces and strategic partners beside policy and funding actors. Surprisingly the JERRI team from UMSICHT noticed that there is a rising demand from industry for participatory elements and for the inclusion of non-scientific persons into the research and innovation process. Of course, this request cannot be understood as a democratization of science but rather points at the need for improving the embedding of innovations into society by engaging end users at an early state. Nevertheless, we think that our long-term strategy should pay more attention to industry as a potential driving actor (see red frame in Figure 6). This is due to two reasons. The first is that by doing industry projects that have a focus on SE we can further develop methods and experiences for participatory research from which also other projects can benefit that have a more societal orientation. Second, if this interest of industry in participatory research turns out to be a continuing trend this would be a very strong driver for uptake in Fraunhofer which is largely financed through industry contract research. Also it might cause other actors in science or policy to follow and to strengthen their efforts within the field of SE. Either way, we think the further institutionalization of RRI can only profit from that trend. Figure 6 shows the revised roadmap for SE with highlighting these new elements and priorities (see red frames and yellow boxes).

⁵ <https://www.umsicht.fraunhofer.de/en/press-media/press-releases/2018/umsicht-science-award-2019.html>

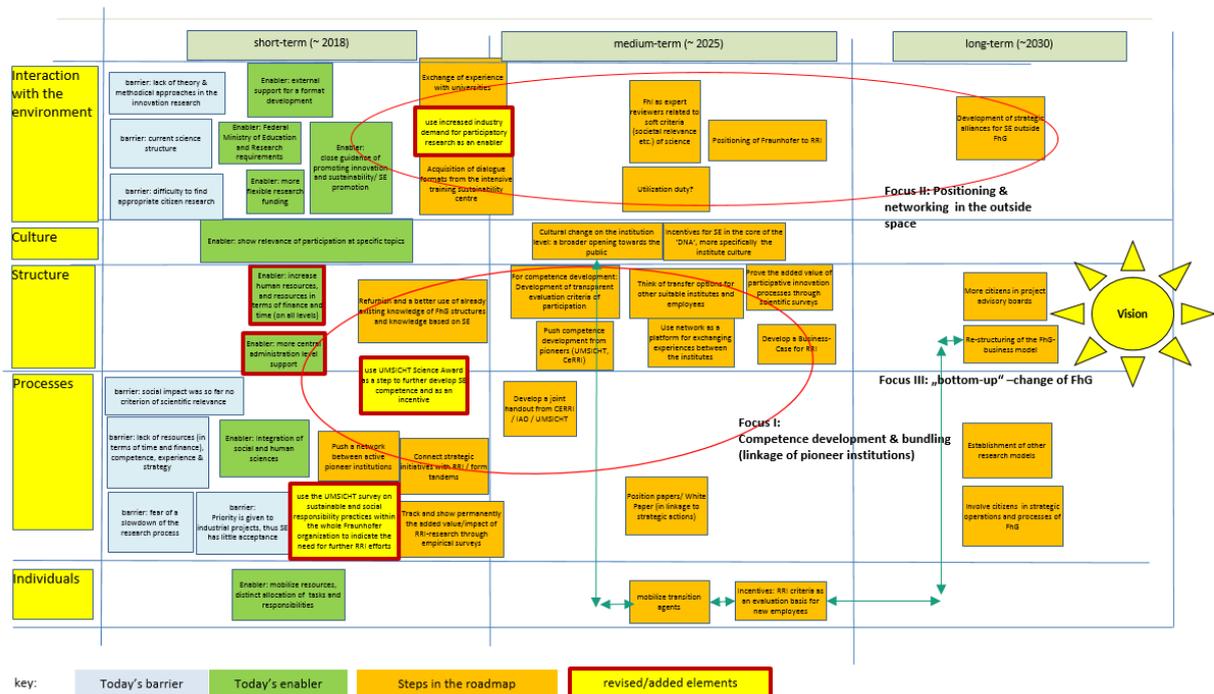


Figure 6: Revised Version of the Transition Roadmap Societal Engagement

2.5 Open Access

The dimension of Open Access (OA) is again in a different situation. Due to the fact that Fraunhofer was one of the initiative members of *Berlin Declaration on Open Access to Knowledge in the Sciences and Humanities* in 2003 and also has an official Open Access Strategy stating that "open access implies granting free and long-term access to scientific findings and scientific literature" (Fraunhofer-Gesellschaft 2015, p. 1) Fraunhofer can be regarded as an early driving force within the scientific system. Of course one must differentiate between the level of policy and the actual research practice. Nevertheless, in principle Fraunhofer can be regarded as a pioneer within the scientific system. For our future aspirations within this field this implies that - in