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Participation brokers in the making: intermediaries taking up and embedding a new role at the science-society interface

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Abstract

Although research has been performed on participatory mechanisms in science and technology such as brokering, little seems written on intermediary organizations, e.g. science museums, taking up and embedding a participation brokerage role and systemic factors influencing these. This paper presents a qualitative case study in which six different intermediary organizations developed their participation brokerage role in a European RRI project. We demonstrate how structuring factors in the project context, the intermediary organization and the broader systemic context influenced the participation brokerage role take-up and embedding. Our findings yield implications for future capacity building endeavors among participation brokers in the making.

Keywords

Participation and science governance; Professionalism, professional development and training in science communication; Public engagement with science and technology

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Introduction

Opening up the research and innovation (R&I) system [Stirling, 2008] is a mantra that reverberates within academia and policy circles ever more loudly; it has come to represent a call for reconfigurations in the relationship between science and society. Over the past four decades, criticism has grown regarding the general tendency to understand R&I as a closed system in which science is seen as a neutral experimentation space disconnected from "political, social and ethical questions" [de Saille, 2015, p. 152], and technological products are inherently linked to societal and economic progress [Wilsdon, Wynne and Stilgoe, 2005]. The introduction of technologies such as nuclear power and genetically modified organisms have shown that mismatches between research and technology on the one hand and societal values and needs on the other, may lead to controversies and societal distrust in institutions [Kearnes et al., 2006; Taebi, Roeser and van de Poel, 2012].

Therefore, critics have pointed to the need for a more open, democratic, and reflexive R&I system that acknowledges the entwinement of science with politics, the economy and society, and in which innovation is seen as progress only if it is aligned with societal needs and values [Felt et al., 2007; Hagendijk and Irwin, 2006; Nowotny, 2003; Wilsdon, Wynne and Stilgoe, 2005].

This opening up of R&I requires new communicative interaction patterns at the science-society interface. In the past, the predominant forms of communication between science and society were merely focused on end-of-pipeline knowledge transmission or the stimulation of technological acceptance, also referred to as the deficit model of science communication [i.e. Bauer, Allum and Miller, 2007; Bucchi and Trench, 2014]. For better alignment with societal needs and values, scholars and practitioners found out that actors in R&I would need to attend more closely to societal perspectives *throughout* R&I processes and their governance [Nowotny, 2003; Wilsdon and Willis, 2004]. Science communication as a field therefore expanded towards a spectrum — or some prefer a transit — from deficit to dialogue [Bauer, Allum and Miller, 2007; Bucchi and Trench, 2014]. In that, nonscientists come to be seen as resourceful actors with "societal knowledge" that can enrich agendas and practices in research and technology development [Nowotny, 2003]. In this paper we refer to the societal co-shaping of R&I processes and their governance as citizen and stakeholder engagement and participation.

Over the years, we have witnessed the proliferation of initiatives, policy programs, and academic experiments that aimed to transit from knowledge transmission to citizen and stakeholder engagement and participation in R&I and its governance [Einsiedel, 2014; see for instance Schot and Rip, 1997; Stilgoe, Owen and Macnaghten, 2013; Thompson Klein, 2001]. In this landscape, new actors have put themselves forward to act as participation brokers [Bandelli and Konijn, 2015], i.e., actors that forge connections between publics and diverse stakeholders with the aim of deliberating and influencing science, technological innovation and their governance. Actors that take up this role come from a broad variety of backgrounds and professional fields. They may be academics, civil servants, consultants, freelancers, NGOs, and so on [Bherer, Gauthier and Simard, 2017; Chilvers, 2013]. In Europe, we have seen a growing number of intermediary organizations — specialized in science communication, education, and engagement — taking up the role of participation broker [Escobar, 2011]. Professional networks, such as ECSITE (the European network of science centers, science museums and science engagement professionals), have advocated at European level for increased recognition of the role that these intermediary organizations could play in an R&I system that aims to better align with societal needs, concerns, and values [Bandelli and Konijn, 2011]. For some intermediary organizations, this has provided an entry point for participating in EU programs with a participatory component, such as those in funding strands related to the Science with and for Society program and Responsible Research and Innovation (RRI).

Although much research has been done on brokering and participatory activities, procedures and mechanisms, to our best knowledge little has been written on various ways by which intermediaries (as described above) try to develop their participation brokerage role and factors that enable or hinder the take-up and embedding thereof in the own organization [Bherer, Gauthier and Simard, 2017; Marschalek, 2017]. This is striking considering the significant impact that these

actors can have on the construction and implementation of participatory initiatives and the shaping of the emerging participatory landscape more generally [Bherer, Gauthier and Simard, 2017].

The research that has been done on participation brokerage demonstrates that it is not an easy role to inhabit. Firstly, brokerage requires connecting and exchanging knowledge between different worlds while never really being part of these worlds, also called "double peripherality" [Meyer, 2010, p. 118], which asks for continuous scrutinization of one's practices and devices to maintain effectiveness in mediating between the different worlds [Carayannis and Weiss, 2021]. Secondly, participation brokerage requires distinct skill sets that relate to designing participatory formats, hosting democratic exchanges, and understanding the decision-making processes that participation outcomes should feed into [Chilvers, 2010; Emery, Mulder and Frewer, 2015; Escobar, Faulkner and Rea, 2014]. In other words, a participation broker needs to embrace and be able to apply relatively new modes of thinking on R&I and science communication. Thirdly, participation brokers need to navigate a multitude of forces that are at play in the participation field and the R&I system more generally that may thwart the democratic character of their participatory activities [Chilvers, 2013; Cooper and Smith, 2012].

However, solely scrutinizing the individual capabilities of intermediaries for taking on this role in the R&I landscape would downplay the complexity of being able to execute this role. Participation brokerage in R&I is an emerging practice in a systemic context that is still largely built on the premise of science as an autonomous and self-correcting system, technological innovation as the key to economic and societal prosperity, and the deficit model of science communication that roots in this premise [Felt, 2017]. All actors, including intermediaries, have to relate to this systemic reality.

