

Future Interactions: a serious board game for future technology assessment

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Abstract

In this paper we present the outcomes of the use of a physical board game, used for technology assessment methods. In this 'Future Interactions' game, stakeholders from different domains discuss values, opportunities and implications of future innovations during a 2-3 hour gaming session. Results show that in all sessions, the future interactions of values, interfaces and technologies helped groups to create tangible common ground for a shared future vision of the development and implementation of innovations. The enjoyable story-telling approach of the participants helped to generate interesting discussions, relevant to all stakeholders, while all field experts allowed the discussion to remain realistic.

Introduction

Many innovations in the fields of new and emerging science and technology, for instance in biotechnology, nanotechnology and design engineering, can change our society and how we live. Considering the impacts of such technologies in early developmental stages is mandatory for their responsible development. Responsible innovation e.g. *"requires that the benefits of science and technology are assessed in relation to possible drawbacks in the full social context of the innovation."* (Flipse et. al. 2013)

However, developing methods that allow for such assessments can be challenging, especially in encouraging actors from science and technology to be structurally involved in these activities. Technology Assessment is one of such methods that allows new technologies and innovations to be discussed early during development, by stakeholders from various domains (e.g. public, policy, and also including science and technology), usually in dialogue workshops with pre-determined future scenarios. E.g. Constructive Technology Assessment (CTA, see Schot & Rip 1997) approaches could help add reflexivity in science and technology practice, by enabling researchers to create dialogue and to reflect on relevant social and ethical aspects of science and technology by participating in an interactive workshop in the early stages of research and innovation. In contrast, this paper presents an evaluation study of a novel, enjoyable Technology Assessment (TA) tool: we aimed to design a physical serious board game called 'Future Interactions,' in which fictional future technology scenarios are first built and subsequently discussed by participants *themselves*, rather than by those initiating earlier CTA approaches.

This Future Interactions game (FIG), as developed by Marco Rozendaal and Niko Vegt at the Faculty of Industrial Design Engineering at Delft University of Technology - generates a tangible common ground through the use of design fictions (as proposed by Hales, 2013) on which the participants can envision technological futures. It has potential to serve the purpose of initiating multidisciplinary interactions, thereby possibly allowing for anticipation of the effects of possible

future technologies. However, that functionality of the game had not previously been researched. This paper presents the first approach to do so. Therefore, we ask the following research question: To what extent can an interactive game be used in a multidisciplinary setting, to open up a dialogue and reflect on Societal and Ethical Aspects of the New and Emerging Science and Technology?

This paper is structured as follows. The next section presents the game and how it is played. Thereafter, we present the results of our investigation to the functionality, in the Results section. We then place our results in a larger societal and scientific debate of responsible innovation, in the final section of this paper.

Methods of the game

In the physical game, stakeholders from various domains discuss values, opportunities and implications of future innovation during an afternoon session. Participants select sets of hexagonal 'play cards' from three stacks: technologies, areas of application, and societal values / issues. Participants can expand the existing set of cards on available empty play cards. By placing their unique set of connected cards in a beehive-shaped grid, the board, participants present future technologies and discuss how these could interact with society. The session is attended by ca. 10 players, is moderated by a moderator / instructor, and lasts up to 3 hours. The sequence of the games was played as follows, even though we would allow for certain variations and flexibility in terms of timing.

1. Choosing cards: the players individually select three cards from three stacks, being a Technology, a Context in which this can be used, and a Value Interaction between people and the technology). Examples of technologies include 3D printing, metabolic engineering, nanotechnology, brain interfaces, robotics, etc. (see also Figure 1). Examples of contexts include public transport, tourism, healthcare, automation, food, etc. Examples of value interactions include identity, empowerment, cooperation, sustainability, security, etc.
2. Develop of personal vision: the players individually think about their chosen technology, context and value interaction, and design an innovation that could be relevant for those areas.
3. Brainstorming session: in duos, players combine their insights and discuss the potential of their designed technologies. They can together come up with a new innovation, or further develop one of the ideas for the remainder of the game.
4. Future visions: in a 1-minute pitch, each of the duos presents their chosen innovation. Thereafter, their proposals are discussed, criticized or improved by the other players.
5. Timeline: the teams subsequently place their cards on the board, which consist of hexagonal shapes (like the cards). The players can place their cards on the deck under 'tomorrow', 'next decade', or 'next century', depending on when they think their innovations can be realized.
6. Discussion: the players can shift around clusters of cards, and connecting developments and innovations, creating a shared vision of the different innovations and how they could connect in the future. Also, here, new innovations can be developed and placed on the map, if desired (also see Figure 2).
7. Reflection: in the last session of the game, each of the players is given a token, which they may place on what they personally think is most interesting or important, thereby

highlighting what for them are interesting and/or troubling aspects of these new technologies. Of course, everything is open for discussion by the other players.

