

Unlocking participation

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Summary

Social, scientific, and technical questions are closely intertwined: visions of a desirable future concern ethical and social values including questions of distributing (ecological and economic) risks, solidarity and social cohesion, fairness, equality and justice. Accordingly, technologies not only need to fulfill specific tasks but instead touch upon questions of responsibility and of reaching societal acceptance (Owen et al. 2013, von Schomberg 2013).

Technologies, especially new and emerging technologies like nanotechnologies, synthetic biology or artificial intelligence are ambiguous in the expectations they evoke (for analyses of the social life of expectations see e.g., van Lente 2012, Borup et al. 2006, van Lente and Rip 1998), and accommodate a range of different value-laden perspectives and patterns of moral argumentation (Swierstra 2017, cf. Swierstra and Rip 2007).

In STI governance, exchanging viewpoints and appreciating resulting options constitutes an important strategy to overcome this ambiguity. Accordingly, engaging stakeholders and the wider public became in vogue to ensure a comprehensive reflection of technologies, to better align them with societal values, and to address and counter democratic deficits in technological development (e.g., Burri 2018, Chilvers and Kearnes 2016, Owen et al. 2013, Kearnes, Macnaghten, and Wilsdon 2006, Stirling 2008). In short: one could think of participation and societal engagement as a way to *unlock* how we design STI governance.

Indeed, societal engagement with emerging technologies features several pertinent promises. It sets out to enhance social robustness of decisions and to ease democratic shortcomings of STI governance and promises a more inclusive process compared to scientific analysis by offering a more comprehensive variety of perspectives, e.g. in policy advice (Delgado, Kjølberg, and Wickson 2011, Stirling 2008). Thus, societal engagement constitutes a popular strategy in technology policy, STI governance, and innovation more generally to arrive at widely acceptable and accepted decisions, and to ensure innovation (Owen, Macnaghten, and Stilgoe 2012, van Mierlo, Beers, and Hoes 2020). Moreover, it is supposed to strengthen agency with regard to STI governance. This is where my thesis sets in.

In this thesis, I study the dynamics between opening up and closing down. In particular, I look at how different forms of participation and societal engagement allow for *opening up and closing down in STI governance*.

To do so, I structure my thesis in the following way: After introducing the overall problem outline, as I did above (*Chapter 2*), I introduce my conceptual approach in *Chapter 3*. Inspired by Andy Stirling, I understand opening up as consistently considering a broad range of actors, perspectives and values in STI governance and closing down as a reduction thereof. Unlike Stirling, I explore opening up and closing down as empirical phenomena, rather than normative, and thus *per se* desirable, steps of STI governance. Opening up and closing down manifest in dialogue, but show occur on different levels as well. Accordingly, I extend my analysis from dialogue to levels of public sense-making as well as affordances. I use three dimensions – social, epistemic and normative – to make the interactions of opening up and closing down visible and to investigate how they enable or constrain agency, assuming that disentangling these dimensions allows for delving deeper into the dynamics between opening up and closing down.

Chapter 4 outlines my research approach: I selected a case study approach to cover different moments of innovation, based on the analysis of documents, interviews and focus groups. Accordingly, my case studies address a broad variety of technological approaches and mechanisms with regard to opening up and closing down: I discuss myth formation as public sense-making in the context of neuroenhancement (Chapter 5), the engagement of civil society organizations in dialogues on synthetic biology (Chapter 6), and affordances of computational modelling for nano risk governance (Chapter 7).

Chapter 5 looks at public sense-making in the context of neuroenhancement: it investigates how unfamiliar technologies are familiarized in public debates by mobilizing the concept of ‘technology myths’. Based on empirical data from upstream engagement on the governance of neuroenhancement, it elaborates on the mechanisms through which public myths emerge. My colleague and I explored technology myths as a mechanism to transfer meaning via technology comparators. By so doing, actors create a specific picture of a technology by selectively highlight some of its traits while omitting others. As a result, the technology at stake, or related practices, are interpreted in different ways. In the case of neuroenhancement, they span from a harmless daily routine (‘drinking coffee’) to illegal practices (‘taking drugs’). With this case study, we show how narratives are performative and offer different interpretations of complex technical issues, while these interpretations affect how the public perceives technologies (e.g., neuroenhancement) down the road. Thus, looking at narrative structures such as technology myths allowed gaining insights into the formation of public perspectives about technologies.