Therefore, this paper sets out to better understand how intermediaries take up and embed the role of a participation broker and the influence of systemic factors on this uptake and embedding. To this end, we present a case study of a European RRI project NANO2ALL in which six intermediary organizations with diverse profiles acted as participation brokers on the topic of nanotechnology and its democratic governance. Our analysis is informed by system transformation theory, which posits that practices are *shaped by* cultures and structures (i.e., structuring factors) in the systemic context in which an actor operates [Loorbach, 2007, p. 60; van Raak, 2016]. At the same time, actors reciprocally *shape* structuring factors and thus exert agency. For this reason, system transformation theory offers a lens through which to explore the influence of the systemic context on the ability of intermediaries to take up and embed the role of participation broker. In our study, we distinguish between structuring factors arising from three different contexts: the project context, the organizational context of the intermediary, and the broader system context in which the intermediary operates.

Our method section below describes the EU project in which the intermediary organizations at stake in this study were operating, our roles, and our approaches to data gathering and analysis. Our results section first presents a description of the participatory brokerage practices of the six intermediaries and then reflects on the structuring factors that have shaped these practices. Based on our findings, we share several considerations for future capacity building endeavors among

intermediaries who are interested in taking up a brokerage role at the science-society interface.

Methodology

2.1 *Case description — the NANO2ALL project*

The case context concerns the EU-funded RRI project NANO2ALL. In this 3.5-year project, six intermediary organizations experimented with the participation brokerage role in science and technology governance in an RRI context. NANO2ALL revolved around societal engagement in nanotechnology R&I and aspired to contribute to the establishment of a European-wide platform for mutual learning and informed dialogue among scientific and societal actors. The project was executed by a multi-stakeholder consortium. The six intermediary organizations acted as third parties in the project and were located in different countries: France, Italy, Israel, Poland, Spain, and Sweden. They were recruited via their network organization ECSITE, who acted as a full consortium partner. Although all intermediary organizations were ECSITE members, four identified as a science center or museum (France, Italy, Israel, Sweden). The Spanish organization was a communication department of a research institute, and the Polish intermediary consisted of a team of researchers in the field of management of engineering at a technical university (see Table 1 for general profile sketches of the organizations). Two authors of this paper, JS and FK, were also part of the consortium and closely collaborated with ECSITE and the intermediary organizations. Being Social Sciences and Humanities (SSH) scholars, our role was to bring a social science and humanities perspective into the project.

The NANO2ALL project consisted of a diverse set of activities. A significant part of the project focused on the organization of three rounds of dialogue events with citizens and stakeholders (see Figure 1). The first two dialogue rounds (i.e., the

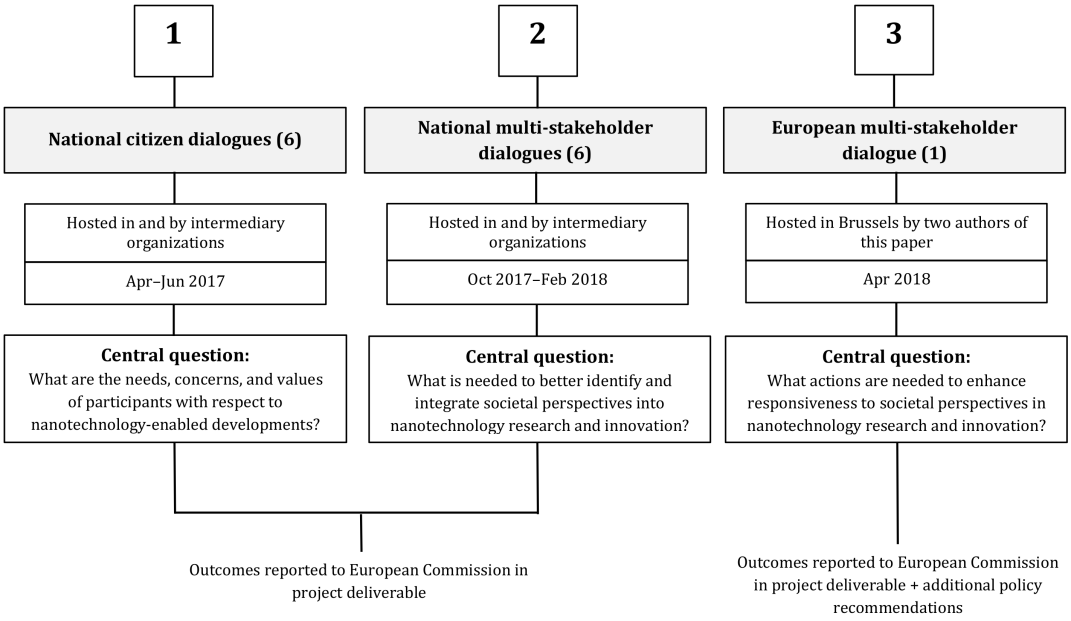

Figure 1. Overview of three-phase dialogue process of the NANO2ALL project.

Table 1. Overview of intermediary profiles.

	Italy	*Israel*	*France*	*Poland*	*Spain*	*Sweden*
Type	Science museum	Science museum	Science center	Management of engineering department at a technical university	Communication department of a research institute	Science museum
Mission[1]	– To interpret nature through a scientific lens – To stimulate scientific curiosity and the pleasure of knowledge – To give value to science, innovation, and sustainability.	– To increase interest among the general public in science and technology in the world around us – To promote excellence in sciences among youth – To present science and technology as an integral part of human culture.	– To challenge self-reassuring assumptions about science in the public sphere – To reflect, experiment, and innovate in the fields of science in society and public communication of science – To create inclusive and empowering spaces for sharing knowledge.	– To popularize and develop knowledge through academic and extra-academic training, research and close collaboration in the business-science-administration triad – To provide high-quality education, including entrepreneurship, promoting respect for universal ethical principles and social responsibility – To maintain the position of an important and modern scientific and educational center in the region.	– To disseminate science and innovation with and for society – To create appealing content and activities that bring nanotechnology closer to citizens and students.	– To stimulate joy, exploration, curiosity and aha-experiences – To increase the understanding of how industrial society's change affects social development and the lives of individuals.
Relative size	Large	Large	Small	Large	Small	Middle-sized
Main type of activities	Developing and running exhibitions, events, and activities, doing research (basic and applied multi-disciplinary research in the field of environmental studies), archiving in the library, educational programs for teachers and school students.	Developing and running exhibitions and events, educational programs in science and technology, training teachers and educational staff.	Developing and running exhibitions, science communication activities and programs (education, reflection), training, publications and consultancy on science communication.	Doing research and teaching university students.	Reporting on the research performed by the institute, having contact with the media, and science outreach (i.e., in the form of educational activities for students, and school presentations, etcetera).	Developing and running exhibitions and events, running educational programs for schools and teachers.