We tested the game in three subsequent sessions (Table 1): first with students, to test the functionality of the tool; second, with technology and policy experts to see if discussions about future innovations occur; third, with experts only from the field of biotechnology, to see if the tool can be used to generate dialogue on a specific topic. The first, pilot session, was not recorded, but the two other FIGs were recorded and transcribed *ad verbatim*, and subsequently analyzed using NVIVO software for open coding.

Table 1: Study overview

| | Pilot study | Game 1 | Game 2 |
|--------------|------------------------------|-----------------------------------|--|
| Focus | Experience | Observations, transcript analysis | Observations, transcript analysis |
| Participants | 8 students, randomly invited | Policy makers & social scientists | Only biotechnology scholars (social & natural) |



Figure 1: Example of playing cards, from the Technology stack



Figure 2: example of people discussing cards in relation to one another during a session

Results

Results show that in all sessions, the future interactions of values, interfaces and technologies helped groups to create tangible common ground for a shared future vision of the development and implementation of innovations. Examples of designed fictional innovations include e.g. a 'dating' agenda (technology: internet of things; context: everyday life; value interaction: love) that manages your everyday activities in such a way that seemingly coincidentally, you meet people who match your dating profile, thereby subtly increasing your chances to find the love of your life. And, a type of glasses that allows low skilled professionals to function better in working life (brain interface, working life, empowerment) without further education.

The first study demonstrated the possibility and utility of the FIG, with a group of enthusiastic students. The second study, with actual academic and policy professionals from various fields, showed that these professionals indeed started to reflect on their own practices, through the future innovations that they were designing and discussing. They could even to some extent anticipate the effects of their innovations, and discuss what would be needed to remedy or accommodate those insights. The second workshop showed similar results, but more specifically focussed on one single field, i.e. biotechnology.

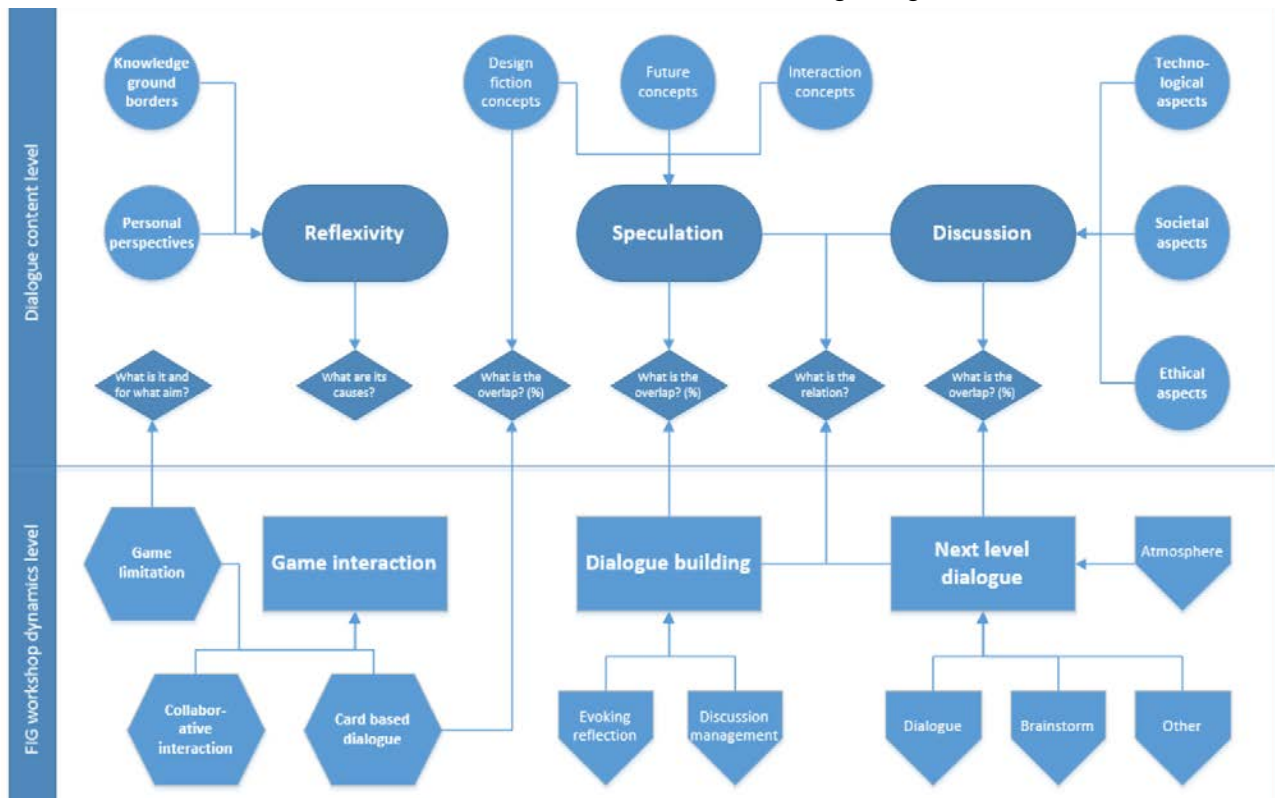
In more detail, on the level of discourse, we found that FIG workshop dynamics level aspects (i.e. how the game was played and mediated by the instructor) had close relations with what was actually discussed by the players. Such moderation seemed necessary to structure dialogue, that seemed to move between speculation and realistic discussion of technological, societal and ethical considerations. Such reflections seemed to rely on both professional knowledge and personal perspectives (Figure 3).