contrary to the dimensions of gender in research and SE - Fraunhofer is not so dependent and cannot rely on pressure from environmental level in order to gain a window of opportunity, because this window of opportunity, meaning the formal acceptance of Open Access, is already there. That does not mean that an overall transformation of the scientific landscape towards Open Access is not necessary or supportive for a further institutionalization. Rather it means that for further transformation of Fraunhofer our main focus should be on the intraorganisational level. Like outlined in D6.1 (see Warnke, Röß 2018b, p. 58ff.) the

experiences of the pilot activities taught us how difficult it is to translate the rationale of Open Access into other units that are based on other institutional logics, e.g. the R&D contract division. Like our theoretical framework stated, in large organizations like Fraunhofer with "multiple institutional logics" (Randles 2017, p. 40) it is the crucial task to combine those different logics in order to create an overflowing effect that would transform **"ad-hoc localised experiments to extensively shared routinized techniques, norms, standards and governance and regulatory instruments and structures, organising, ordering and co-ordinating practice and inter-organisation exchanges (including market transactions with clients and customers)."** (Randles 2017, p. 36). Therefore, the main focus of our future efforts for deeply institutionalizing Open Access should be still to further "connect different cognitive frameworks and enable symbolic sense-making across different communities of practice" (Randles 2017, p. 36). Like outlined in D6.1 (see Warnke, Röß 2018b, p. 65) this boundary spanning task was fulfilled very well by several change agents. Besides change agents also so-called boundary objects (Star, Griesemer 1989) like new frameworks or guidelines can fulfill this task (Randles 2017, p. 36) So in our original action plan (see Warnke, Röß 2018a, p. 32) we were definitely right with our focus on the following three main action fields:

1. Open Access as a sign for scientific quality and as a part of the culture of science disciplines.
2. Developing guiding and informational material on standardized publishing processes and introducing incentives for Open Access publishing.
3. Competence building and bundling.

Figure 7 shows this first version of the Transition Roadmap for Open Access.