[1] Content is based on mission statements presented on the website of each organization or strategic documents.

national citizen dialogues and national stakeholder dialogues) were organized and hosted by the intermediary organizations at local level. The citizen dialogues aimed to make participants reflect on their needs, concerns, and values with respect to nanotechnology-enabled developments. The stakeholder dialogues centered on how to better identify and integrate societal perspectives in nanotechnology R&I. The third international dialogue in Brussels was hosted by us — JS and FK — in collaboration with several full consortium members and SSH colleagues. We, JS and FK, supported by MM and JB, were responsible for the

design of the NANO2ALL dialogue methodology, the methodological training of the intermediaries, the analysis of the dialogue outcomes, and the monitoring of the overall dialogue process. This study is merely relating to the first two dialogue rounds, since the intermediaries had an explicit participation brokerage role in these.

2.2 *Approach*

We employed a case-study approach, meaning a qualitative within-case analysis and cross-case comparison — considering data gathered about each single intermediary organization as one case — by means of "analytical immersion" in data (i.e. transcripts and researcher notes) and "identification of significant statements" of single cases (i.e. transcript quotes or key insights in notes), comparison of these statements across cases, and the organization of "categories of significant statements by themes" [cf. Ayres, Kavanaugh and Knafl, 2003, p. 874]. We performed the case study approach through an emergent research design. Such an open design allows researchers to attend to problems and questions as they arise in complex and "real-world" settings [Betten, 2017, p. 34; de Jong, 2015]. In the following sections, we elaborate on the emerging process of data collection and analysis performed for this study.

2.3 *Data collection*

For this study, we collected various types of qualitative data both *throughout* and *after* the project (see Figure 2). These included during the project (1) observations, (2) records of correspondence that took place during the entire project period, (3) notes taken during project meetings and training sessions that science centers attended, (4) notes of individual briefing conversations *before* the citizen and

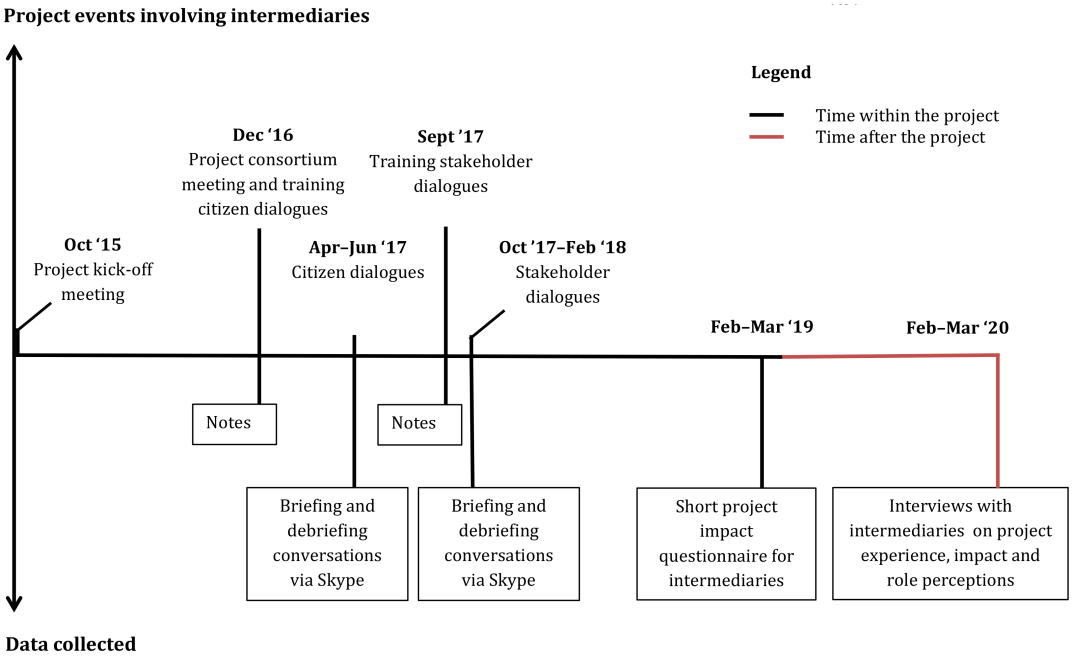

Figure 2. Timeline data collection.

stakeholder dialogue events of each intermediary organization, and (5) audio-recordings of individual debriefing conversations shortly *after* these events. At the end of the project, a short qualitative questionnaire was sent to the participating intermediary organizations in which they were asked about their experience of the project and the impact it had on their organization. The answers to this questionnaire were used as data in this study and served as input for a final round of in-depth interviews with each of the intermediary organizations, which were conducted one year after the project's finalization. All intermediary organizations were asked for their permission to use these data for the purpose of this study.

2.4 Data analysis

The audio-recordings of debriefing conversations and interviews were transcribed and available project notes and correspondence were checked for study relevance. We analytically immersed ourselves in the data by closely reading all the collected data multiple times. Thereafter we identified significant statements within cases, namely transcript quotes or key insights in our researcher notes about each single intermediary organization, and compared these statements across data about all intermediaries informed by thematic analysis [Braun and Clarke, 2006] with both inductive and deductive components. For the deductive component, we used system transformation theory's distinction between culture (e.g., norms, values, world views), structure (e.g., physical structures, resources, regulations, policy), and practice (i.e., behavior and routines that arise from actors interacting with culture and structure) as an analytical lens for our data [van Raak, 2016, p. 91]. In this triplet, structure and culture represent a spectrum of structural elements that can shape practice and vice versa. The distinction between culture and structure is not clear-cut. For instance, norms and values may have been translated into policy or regulations, or the other way around. The mutual relationship between practice and structure-culture nevertheless served as a valuable heuristic to identify, compare and categorize significant statements across cases and to induce themes. We regarded statements about the take-up and embedding of the brokerage role as 'practice'. We considered statements as part of the culture-structure spectrum if they concerned factors influencing these practices related to the NANO2ALL project context, the organizational context of the intermediary, or the broader systemic context in which intermediaries operate. We therefore distinguished between two overarching questions in our analysis:

- *How did intermediaries take up and embed their participation brokerage role in the context of the NANO2ALL project?*
- *How did structuring factors in the three contexts (project, organization and system) influence the ways in which intermediaries take up and embed their participation brokerage role?*

Upon multiple rounds of discussion and shared decision making among the authors, we induced contextually rich themes within the variety of intermediaries' brokerage practices, and themes regarding the influencing structuring factors on these practices related to the project context (2), intermediary's organization context (3) and broader systemic context (3). We proceed to detail them below.

