SUMMARY

Responsible Research and Innovation (RRI) promotes the idea that research and innovation (R&I) happen in close interaction with society. To achieve that, RRI extols the involvement of various actors from in- and outside R&I in the reflection on R&I practices, especially when the R&I are emerging and (potentially) controversial. The goal of such inclusive reflection, in this thesis called ‘RRI-reflection’, is the mobilization of R&I sense-making in society, and, eventually the collection, consideration, and responsible embedding of societal perspectives in further courses of R&I.

In the last decades, experimental tools, formats and environments for reflection on R&I have gained the interest of scholars and practitioners in RRI contexts. In these tools, formats and environments, the use of art installations, exhibits, theatre, movies, and other formats with fiction, non-fiction or semi-fiction narratives are becoming more common. In this thesis, we refer to these tools, formats and environments as ‘playful RRI-reflection methods’. In RRI context, playful reflection methods carry the potential to support people that participate in the reflection in (1) analyzing and making sense of the emerging R&I, and in (2) thinking beyond their own, usual lines of reasoning. The latter is especially important to assure that all different viewpoints are voiced during the reflection.

Although various playful RRI-reflection methods have been investigated so far, albeit often not explicitly described as playful, only a few studies have focused on conceptualizing or relating the design principles of the reflection methods to the actual reflection processes and outcomes that they trigger. Further insight into such conceptualizations and relations could help to inspire and professionalize the architecture of RRI-reflection methods that seek to go beyond verbal interactions.

Therefore this thesis uses a Design-Based Research approach to (1) conceptualize design elements for playful RRI-reflection methods, and to (2) study how the application of various combinations of these design elements in RRI-reflection methods can contribute to reflection in practice. The former is done by means of a narrative literature review, while the latter is tackled by means of five case studies into RRI-reflection methods, purposefully designed to be playful, among participants of various age groups and backgrounds. One case study focuses on the facilitation of reflection on sustainable development, the other four concern methods for reflection on synthetic biology. Taking the narrative literature review on playfulness and the five case studies into the playful reflection methods altogether, this thesis aims to answer the following main research question:

How can playful tools and formats contribute to RRI-reflection?
Chapter 2 of this thesis presents the theories on learning, reflection and playfulness that were part of the theoretical frameworks used in Chapters 4-9. Starting from experiential learning and vicarious learning within R&I, we integrate various conceptualizations of reflection on R&I. In that, we make a distinction between first, second and third order reflection. First order reflection concerns the elicitation and discovery of first order notions, such as beliefs by which we tend to categorize R&I as great, dangerous, useful or unnecessary. Second order reflection comprises the elicitation and discovery of second order notions, such as values and assumptions that underlie first order notions. Third order reflection is conceptualized as the awareness of the reflection process as a whole. To conclude Chapter 2, we argue that RRI-reflection methods should facilitate all these orders of reflection in order to realize mutual understanding among participants engaged in the process.

Chapter 3 presents this thesis’ case study method and the Design-Based Research (DBR) approach that is applied in that. After a brief elaboration on which DBR approach was chosen, the chapter introduces the literature review and each case study that is part of this thesis. Strategies adopted from a validity perspective are described as well. The Chapter presents four study questions:

1. What playfulness design elements for tools and formats could, according to state of the art literature, contribute to RRI-reflection?

2. How do various combinations of identified playfulness design elements lead to reflection in real-life RRI-reflection contexts?

3. What new contributions and limitations of the literature-based playfulness design elements arise in real-life RRI-reflection contexts?

4. What synergies and trade-offs between literature-based playfulness design elements arise in real-life RRI-reflection contexts?

The first is to be answered by the narrative literature review into playfulness and learning, the latter three by means of the five case studies.

Chapter 4 presents the narrative literature review into playfulness and learning. The study yields a definition of playfulness for RRI-reflection contexts, and playfulness design principles for RRI-reflection methods. Defining playfulness as an intellectually curious, alert, flexible, inventive and prejudice-free attitude in (1) the analysis of new complex information or issues as well as in (2) the synthesis of new, creative, ideas or solutions, the review identifies four activity principles and three process conditions for playful RRI-reflection methods. The activity principles are ‘narration’, ‘imagination’, ‘action-reflection’, and ‘co-creation’. The playfulness process conditions are ‘focus’, ‘experimentation space’ and ‘stimulating guidance’. The review concludes that process conditions need to be applied altogether to make an RRI-reflection method playful; activity principles can be applied in accordance to RRI-reflection method aims.
With the playfulness design principles as a base, Chapters 5-9 subsequently present five case studies into playful RRI-reflection methods.

