

Artmaking as Technology Assessment: A Case Study at the Rathenau Institute

1. Introduction

In the late 1960s and 1970s, a global art movement emerged that gave rise to diverse experiments of new modes of artmaking, characterized by engagement with new media forms, genres, and social movements (Century 2022, p. 137). One notable example is the Artist Placement Group (APG), founded in London in 1966 (Bishop 2012, pp. 163–179). This artist-run organization sought to reposition art within unconventional contexts, including industrial and governmental settings. Through these placements, artists gained new experiences that inspired innovative forms and expressions. The APG's pioneering experiments in alternative modes of artmaking have since become a historical precursor to what is now commonly referred to as the artist-in-residence programs (EU 2014, p. 9).

In recent years, artist-in-residence programs have been introduced into the field of technology assessment (TA), promoting collaboration between artists and scientists on emerging areas such as synthetic biology (Synenergene 2014). Within this context, the definition of “artist” has broadened to encompass a diverse range of cultural practitioners – including designers, writers, biohackers, and others operating at the intersection of art and science. Concurrently, terms such as art-science interface or art-based engagement have been used to describe the repositioning of art within TA, each reflecting distinct interests and emphases. However, these fragmented approaches often result in limited understandings of the role of art in TA, with the surrounding discourse frequently reverting to the familiar dichotomy between the instrumentalization of art and the ideal of its autonomy. As a 2022 literature review concluded, there is a pressing need for a deeper understanding of how art-based engagement “fuels the formation of issues and publics and, with that, a shared responsibility for emerging and controversial technologies” (Fraaije et al. 2022, p. 707). In other words, a methodological inquiry into the nature and processes of artmaking is essential to fully realize the potentials of art within the context of TA.

This paper contributes to that inquiry by critically examining artmaking as a mode of TA – and, conversely, TA as a mode of artmaking. The term *mode*

is used to articulate the emergent ontological convergence between these two practices. To more precisely capture the characteristics and dynamics of this convergence, I introduce the concept of *artistic assessment*, which underpins an analytical framework comprising three interrelated dimensions: epistemic assessment, communicative assessment, and diplomatic assessment. The following sections present an in-depth case study of the artist-in-residence program at the Rathenau Institute in The Hague, The Netherlands. Within this case study, the three dimensions of artistic assessment serve as analytical tools for evaluating the procedures, challenges, methods, tools, and outcomes of artmaking, and are applied to specific instances drawn from the program.

2. Roos Groothuizen: Artist-in-Residence at the Rathenau Institute

In 2018, media artist Roos Groothuizen began her artist-in-residence at the Rathenau Institute. Groothuizen has long been engaged with themes such as digital surveillance, privacy, and human agency. At the Rathenau Institute, her role was to collaboratively investigate the societal and ethical implications of law enforcement's use of sensors in public spaces. She was expected to create potential scenarios to explore "what if" questions, such as: "what will happen if the police are wearing sensors in the public spaces?"

At the outset of her residency, Groothuizen encountered challenges in establishing a shared language with the institute's TA experts, whom she referred to as "scientists". She describes this initial phase as "almost like an anthropological effort—it's like getting in contact with these people, trying to build a relationship, and understanding their language" (Lin 2024). Meanwhile, the original project on public sensors was delayed. Subsequently, she was introduced to a new initiative examining the potential societal impact of augmented reality (AR) and virtual reality (VR). This occurred shortly after the global phenomenon of Pokémon Go, an AR game developed by the American company and Google spin-off Niantic, which launched in the Dutch market in July 2016 and quickly caused uproar in The Hague.

Groothuizen inquired whether the team would acquire VR headsets for the project, only to be told that the primary source of knowledge would be academic literature. For her, the idea of understanding virtual reality solely through texts was alien. How can one write meaningfully about the experience of virtual reality without having experienced it firsthand? Convinced of the need for direct engagement, she acquired a VR headset herself. Together with an intern, she tested

various VR games in her studio. During these sessions, they observed troubling behaviors, including frequent instances of online sexual harassment.

Rinie van Est, the project coordinator at the institute, questioned the necessity of the VR headset and asked Groothuizen about her research methodology. She was caught off guard. “It was the first time I heard the word *methodology*,” she later recalled. “I had an arts education for both my Bachelor’s and Master’s, and the idea of methodology sounded like a strict set of rules.” She explained: “I read the news. I read philosophers. I read Bruno Latour on Tuesday with the researchers at the institute, and we talked about it. But I don’t read it specifically as a tool for my research. I read it because I’m interested in it. So, there’s this question of reading and how to gather knowledge for your research. But when are you allowed to call it a methodology, and when is it just a hyper-focus” (Lin 2024)?

After discussing her residency experience with Jelle van der Ster, co-initiator of this artist-in-residence program, Groothuizen came to understand that her approach aligned with design thinking – a methodology increasingly adopted by artists as well as designers critically engaging with technology. This approach involves an iterative process of “trying out experiences as a prototype, reflecting on them, and then adjusting the prototype or experience based on what was learned” (Lin 2024).

3. Speculative Design and “What If” Scenarios

Design thinking emerged to address human, technological and strategic innovation needs. These needs are often embedded in extremely complex and multi-dimensional challenges—what were termed “wicked problems” (Buchanan 1992, pp. 15–16) in the 1960s and are now referred to as complex social-technical systems. In the 1950s and 1960s, architects and engineers were among the first to confront such problems. Simultaneously, the 1960s witnessed the rise of avant-garde movements in art, architecture, and design.