Results

In the results section, we first describe how the role of participation broker was shaped in the NANO2ALL project practice and how the intermediaries further integrated this role into their own or organization's practices in the period after the project. Next, we provide an analytical account of the structuring factors that influence intermediaries' uptake and embedding of the brokerage role in practice. Illustrative quotes inserted in this section come from conversation transcripts or intermediary's written answers to the qualitative questionnaire and were slightly adjusted for readability purposes.

3.1 Uptake of the participation brokerage role

The six intermediaries discussed in this paper were connected to the NANO2ALL consortium as third parties. Their primary role was to execute two dialogue events (one for citizens and another for stakeholders). As SSH scholars with practical and theoretical expertise on shaping participation in RRI contexts, JS and FK developed the dialogue methodology for these events, with advise from MM and JB. The intermediaries were responsible for local recruitment of participants, hosting the events, and the collection of data that would later be analyzed by us and, together with other project materials, fed into a policy advice on fostering responsible nanotechnology in Europe. In this section, we give a detailed account of how the brokerage role of intermediaries gained shape while carrying out these activities. We describe this practice by distinguishing between the preparation, recruitment and execution of the citizen and multi-stakeholder dialogues. In reality the citizen dialogue preceded the multi-stakeholder dialogue, whereas their preparation, recruitment and execution stages evidently intertwined over time.

3.1.1 The citizen dialogue

Preparing for the dialogue: training, guidance, and rehearsal. We developed a 4-hour interactive format for the citizen dialogues that the six intermediary organizations executed. The format was an embodied, value-oriented inquiry and consisted of prototyping and story-writing exercises as well as a plenary discussion. Since the format was new to the intermediaries, we organized a central training session to collectively test the format and gather feedback. Suggestions for adjustments were collectively discussed and sometimes tried out on the spot. Contextual- and experience-based input from the intermediaries helped to validate and fine-tune the centrally developed dialogue format. Shortly after the dialogue training, the intermediaries received an updated dialogue manual and all necessary materials. The intermediaries put a lot of time and effort into preparing the citizen dialogues event. Many organized rehearsal sessions, with colleagues or using other creative ways, for instance with a group of teenagers in a school program. One intermediary indicated:

> *Feeling comfortable with the script is paramount. It did not happen until after the training sessions, the rehearsals and a deep understanding of the script. (Intermediary Spain, questionnaire)*

Recruiting participants for the citizen dialogue. The intermediary organizations were regarded as organizations embedded in extensive local networks, for which

no specific budget was allocated for the dialogue participant recruitment process. As a result, the intermediaries configured their own recruitment strategies and were encouraged to share these among each other on the project platform. They employed their own channels (e.g., their website, social media, newsletters, on-site promotion, emails targeted at social networks or participants of similar previous activities, and local press) to promote the dialogue event and attract participants. As SSH scholars, we emphasized that during the recruitment process attention should be paid to composing a group with a broad diversity of *ideas* and *backgrounds*. The intermediaries were advised not to fixate on *all* possible demographic factors but to focus on balance regarding gender, age, and educational background. In the end, each dialogue was attended by 11 to 19 citizens. The age range varied from young citizens to 65+; further diversity details remained unreported.

Executing the citizen dialogue. The intermediaries independently chose a date and location, and took care of decorating the immediate environment to create a friendly and open atmosphere. Many intermediaries felt the participants should be rewarded for their time and effort, for example with an elaborate lunch or an invitation to a special event. They thought that their sessions were lively and engaging and felt that their participants were committed to making valuable contributions to the discussion. Hosting the dialogue session was considered to be an "intense" activity that required balancing a multitude of tasks (group dynamics, execution of script, timing). The intermediaries were asked to produce a summary document of their event as a news item for the NANO2ALL website immediately after their dialogue had taken place. After the dialogues, the intermediaries sent us the collected data (i.e., audio-recordings, pictures) for analysis and synthesis into a project report.

3.1.2 The multi-stakeholder dialogue

Training sessions for the multi-stakeholder dialogue. The intermediary organizations hosted a multi-stakeholder dialogue session about a year after the citizen dialogues. We designed a full-day format that consisted of several playful exercises [cf. van der Meij, Broerse and Kupper, 2017], including an elaborate scenario-exploration game, which was based on a game format constructed by the Joint Research Center of the European Commission and was adapted in collaboration with several project partners. The preparation for this event followed a similar logic to that for the citizen dialogues: we (JS and FK) developed a format, practiced it with the intermediaries, gathered feedback, and sent them an updated version.

Recruiting participants for the stakeholder dialogue. We encouraged intermediaries to recruit stakeholders of four categories (industry, science, policy, and civil society), plus actors without an obvious stake in nanotechnology (media, scholars, artists) and participants who had taken part in the citizen dialogues. The intermediaries performed their own local stakeholder analysis before inviting actors via a targeted approach. The project partners assisted in the recruitment process by sharing relevant contacts in the intermediaries' countries of residence. Specific recruitment strategies and progress were shared on the project's internal

platform. In the end, each dialogue was attended by 9 to 12 stakeholder participants.

Executing the multi-stakeholder dialogue. As with the citizen dialogues the intermediaries scheduled, located and decorated their dialogue independently, for instance providing lunch or dinner. All of the intermediaries implemented the full-day dialogue format. After feedback from the first three intermediaries that hosted their dialogue session, we decided to simplify one of the exercises in the dialogue format. The adapted format was used by the other three intermediaries who hosted their dialogues at a slightly later stage. Overall, the intermediaries felt that they were able to host lively and fruitful conversations and that participants showed an interest in each other. After the dialogues, the intermediaries collected the dialogue data and reported on the dialogue event in a similar way to what they had done after the citizen dialogues.