Chapter 5, case study 1, presents TransLearning (TL). This hybrid e-learning reflection method exists of workshops in which participants of sustainable development networks (in Dutch rural areas) reflect on authentic narratives, embedded in an online video-repository, of people engaged in the network. The case study identifies four patterns in the reflection of participants that result in useful insights for the improvement of their collaboration. Nevertheless, Chapter 5 concludes that authentic narratives may not provide enough structure nor depth to optimally facilitate reflection. The narrator is of importance for the reflection too.

Chapter 6, case study 2, presents video-narrative based reflection (VNBR). This reflection method (prototype) uses semi-scripted video-narratives that represent four distinct rationales for looking at synthetic biology, to support citizen-reflection on this R&I field. This case study identifies three reflection processes and three reflection outcomes. However, the study concludes that semi-scripted video-narratives may become more powerful for reflection if additional playful tools are used in the reflection method.

Chapter 7, case study 3, presents the Frame Reflection Lab. This is a method for reflection on synthetic biology for students, which uses the same video-narratives as in case study 2 plus additional reflection-supportive design elements, such as imagination-triggering cards, co-creation exercises, and more extensive process facilitation. This case study shows that the additional tools (indeed) support participants to extend their reflection, on first but especially also on second order. Nevertheless, the playful activity principles applied in the method occasionally seem to make the exercises ambiguous, resulting in uncertainty among some participants during the exercises. Chapter 7 therefore concludes that it may be required to pay more attention to playfulness process conditions, especially among uncertain participants, to realize the second order reflection to full extent. Furthermore, the narrators and their seemingly different characteristics (vocabulary, tone of voice, etc.) appear of importance to the consideration of particular perspectives too.

Chapter 8, case study 4, presents the Opinion Lab. This is an exhibit prototype to support children aged 8-12 years and their parents in sense-making and reflection on synthetic biology, by means of various hands-on exercises, audio-narratives and facilitated conversations. The prototype uses a comparable framework for the narratives as applied in case studies 2 and 3. Case study 4 identifies patterns in the initial framing of children and parents, in their framing development on a first order, and a frame deepening (second order) pattern. The latter seems to facilitate the development of understanding for different viewpoints, or occasionally the convergence between viewpoints between children and parents. However, children (logically) have a shorter attention span, for which Chapter 8 concludes that a hands-on design with fewer narratives could suffice for the support of frame-diverse reflection among science museum visitors too, only if facilitated well.
Chapter 9, case study 5, presents the Theatrical Debate. This is a format for citizen-reflection on synthetic biology by means of iteration between improvised theatrical sketches and facilitated dialogue. This case study shows that the format facilitates first, second and third order reflection in many different ways. The study also identifies that the playfulness design principles are closely interconnected, resulting in certain synergy, but that ‘focus’ is often challenged by the other principles. Also, providing participants the space to ‘join the stage’ seems a promising direction to let participants really experience the reflection on futures of R&I. Therefore, Chapter 9 concludes that (again) the playfulness process conditions are crucial to reach depth in the reflection of participants, and that participatory play could be an interesting line of thinking for the further investigation and practice of RRI-reflection methods.

Taking the narrative literature review and the five case studies together, Chapter 10 presents the findings in relation to the study questions and main question. Test sessions with the methods show that the various combinations of playfulness design elements applied in playful tools and exercises could trigger patterns of first, second and third-order reflection on R&I among case study participants. To actually reach reflection on a second and third order, the case study findings show that playfulness activity principles (‘narration’, ‘imagination’, ‘action-reflection’ and ‘co-creation’) need to be carefully combined and benefit from the careful and holistic implementation of playfulness process conditions in the reflection (‘focus’, ‘experimentations space’ and ‘stimulating guidance’), albeit in slightly different ways in accordance to the intended goals of the reflection and the participant composition. Building on this conclusion, Chapter 10 furthers the conceptualization of the playfulness design elements by appointing contributions, limitations, synergies and trade-offs of the elements in the context of RRI-reflection. Based on that, we argue that reflection environments that apply playfulness process conditions combined with one or more playfulness activity principles can especially facilitate an intellectually curious, alert, flexible, inventive and prejudice-free attitude among RRI-reflection process participants (1) in the analysis of new complex information or issues, and (2) very probably in the synthesis of new, creative, ideas or solutions as well. Having concluded that, we argue that this thesis provides a breeding ground for the development of reflection methods that can contribute to the realization of RRI objectives such as the inclusion of stakeholders and citizens in R&I, anticipation, reflexivity and responsiveness, as these playful methods carry the potential to facilitate mutually respectful dialogues and exchange between citizens and stakeholders about R&I fields.

Chapter 10 ends with recommendations for further research and practices concerning playful reflection methods and the governance of R&I, playful environments for reflection on R&I that do not make use of (live) facilitators, such as exhibits or art in public spaces, and larger scale studies into the interplay between playfulness design elements, to optimize the design of playful RRI-reflection methods. We end Chapter 10 with example-heuristics for playful RRI-reflection method design.