On a more general level, the story-telling approach of the participants helped to generate interesting discussions, relevant to all stakeholders, while all field experts allowed the discussion to remain realistic. The essence of a fiction is often followed by an example. These examples are like quick sketches of a fictional scenario which leaves it (the essence) open for interpretation, it provides a key point and starting points for dialogue.

When the moderator introduces this discussion round, by highlighting the societal and ethical implications in the narrative, the participants choose what they think is a valuable consideration regarding SEA's in the developed narrative. By focusing on the development of a specific aspect that is introduced early in the narrative, a learning curve can be interpreted: people combine viewpoints of others with their own viewpoints, placing their ideas in a broader perspective.

We also observed many indications of people enjoying themselves, such as laughter, jokes, etc., but always with a serious tone afterwards. Some fictions bring tensions into the discussion. The presented or discussed idea's challenge existing beliefs of societal and ethical principles and simply gut feelings. The intensity and focus of observed participation shows to what extent the attention is directed at a specific societal or ethical aspect of the narrative.

Figure 3: Overview of NVIVO codes and their interconnections, bringing together game dynamics and the content that was discussed during the game.



Discussion & conclusion

This paper set out to answer the question: to what extent can an interactive game be used in a multidisciplinary setting, to open up a dialogue and reflect on Societal and Ethical Aspects of the New and Emerging Science and Technology? The results indicate that such dialogue and reflection is indeed possible, under guiding supervision of a moderator.

Reflexivity is an apparent feature in the workshop, especially in the start of the workshop when the participants introduce themselves and their ideas and later while placing their designs in the context of others'. In the first round the participants identify themselves with their role as a professional and the future vision that is presented is related to the professional background. From that starting positions the participants learn other perspectives on their presented idea. This initiates adaptation of the idea or to defend it from a specific point of view. **The idea develops while it is being discussed, and this** process seems to be at work then the participants interpret the ideas of others and respond to it, also in light of their own ideas. Expressions of concerns or other reaction to the idea shows that the original shared idea is transformed by other participants and adapted to the narrative of which the broader ideas of which it is now part. We interpret this as learning during the game.

On a higher level the purpose of discussing SEA's in STS is to encourage researchers to think in a broader perspective about the research in order to improve a sense of responsibility. Participating in a multidisciplinary workshop that exposes multiple perspectives on society and technology contributes to that. The participants admit to have had a meaningful experience, in the interviews and in the afterthoughts of the FIG sessions.

Like children that who are playing war in the garden, the filling in of the fictional narrative has a level of playfulness. Only a few points of reference are provided by the game, they function as a starting point for the narrative. Everything that is said in relation to these points of reference is fiction, a fabrication of idea's that relate each participant. When the participants share what comes to their mind then other participants are enabled to respond on that information, may it be fictional of fact. From that the narrative grows and evolves dependent of interpretation and reflection on it.

The moderator guides the participants through the steps of the game. The purpose of playing the game seems at first to generate plausible narratives that may warn us about important societal and ethical issues that have to be discussed and investigated. However that might be a side effect of the game, the purpose is to bring participants from different disciplines together in a challenge to share their perspectives in the creation of a fictional narrative.

The narratives and designs are products of the FIG that every participant takes home after the workshop, along with the experience of sharing and reflecting on your own narrative as a professional. The research does not elaborate on the exact experience of the participants, nor on the contents of the narrative or what we can learn from it. We do show that this aesthetic FIG approach can be used to develop societal and ethical perspectives on science and technology studies (STS), through the dynamics between the participants and the game, how the game enables the participants to open up a reflective dialogue, and how the game initiates or influences discussion of societal and ethical perspectives.

The future interactions of values, interfaces and technologies helped groups to create tangible common ground for a shared future vision of the development and implementation of innovations. The game may have value in bringing together public stakeholders, scientists, policy makers and other non-governmental stakeholders in formal and informal settings, e.g. in public participation and engagement efforts, science policy agenda setting, and science cafes. Of course, we aim to further explore these possibilities in future studies.

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