3.2 Embedding of the participation brokerage role

The embedding of the participation brokerage role in the own practices or organization highly varied among the intermediaries. For two intermediaries, the project mainly acted as a solidifier of the roles and practices that they were already familiar with. They indicated that participation in the project helped them to further increase their practical experience in the field, strengthen their reputation in the area of public participation, connect to (new) local and European actors, and gain knowledge from the project's methodological approaches. One year after the project, both were already involved in new projects that revolved around either stakeholder dialogue or inclusive knowledge production practices.

The intermediaries from the two knowledge institutions both explained that their participation in the project had redirected some of their usual practices. For the staff member from the technical university, this implied a new focus within his own research and education work: RRI and the collection of different forms of knowledge. The communication professional from the other research institute felt that the project had created a change in mindset regarding the kind of interactions that their communication department aspires to create between science and different publics. In several of the department's "outreach" activities, it moved "*from storytelling to story sharing*", consciously providing their publics the chance to reflect on the science presented and share opinions, concerns, ideas in relation to broader societal themes.

For the other two intermediaries (both science museums), the project did less in terms of influencing their practices or supporting the cultivation of a participation brokerage role. One of them pointed out that the project and its approaches did inspire them to look for new opportunities and collaborations in which they could further unroll a participation brokerage role, but that at that time, no such initiatives had been instigated. In the case of the other museum, the relevant staff member had left the organization after the NANO2ALL project ended. This staff member indicated that he had used some of the newly acquired methodological skills to engage citizens in discussions about science and technology in his work as a freelancer. Within the science museum as an organization, though, the experimentation with the participation brokerage role left no visible trace.

3.3 *Structuring factors influencing uptake and embedding of the brokerage role*

We will now describe so-called structuring factors induced from our analysis that have influenced the uptake and embedding of the brokerage role by the intermediaries, distinguishing between the project context, the intermediary's organizational context, and the wider system context in which the intermediary operates (Figure 3).

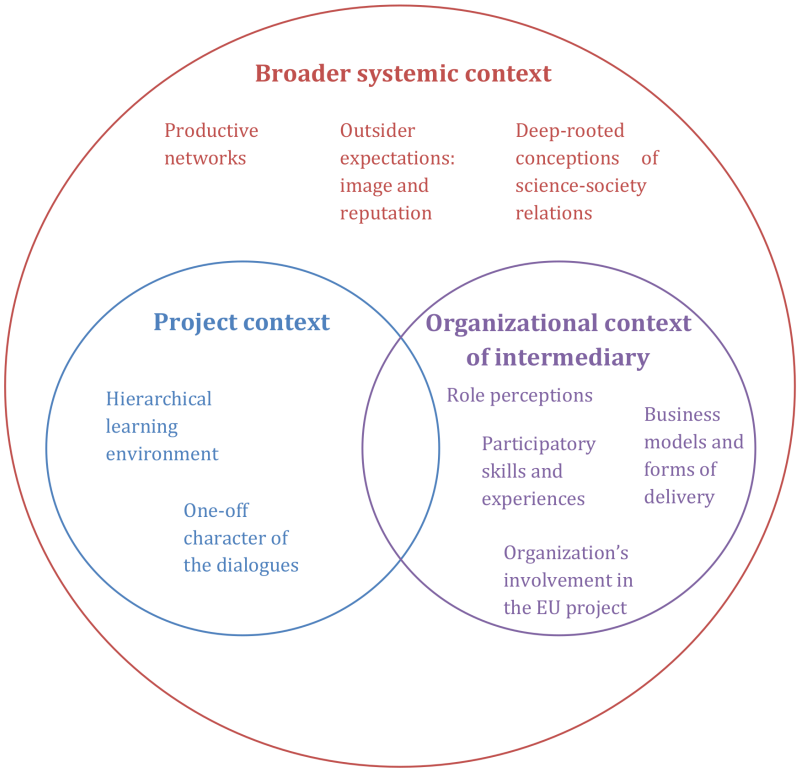

Figure 3. Overview of structuring factors influencing the uptake and embedding of the participation brokerage role.

3.3.1 Project context

The limited scope and duration of the project guided the way in which participation was set up and thus structured how the intermediaries practiced and developed their brokerage role. The dialogue activities of the NANO2ALL project were designed as a small-scale consultation initiative that would efficiently yield a broad variety of perspectives on strengthening responsible governance of nanotechnology. This efficiently gathered input was regarded as beneficial for constructing central recommendations that could be sent to the European Commission. However, the *one-off character* of the citizen and stakeholder dialogues made it difficult for intermediaries to engage in a well-dosed learning experience that allowed them to move through multiple cycles of action and reflection. Intermediaries experienced the dialogue events as intense and demanding moments in time and resources; to them it was a one-shot exercise in which everything had to fall in place. One intermediary suggested that engaging societal actors in a process of multiple — but shorter — events could have more sustainably strengthened their confidence in acting as a participation broker. At the

same time, intermediaries indicated that being able to tell that you participated in an EU project like NANO2ALL does help to strengthen one's reputation as participation brokers in the field, and the activities did allow them to get in touch with new actors or to nurture existing ones.

The second structuring factor related to the project context was the *hierarchical learning environment* in which the intermediaries were asked to perform their activities. Differences between intermediaries in terms of organizational profile, relevant knowledge and experience, and role ambitions were not attended to from the start. Instead, all intermediaries received the same training and were supposed to carry out the same activities. Outcomes and learned lessons were shared with us — as monitors of the process — and with ECSITE (intermediaries' network organization), who would produce a report on them. This quite hierarchical setup was a way of ensuring the rigor of the dialogue methodology and data collection; it allowed for synthesis and comparison of the dialogue outcomes. For the intermediary organizations, it facilitated the short-term uptake of the participation brokerage role, providing step-by-step guidance regarding carrying out a participatory activity that would feed into European decision-making processes. One intermediary said:

> *It was really nice to do something that someone else had really thought about, the different steps and the why… it was very interesting and inspiring, actually. (Intermediary Sweden, debriefing conversation after citizen dialogue).*

Moreover, it allowed the intermediaries to become familiar with approaches and techniques that were unfamiliar to some of them (e.g., the embodied, value-oriented inquiry in the citizen dialogues or the use of serious gaming in a stakeholder setting).