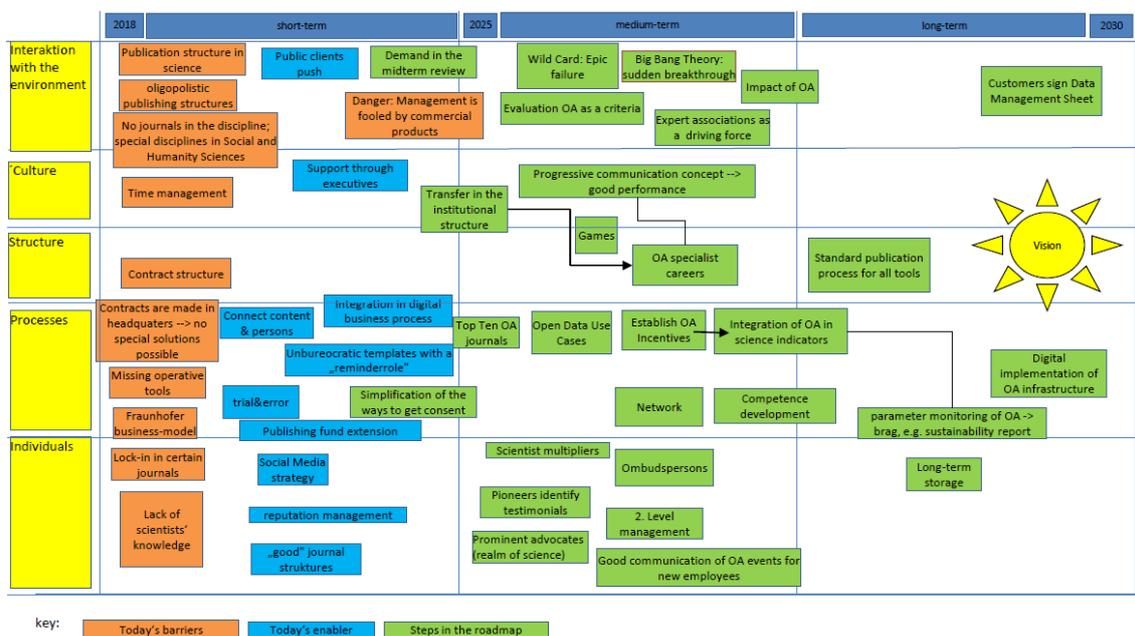


Figure 7: First version of the Transition Roadmap Open Access.

Again, we do not want to discard our roadmap here, but only supplement it with regard to some aspects. Concerning the aspect of **competence building and bundling** on an intraorganisational level our experiences from the implementation (see Warnke, Röß 2018b, p. 60, 65) stage showed that this has to be done through a bottom-up strategy. This is due to two circumstances. The first is that it has turned out that units with overall function, e. g. the R&D Contract Division, are not the right target/level for successfully institutionalizing OA. The second circumstance is that OA approaches and solutions have to consider individual contexts, meaning that every domain and research field has different demands and should therefore find individual approaches for OA solutions and business models. Considering these circumstances, we should continue our bottom-up strategy in the realm of competence building and bundling. Like for RRI in general, also for the topic of OA the building of a pioneering coalition is crucial to create a critical mass that will gain an "overflowing effect" (Randles 2017, p. 36). Concretely, such a pioneering coalition could be composed of Ombudspersons, established and well-known scientists and second level executives. Once identified and connected, such a group will also easily contribute informational and guiding material to OA trainings and workshops. Again, like in the several dimensions before, we came to the conclusion that what is crucially needed, besides communication and education measures, are Use Cases or blueprints that give empirical evidence about how Open Access/Open Science practices contribute to R&I quality and relevance.

What still remains as an important but also difficult action field is the cultural aspect of OA. To deeply embed OA practices into the culture of Fraunhofer institutes it is necessary to come to a new understanding of publications and the overall science system. As long as gaining excellence within the scientific community by classical means is the predominant motivation OA will not find a widely shared support within the institutional and overall scientific culture. What is missing therefore is to connect the topic of OA stronger with the wider notion and idea of Open Science. The concept of Open Science measures excellence not only according to internal scientific criteria but also to societal relevance and needs. If this notion of science and publications prevails, it will be also much clearer and more evident why it is beneficial to publish in an Open Access way. For a cultural change we decided therefore that our further communication measure should stronger emphasize the overall idea of Open Science. Again of course, the cultural change of a research organization like Fraunhofer can only succeed as far as other actors of the science system also move towards this new idea of R&I. Finally, Figure 8 presents the updates on our action plan for OA, which highlights (see yellow boxes and red frames) our new suggestions and approaches.