Chapter 6 compared different settings of civil society organizations’ engagement (‘CSO engagement’) by analyzing their actor roles, formats, and framings in relation to synthetic biology. The first setting was a public protest against household products that (potentially) contained synthetic biology components to substitute palm kernel oil; the second was triggered by this conflict and featured an invited multi-stakeholder deliberation process; the third was organized under the premises of upstream engagement of R(R)I. Thus, the settings ranged from early-upstream engagement to downstream reactions to ready-for-market products, contrasting invited engagement with other forms of engagement, i.e., protests as explicit political activity to alter decision-making on a specific topic. This case study compared different forms of dialogue, and looked at how different conditions shape and are shaped by CSO engagement. CSOs did not engage in all settings in the same way or for the same reasons. In particular, to hold framing power and to see real-life impact of their activities turned out to be crucial for CSO engagement. Consequently, they hardly engaged in settings they perceived as pre-framed in a way that contrasted their agendas. However, looking at STI governance as a whole, we concluded that a variety of engagement formats under different framings enhances the societal competence and capacity for comprehensive reflection on synthetic biology.

Chapter 7 investigates how a specific computational modelling tool affords understandings of risk governance in interdisciplinary collaborations. Generally speaking, affordances limit the way how (virtual) artifacts are used, i.e., close down discourse through material conditions. They perpetuate specific understandings of issues at stake, like risk or sustainability, and accommodate potential user choices. Thus, we reconstructed how the tool affords actor constellations, concepts, and the imagined contexts of using the tool, in particular in relation to R(R)I. By so doing, we explored virtual manifestations of discourse in the context of computational modelling, in particular

the shifts in discourse they afford. My colleague and I found that next to disciplines conventionally engaged in risk assessment and management, expertise for responsible innovation supported to move towards 'sustainable manufacturing'. The tool extended its scope by incorporating shifts related to findings on nanomaterials themselves, as well as additional analyses, such as socioeconomic analyses and undertook enormous efforts of engaging a range of actors. Yet, opening up its scope and the actors involved in its development as required by basic research also put the tool at tension to industrial applications, which again affected its overall tendency to open up.

Subsequently, *Chapter 8* follows the three dimensions in all three case studies individually and in cross-case comparison. I argue that first, aspects of the social dimension dominate the discussion in the literature on opening up and closing down. Between the three dimensions, it is also the best reflected by practitioners in the field. This is because the social is expected to approximate varying epistemic and normative input as it is considered to embody knowledge and values. However, my analysis shows that this approximation does not necessary hold. Opening up and closing down in the epistemic or normative dimension do not automatically respond to a wider or narrower range of actors involved, although such tendencies exist.

Second, I found that the epistemic dimension is the most variable between all three in terms of how it manifests. Whether it is established through narratives or various kinds of data depends on the position of each case study in the innovation stream, as well as their overall normative setting. Yet, in individual situations, specific epistemic input shifted the overall normative scope of the case study, at least to a certain degree.

Third, the normative dimension dominated all my case studies, and defined the social and epistemic dimension of my case studies. If it is closed down completely, shifts in the social or epistemic dimension would not show any effects. Thus, I consider the normative dimension the most crucial for opening up and closing down.

Moreover, it carves out the specifics of public sense-making, dialogue, and affordances with regard to opening up and closing down. Very briefly put, public sense-making gains a double function as exploring and sharing a range of interpretations of technologies. Dialogue strengthens this emphasis of exchange, placing emphasis on the relations between different actors and on learning on eye-level. Affordances, again, highlight durable features of discourse and introduce a certain rigidity of structure and qualities. Thus, each of these mechanisms shapes how the opening up and closing down are performed.

Finally, in *Chapter 9*, I present concluding remarks, and discuss conceptual as well as practical implications of my work. With regard to the latter, I argue that the normative dimension cannot be closed down fully. Likewise, my findings on epistemically induced shifts in the normative dimension suggest that its closure remains relative, rather than absolute. This implies that core issues of contestations are value-based and therefore show a tendency to prevail, irrespective of the social or epistemic peculiarities of the respective situations. As a result, closing down of a debate is *per se* impossible; instead, closure itself remains temporary, based on a more or less (technically) stabilized discourse, i.e., compromise between actor positions.

My thesis aims at providing reflection on enabling and constraining agency, in particular in the context of R(R)I. Such a reflection is necessary as opening up and closing down take shape in multiple forms and require careful consideration of how debates are

opened up or closed down *before and after* participants get involved. In this respect, overall, I argue in favor of a reflective approach towards opening up and closing down, and for maintaining a diversity in efforts to address how agency is enabled or constrained in STI governance as unlocking participation, in my understanding, requires more than one key.