> *You [exposed] us to new tools for public engagement, which are interesting I think. […] Sociologists they use these tools for engaging people in discussion. Coming from a scientific community we don't use them. We are not… [Laughs]. You feel like children, you know. Making a game [i.e., referring to the scenario game played in the multi-stakeholder dialogue] [laughs]. But in the end I think this was very useful. (Intermediary Italy, debriefing conversation after multi-stakeholder dialogue)*

On the other hand, the top-down character of the NANO2ALL dialogue methodology produced a form of instrumentalism that proved less powerful in supporting the intermediaries to sustain and nurture the brokerage role over a longer time. One year after the project ended, several of the intermediaries indicated that the dialogue format was difficult to reuse outside the project setting (see next section) and that they had experienced limited opportunity to draw collective lessons from their project experiences or the strategies of other intermediary organizations.

3.3.2 Organizational context

The organizational profiles of the intermediaries in this study were considerably different. We can distinguish between the four science centers and museums on the

one hand and the two scientific knowledge institutions on the other. Whereas the first group presents itself as an intermediary actor as organization, the latter group belongs to the world of science but includes a team or individuals who act as an intermediary figure to create connections with society. Within and across these two groups, we observed considerable differences in terms of the dominant *role perception* and reported level of *skills and experience* regarding the use of participatory approaches and dialogue facilitation. Both of these factors had a structuring effect on the uptake and embedding of the participation brokerage role within the project.

Two of the intermediaries strongly perceived their dominant role to be in engaging citizens and democratizing science. They were familiar with the theories underpinning dialogue models of science communication and had both published scientific articles about it as well. They used these theories to reflect critically on the NANO2ALL project, its framing, and its activities. When reflecting on the decision that was made to join the NANO2ALL project, one of the participants from one of the intermediaries said:

> *The idea of the project was to overcome the big problems raised by the GMOS [Genetically Modified Organisms]. [. . .] So I think we have to be careful about this. [. . .] Because I was afraid that this approach was related to what is called the deficit model theory. So I teach you the nanotechnology and then you are not scared about it. So I was a little bit afraid. . . This could be a risk, you know. This could be a risk. (Intermediary Italy, follow-up interview after project)*

This quote illustrates how this intermediary's role perception was already strongly grounded in public engagement and democratization ideals before the start of the project. In many of their own activities and prior projects, both of these intermediaries that identified as 'engagers and democratizers' had already worked with formats in which citizens were invited as equal partners to express themselves about science or to contribute with their own "societal knowledge" to a particular topic. The participation brokerage role was therefore a relatively familiar one to take up, and these intermediaries indicated that they felt comfortable in their role. When executing the dialogues, they could draw from their previous experiences and in-house facilitation skills.

The intermediaries that viewed themselves predominantly as science ambassadors and educators seemed less comfortable with the openness and dialogical nature of the NANO2ALL process, at least at the start of the project. For them, the practice of hosting dialogues was new. In particular, the openness of the dialogue formats and the focus on collaborative thinking and free expression of ideas required a different set of skills compared to their usual work routine.

> *I was used to teaching and instructing, not so much involving the audience, or trying to get the audience involved so much. So, for me it was a new experience, it demanded a lot of tolerance and patience. People sometimes go on about things, and you have to stop them, but gently, politely.*
> *(Intermediary Israel, debriefing conversation citizen dialogue)*

In some instances, the perception of having a role as a science ambassador and educator seemed to interfere with the dialogical approach that was developed by

us. Some of the intermediaries, for example, had difficulties with the level and amount of information provided at the start of the citizen dialogues. The dialogue format merely provided basic nanotechnology information on small cards. The participants could be flexible regarding whether and how to use that information in activities. One intermediary was afraid that the level of information provided would not be enough for a good quality dialogue and decided to host an additional lecture by a nanotechnology researcher before the dialogue event, even though the dialogue methodology was grounded in the assumption that the issue framing of the dialogues should stay open to the lived experience of the participants and not be led by experts. Another intermediary provided the participants with more information about nanotechnology *after* the dialogue session in order to give additional insights as a service to them while avoiding influencing the dialogue itself.

Furthermore, several intermediaries felt uncomfortable asking citizens to engage in a 4-hour dialogue activity without giving them anything in return. The fact that one intermediary repeatedly referred to participants in the citizen dialogue as volunteers also seems emblematic here. It suggests that for some the collection of data felt like "taking" something from people rather than offering them something, which is what many of the intermediaries usually do in the form of providing knowledge, fun activities, trainings etcetera.

Nevertheless, the dominant role perception of intermediaries as ambassador and educator could also enrich supported uptake of the brokerage role. For most intermediaries, it was for instance of utmost importance to connect the scientific and social issues to be discussed to the lived experience of citizens. They believed that topics should touch citizens, emotionally or intellectually, and be of relevance to their own lives. Thus, at the beginning of the project, the intermediaries encouraged the project team to improve the dialogue design by better contextualizing the dialogue focus and demonstrating relevance from the perspective of citizens.

We noticed that the embedding of the participation brokerage role was often complicated by another structural factor related to the organizational context namely *existing business models*. Several of the science centers and museums in our sample are rooted in a business model that revolves around attracting large numbers of visitors. These intermediaries indicated that although the NANO2ALL dialogue formats provided inspiration for future activities, they were difficult to fully reuse outside the project context: the formats were time and resource intensive while only involving a small group of people. The two knowledge institutions indicated that science communication activities — let alone participation and dialogue — have little priority in their organization. Their organization's sources of revenue and reward systems are mainly targeted at the performance of research or education and the role of participation brokerage is generally regarded as a side activity. We noticed that even though these organizations' representatives in the NANO2ALL project personally thought it was relevant to roll out participatory activities further in their organization, there was limited scope to actually do so beyond the context of a project with dedicated funding.

A related issue is the dominant *form of delivery*. For most of the science centers and museums among our six intermediary organizations, exhibitions served as the main form of delivery. These organizations preferred to use participatory activities that somehow linked to the exhibition floor. One science museum intermediary, for instance, explained that the organization does see a role for itself in the participatory landscape, but noted the following about the NANO2ALL dialogues in relation to the museum's unique forms of delivery:

> *But eventually: why a science museum? While you could have hosted these same talks in a community center or in schools? Or maybe in a mall? Or inside an academic institute? If you contract a science center, you need to do something more tangible besides that... You need to have a [...] You need to justify the visit. You justify the visit by doing something unique that can be done only in a science museum. (Intermediary Israel, follow-up interview after the project)*

It seems evident that a new role requires adaptations in organizational practices, but *some* alignment between participatory formats and current business models and forms of delivery *can* facilitate intermediaries to develop the brokerage role more sustainably within their own organizational context.