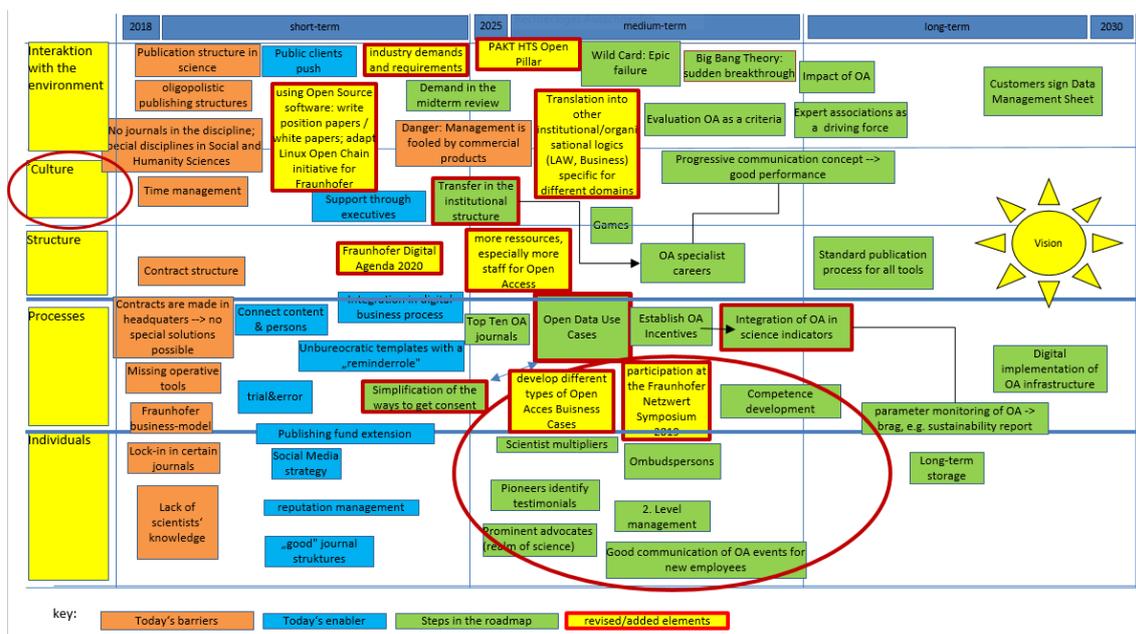


Figure 8: Revised Version of the Transition Roadmap Open Access

3 Conclusions: Synthesis across RRI dimensions

In the current report, we reconsidered the previously developed long-term RRI action plans in the light of the experience we made during the implementation stage. Mostly, these revisions turned out as only small updates to the original roadmaps, like e. g. adding a new important actor or a new *window of opportunity* that occurred to our long-term plan. In general, this proves that our roadmaps can be regarded as a quite robust heuristics for continuing our journey towards deeply institutionalized RRI practices. Nevertheless, as we understand our efforts in the individual dimensions always interrelated to each other in order to achieve synergy effects, we finally want to give a conclusion about the key action lines across all dimension. By doing so we again hope to give other interested RTOs some key recommendations on how to implement RRI in general into their organization. Like in D4.2 we orient ourselves on the already known three levels (actor level, intraorganisational level, interorganisational level) and assign the key action lines to them. At the intraorganizational level we had identified two critical action lines in D4.2 (see Warnke, Röß 2018a, p. 36):

- Aligning RRI with the intrinsic motivation of the organization, e.g. excellence and relevance in the Fraunhofer case
- Building up RRI competences and capacity on the right level of the organisation

In case of the first aspect there is not much to add. In fact this consideration was taken into account in all JERRI activities and was the key rationale of our communication strategy. Regarding the second mentioned action line on the intraorganisational level we now can add some more details. RRI competences and trainings not only have to be placed within the right position and the right function of the institute/organisation, but also have to be tailored to different needs and ambitions of the researchers. RRI resources like guidelines, frameworks or trainings should therefore be differentiated according to the level of knowledge and different target groups. Another aspect that turned out to be important for successfully building up RRI competences are mediation and translation abilities. These abilities are important in two ways. Firstly, it is crucial regarding designing and performing of RRI guidelines and trainings in which different expectations and levels of knowledge need to be managed. Secondly, mediation and translation abilities are RRI competences in itself, that are for example obviously important for the field of SE in which one has to deal with different concerns and agendas of the stakeholders who are struggling to find a common language. So mediation and especially translation abilities should be definitely a topic for every RRI training.

Beside these two action lines on the intraorganisational level - aligning RRI with excellence and building up RRI competences - we want to emphasize also the topic of organisational/institutional **culture**. In our view an organisational and scientific culture that is in line with the idea of RRI is characterized by reflexivity, interdisciplinarity and the notion and motivation that research results should stronger contribute to societal challenges. Especially interdisciplinarity should be deeper integrated into the culture of R&I to gain a stronger acceptance of RRI topics like gender, normative and societal implications of research and the idea of Open Science. A cultural framework of an organization that is in line with the idea of RRI will also work as a motivational factor to work in interdisciplinary settings concerning the research teams and projects.

The cultural aspect of an organization is also strongly influenced by its environment. A supportive factor from the interorganisational level are therefore new professional codes of conduct and new university curricula that focus on the social aspects and responsibility of engineering. Like already outlined in D4.2 (see Warnke, Röß 2018a, p. 36) RTOs like Fraunhofer would benefit from such a new generation of academics that are already RRI educated to some extent. What would also serve as a support from the environment is the provision of examples and cases, which gave empirical evidence to the various benefits of RRI approaches within R&I. Such examples or case studies would have a highly motivating and convincing effect on other researchers.

For the actor level we again emphasize the crucial role of change agents. Even when there is formal commitment from the board to RRI, we experienced many times during the implementation stage that it is crucial to have well connected change agents on the operational level. In our case they fulfil the function of bringing together different networks and communities and to connect RRI to already established discourses (e. g. sustainability, diversity etc.). Therefore, we will continue to rely on change agents and a bottom-up strategy for our ongoing transformation process. In our opinion, the combination of change agents and a bottom-up strategy can initiate such a transformation process by creating a pioneering coalition that can build up critical mass for a wider transformation. But still the effectiveness of the actor level is interrelated to the structural conditions, especially resources of time and money provided by the organisation and its environment.

Besides these long-term key action lines we also want to mention some identified levers of change that could be exploited right now. As D4.2 already gave such a list of inroads (see Warnke, Röß 2018a, p. 36), we here just want to highlight and outline only on some:

- mobilizing the Fraunhofer Think Tank for connecting and bundling RRI actors and aspirations
- building on and advancing already existing RRI related knowledge

- intensifying the exchange and strengthening the network between pioneer institutes
- introducing RRI to central Fraunhofer events in particular "Netzwerk Meeting" and orientation course for new staff.

In all three aspects activities have already started.

Finally, we want to highlight the alignment of our RRI practices and their application within concrete research projects as an important next step across transformation roadmaps. As we have established a variety of RRI resources within JEERI but are still struggling to embed them into the daily routines of research, it is now crucial to apply these instruments within actual research projects. Therefore, instead of focusing our efforts exclusively and directly on organizational change, we should take a detour and use the beneficial impact of our RRI tools in research practice as an inroad for change. As a starting point, we have identified in our last project meeting working together with the whole JERRI consortium and advisory board three “aspirational cases” highlighting how RRI practices could underpin cutting-edge research and innovation projects that achieve breakthrough advancement in addressing pressing real world problems. These three aspirational cases are about (1) Developing an AI based citizen support system conforming with highest ethical standards (European third way on AI) (2) Participatory transformation to a sustainable bioeconomy and (3) the responsible decarbonisation of the energy system in a European cross-border region. In all three areas both Fraunhofer and TNO are highly active and important players. If they jointly engage in these fields with an RRI attitude this could become a powerful signpost for others to follow. As a first step into a life after JERRI we plan to outline for each of these cases how the JERRI RRI practices can contribute to socio-technical breakthrough developments. We expect that the current turn towards mission oriented policy paradigms may lead to an increasing request for such research and innovation projects where responsible research and innovation practices are seamlessly integrated into the research programme. This means that together with the increasingly perceived risk of disastrous unintended effects from emerging technologies the SDG agenda may become the most relevant external pull factor for RRI transformation in Fraunhofer.

ABBREVIATIONS

| | |
|--------------------|---|
| CeRRI | Fraunhofer Center for Responsible Research and Innovation (Part of Fraunhofer IAO, JERRI project partner) |
| Fraunhofer | Fraunhofer-Gesellschaft |
| Fraunhofer UMSICHT | Fraunhofer Institute for Environmental, Safety, and Energy Technology (Member of JERRI consortium) |
| JERRI | Acronym for the project Joining Efforts for Responsible Research and Innovation |
| KSI | Key Strategic Initiative In the KSIs the Fraunhofer-Gesellschaft bundles the competencies of its 72 institutes around strategically important topics. |
| NGO | Non-governmental organization |
| OA | Open Access |
| R&I | Research and Innovation |
| RRI | Responsible Research and Innovation |
| rri | De-facto responsible research and innovation |
| RTO | Research and Technology Organization |
| SE | Societal Engagement |
| TNO | Netherlands Organization for Applied Scientific Research |

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