The final structuring factor in the organizational context that influenced the embedding of the brokerage role concerns the *level of integration* of the project in intermediaries' daily practices. In several organizations, the project had a somewhat isolated position, with one employee carrying most of the responsibility for the project. This made the learning process at organizational level more vulnerable. We observed, for example, that some individuals left their intermediary organization during or immediately after the NANO2ALL project, taking the obtained knowledge and experiences with them to new places. Some of the organizations that experienced staff changes noted that this had impacted their ability to capitalize on the lessons learned during the project.

3.3.3 Systemic context

We also found structuring factors in the systemic context that influenced the uptake and embedding of the participation broker role. The first structuring factor concerns *the productive networks* that intermediaries are embedded in. The intermediaries that took part in the NANO2ALL project were all embedded in extensive networks, be they local, regional, or international. For example, the science centers and museums benefited from their own local channels when they reached out to (and recruited) citizens from local communities. The two knowledge institutions had existing connections to certain stakeholder groups, such as (local) industry actors. Most of the intermediaries were strongly connected to the research community, which facilitated the recruitment of researchers to a great extent.

In addition to having connections, either in societal or research and innovation networks, intermediaries also needed to be recognized within those networks for their role as participation broker. This recognition proved challenging for some in the NANO2ALL project, for instance during the recruitment process for the citizen dialogues. Despite the significant effort that the intermediaries put into this process, half of them experienced difficulties in recruiting a sufficient number of

citizens, and several intermediaries noted that the participants who did attend the dialogue had "classic" expectations of what the event would entail, that is, transmission of knowledge with a more passive role for the citizens.

> *Because they know us, I think they expect a researcher. They expect some information about nanotechnology. Because we are a science center in a graduate school of science in Paris. So it is a location [. . .] people know, "Ah, okay, it is [name of public venue of graduate school], they do some conferences, because they have a lot of researchers. So, okay, if I come [. . .] I understand that I will learn something about nanotechnologies. (Intermediary France, debriefing conversation citizen dialogue)*

It was clear that the *image and reputation* of the intermediaries' organization also constituted an important structuring element that influenced how the participation brokerage role could be performed or embedded. In general, science centers and museums were regarded as friendly and safe environments where different (scientific and nonscientific) actors could meet to express their ideas freely and openly. However, the scope of interactions that actors and publics imagine take place there sometimes remained limited. Some science centers and museums explained that they experienced difficulty in convincing researchers that their institute is more than a channel to showcase and explain science. And a representative from one of the science museums indicated that — despite its willingness to take up a new role at the science-society interface — it is not always recognized by companies or local authorities as an institute that can help solve complex societal problems by means of dialogue and co-creation activities.

The image and reputation-based struggles demonstrate that intermediaries interested in adopting the role of participation broker in the R&I landscape face the challenge of having to renegotiate deep-rooted *conceptions of science-society relations*, including the task of intermediary actors therein. Such renegotiation can be an ongoing challenge. One representative of a science center with extensive experience of and success in participatory activities indicated that the relevance of the center's participatory activities is still not always understood by the university that funds much of its work and that pressure is being put on the center to perform activities that conform to more traditional notions of science communication (i.e., outreach).

Discussion

In this paper, we aimed to deepen our understanding of the uptake and embedding practices of participation brokerage roles among intermediary organizations and structuring factors that influence these, both within the NANO2ALL project, the intermediary's organization and the broader system around it. Our case-study analysis showed that intermediaries' uptake and embedding of a participation brokerage role in RRI projects like NANO2ALL varied along with intermediary-specific influencing structuring factors. Some of our six intermediaries dutifully followed the citizen and stakeholder dialogue formats as offered by the NANO2ALL project. Others made minor decorative adjustments, like a lunch, to offer participants something in return or even added knowledge transfer activities to the events. Their variable role uptake either resulted in more solidified organizational embedding of the participation brokerage role, transits in mindset and personal interests, new science communication practices, or no change at all. In that sense, so far, the intermediary's brokerage practices did

influence some activities of the NANO2ALL project and the own intermediary organization, but did not result in rigorous reconfigurations in the project, the intermediary's organization, or the wider system around it.

The structuring factors influencing how intermediaries could take up or embed the role of participation broker in their practice, were related to the intermediary's organization itself (i.e., role perceptions, participatory skills and experiences, business models, and forms of delivery) and in the broader systemic context in which the intermediary operates (i.e., productive networks, image and reputation of the organization, and deeply-rooted conceptions of the science-society relationship). In addition, we unraveled how structuring factors in NANO2ALL's project context (i.e., its one-off character and hierarchical learning structure) mainly facilitated short-term uptake of the brokerage role and provided less guidance for sustainable embedding within the organization. Nevertheless, these factors did not limit the intermediaries' opportunities to gain new experiences, get acquainted with new approaches, and build on their reputation in the field. In what follows, we connect our findings to the broader literature and note some essential points for discussion that should be addressed.

4.1 The NANO2ALL dialogue formats

Our first point relates to the use of NANO2ALL's centrally developed dialogue formats. Our findings showed that this format did not always fit in well with the organizational structures and working methods of the different intermediary organizations, making its application outside the project context difficult. We want to point out that the participatory format used in this project context fits in with a top-down tradition of organizing public and stakeholder participation in that its scope and focus were guided by a project team rather than the citizens or stakeholders themselves. We are aware that this take on participation has received substantial criticism over time, sparking questions about the effects of such stage-managed activities and the extent to which their proliferation has narrowed our understanding of what constitutes democratic participation [Braun and Könninger, 2018].

Although it is beyond the scope of this study to reflect on the impact of NANO2ALL's participatory approach on R&I policy, we do want to stress that alternative approaches exist for engaging citizens and stakeholders. Some of the intermediaries in our study also indicated that if they were to take up this role more frequently, it would be in a different form that would be more strongly connected to the strength or uniqueness of their organization and its network (for instance, connecting participatory activities to the exhibition floor in science museums, as some intermediaries suggested). It seems important here to make a connection to the work of Davies and Horst [2016] and Selin et al. [2017], who argue that the democratic landscape in R&I is not just constituted in highly structured dialogue activities that have a connection to decision-making processes (as was the case in NANO2ALL) but is shaped by a multitude of formal and informal activities and instances that allow societal actors to discuss and make sense of techno-scientific issues. Such an understanding of the democratic landscape allows intermediaries to also imagine other roles and activities that could contribute to the democratization of science and technology in alternative ways.

4.2 *Reflection on roles*

Our study showed how the role perception that the intermediaries had of their organizations (and skills and experiences associated with that role) influenced how comfortably they took up the participation brokerage role, and shaped how they implemented dialogue activities in practice (e.g., adding an additional lecture by an expert). We demonstrated how role perceptions that still strongly link to the notion of predominantly being a science ambassador and educator may spark tension with the open, dialogical approach that constituted our centrally developed format. Since most organizations within our study also see important roles for themselves *outside* the participatory landscape, these associated perceptions and practices may become entangled in the participatory activities that they undertake; therefore, we argue that explicit reflection on roles is warranted [also see Escobar, 2011]. Organizations and individuals who see a role for themselves as a participation broker may benefit from considering how the brokerage role aligns with their organizational culture, structure, and practices and reflection on how to navigate potential tensions caused by misalignment. Such reflections can help to make explicit choices about the actions that one wants to undertake within the participatory landscape, while leaving room to learn more about and change one's role when aspired.

4.3 *Collective attention to principles of participation*

We noted that in our study all of the representatives of the intermediary organizations were curious to learn and do things in a different way from what they were used to. For those intermediaries that *are* interested in further developing a role as a participation broker in activities that have a direct link to either R&I policy making or R&I practices, we stress that capacity building endeavors are needed that move beyond the hierarchical learning structure as provided in the NANO2ALL project. We demonstrated how the hierarchical learning structure offered room to gain a new experience and to get acquainted with new formats and approaches but offered little support to thinking more structurally about how participation brokerage activities could be embedded in the organizations. Learning was mainly directed at learning to work with the format. Previous studies put forward that a focus on this "hardware" of engagement [Wilsdon, Wynne and Stilgoe, 2005, p. 19] introduces certain risks, the most prominent being losing sight of the underlying vision and principles that have guided a particular format and prioritizing the participatory *process* over the *outcome* [Amelung and Grabner, 2017].

Although in the training sessions for intermediaries we tried to attend to the principles behind the dialogue methodologies, and one intermediary also explicitly indicated that its vision concerning science communication had been transformed by the NANO2ALL experience, we believe capacity building is needed regarding such principles. Experimenting with participatory formats and training skills — i.e. facilitation of dialogues — may indeed serve as useful inspiration for intermediaries developing their brokerage role. However, we believe that paying explicit attention to principles underlying the public engagement field is essential. Therefore, it might have been useful to more actively engage with these principles *collectively* in the project, for instance by exploring important questions around

NANO2ALL's dialogue format. How should we understand the participatory mechanism of this format? What norms and assumptions about science, technology, and society have shaped it? What people and perspectives are we excluding due to the character of our engagement process? And so on. As Escobar [2011, p. 46] suggests, "*every time you organize and facilitate a public engagement process, you are making political choices all the way*". It is these political choices that deserve attention in capacity building initiatives that aim for participation brokerage.

4.4 Attention for organizational and systemic factors when developing new roles

Lastly, it is important to realize that intermediary organizations are not stable entities but are constantly shaped and reshaped over time, in dynamic multidirectional processes [Pallett and Chilvers, 2015]. They should not be considered as clearly delineated entities but as part of a broader system and variety of networks. In our study, for instance, we showed how broader systemic factors, such as the image and reputation of the organization to which the intermediary belongs and deep-rooted understandings of the science-society relationship among funders of intermediaries, stakeholders, or publics, may push intermediary organizations into certain roles. And *within* an organization, there might be different ideas about organizational roles and the kind of communication that is preferred between science and society. This has implications for how we should conceive the learning processes of intermediaries. Learning and role change are not linear processes that can be centrally "managed" within an organization. They are shaped by the contextual factors described above, which might be different for each intermediary organization or individual actor within it [Pallett and Chilvers, 2015]. This signifies the importance of addressing structuring factors in the organizational and systemic context of intermediaries when they are engaging in learning processes and experimenting with new roles. We argue that in (EU) projects like NANO2ALL — which presume to build capacity among intermediaries — more time and space are needed to collectively explore and discuss how intermediaries may relate to such structuring factors and what would be needed to transform them.

4.5 Limitations of the study

Finally, we would like to address some limitations of this study. The first relates to the variety of intermediary profiles in terms of mission, size, affiliations, business models, geographical location, history, etcetera. Although this diversity in actor profile is a characteristic of the participatory landscape, it did make it more difficult to pinpoint what factors contributed to particular differences in intermediaries' behavior, choices, and experiences throughout the NANO2ALL project. This was complicated even further by the fact that we only collaborated with certain individuals within the intermediary organizations, all of whom have their own unique professional profile, history, and view of their own organization and the NANO2ALL project.

The second limitation is that the study design made it easier to identify those factors that hinder the uptake of participation brokerage role by intermediaries than the ones that enable it. Although our observations showed that some

intermediaries had more experience with participation brokerage and had also embedded this role in their organizational practices, the study's focus on the NANO2ALL context did not allow us to move beyond this diagnosis. What enabled these organizations to more deeply embrace this role? Examining this would require a different study design, applying a more historically oriented approach.

4.6 Toward reflexive uptake and embedding of the participation brokerage role

Various scholars [Bherer, Gauthier and Simard, 2017; Chilvers, 2013] argued that the expanding stakeholder and public engagement and participation field finds itself in a paradoxical situation. On the one hand, it strives for professionalization and the development of quality standards, guidelines, etcetera. On the other hand, it seeks to remain open to new participatory mechanisms, actors, spaces, and an ongoing open discussion about what constitutes democratic quality. To navigate this paradox, Chilvers [2013] pleads for more reflexivity in the field. In this study, we have explored how structuring factors influence actors — some newer to the field than others — in adopting and embedding the role of participation broker in their practices. We argue that capacity building endeavors for such roles should move beyond learning to work with a particular dialogue format. If intermediaries are to develop this role more sustainably and *reflexively* in their practice, learning processes should (1) explicitly deal with the organizational and systemic context in which the intermediaries are trying to develop this role and (2) involve collective reflection on engagement and participation ideals, and the politics of the mechanisms that they experiment with.

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