One notable example is Superstudio, an architectural collective founded in 1966 in Florence, Italy. They adopted a radical Utopian approach to Modernist design and architecture, producing photo-collages, films, publications and exhibitions that critiqued the consumerist and capitalist underpinnings of mainstream design. This Radical Design philosophy laid the groundwork for what is now known as *critical design*, a term popularized by British designers and educators Anthony Dunne and Fiona Raby. According to Dunne and Raby, critical design

“uses speculative design proposals to challenge narrow assumptions, preconceptions and givens about the role products play in everyday life” (Dunne/Raby 2007, p. 193). Their 2013 book *Speculative Everything: Design, Fiction, and Social Dreaming* expanded on this approach, positioning design as a tool for imagining alternative futures (Cf. Dunne/Raby 2013). Speculative design has since gained traction among critical designers and artists working with emerging technologies. It is a tool for exploring “what if” questions and for opening debate and discussions about the kinds of futures people want – or want to avoid.

At the Rathenau Institute, Groothuizen attended several talks and conferences. She noticed that a screenshot of a robot dog from one episode of the sci-fi series *Black Mirror* appeared repeatedly in presentations. This observation led her to realize that the scientists were already using speculative scenarios to communicate their ideas.

Groothuizen decided to design a *Black Mirror*-style scenario for their report on AR. The result was three future scenarios set in the year 2026, which were integrated in the final report titled *Fake for Real: Ethical and Societal Implications of Augmented Reality* (2021). These visually depicted scenarios explored potential uses—and misuses—of augmented reality, highlighting risks while also suggesting “playful, technical, or administrative solutions” (Rathenau Institute 2021). The first scenario illustrates how AR can be used to manipulate hybrid identities and constitutes a form of sexual harassment. The second scenario reflects on the abuse of augmented reality filters leading to distorted self-images and commercial algorithms for plastic surgery. The third scenario explores the disruption of public space by AR games, referencing the chaos caused by *Pokémon GO*. It raises questions about the collision between physical laws and virtual game rules. “What if there were strict rules on augmented reality used in the Netherlands? How would that look like” (Lin 2024)? Groothuizen imagined a city with AR-free zones and AR-restricted zones and designed traffic signs to mark these areas.

To further explore the societal and ethical implications of AR in public spaces, Groothuizen collaborated with programmer Allan Lyon and designed a browser-based smartphone game *Mirror World*. The game is a mixed reality version of hide-and-seek: one player secretly takes a picture of something in her surroundings, and another must find and replicate the photo to earn points. This reward mechanism encourages players to challenge the norms of physical space—sometimes even pushing legal boundaries. “It was radical in the sense that I wanted people to break the physical rules because the virtual game allows you to do whatever you want. How far can we take it? Will people suddenly take pictures

of the faces of others, for example, and stop thinking about privacy?” reflected the artist (Lin 2024).

Groothuizen’s residency also inspired a research project that culminated in a board game, which she described as “a design speculation exercise” (Rathenau Institute 2020). She investigated three major business scandals and identified a pattern in the cycles of technological innovation. The project began with the Cambridge Analytica scandal in 2018, where the company harvested vast amounts of personal data from Facebook users, while Facebook attempted to downplay the incident. “I was obsessed with the Cambridge Analytica scandal,” she said. “Then I felt like I have seen this before. This is a pattern, a spiral movement. When a scandal or incident happens, politics react with new regulations, then the company attempts to regain their reputation with a series of predictable campaigns, and not long after, they introduce a new technology” (Lin 2024). She conducted extensive online research, diving into global news sources and YouTube channels. From this, she constructed a timeline of privacy-related abuses and visualized the recurring pattern in a circular diagram titled *The Circle of Data*. She applied the same method to the 2010 BP Gulf of Mexico oil spill and the 2008 Icelandic financial crisis, resulting in *The Circle of Oil* and *The Circle of Speculation*, respectively. These three circles were integrated into a board game titled *The Cycles of Innovation*. Based on the different phases of a crisis, players are challenged to speculate on future scenarios:

- What is the timeline here?
- What is the next scandal like?
- How will politics react to that?
- How will the company attempt to regain its reputation?
- What new technology will be introduced?

The game fosters an interactive brainstorming session, where conversations begin in a playful yet critical manner (Rathenau Institute 2020).

Reflecting on her two-year residency at the Rathenau Institute, Groothuizen concluded: “Through this approach to design prototyping and building experiences, I’ve gradually improved at explaining to others, for example, why I always use games in my artistic practice. In a way, I would describe this as a methodology—using or experiencing game mechanics as a means to develop the process and create the artwork” (Lin 2024).

4. Three Dimensions of Artistic Assessment

The Rathenau Institute's final report describes Groothuizen's work as "artistic design-based research", referring to research conducted from an artistic perspective using design-based approaches. The following section presents a critical evaluation of artistic design-based research through the analytical framework of three dimensions of artistic assessment: epistemic assessment, communicative assessment, and diplomatic assessment. Each of these dimensions is first defined conceptually, followed by a discussion of its practical implications.

4.1 Epistemic Assessment

Epistemic assessment concerns the understanding of a research context and its associated questions, as well as how a situated artistic design intervention can generate new insights and understandings of a given situation or problem. In the Rathenau Institute case study, the epistemic engages various levels of situated, practical knowledge involved in exploring "what if" scenarios. These forms of knowledge are often entangled within a network of things, actors, and systems, which can be conceptualized as follows: knowledge (a) of a context in which knowledge (b) is situated and instigated by knowledge (c). These three levels of know-how can be described as:

- Knowledge (a): *speculative know-how*, which combines facts, reasoning, and imagination to construct potential scenarios of technical artifacts and systems
- Knowledge (b): *experiential know-how*, derived from the first-hand experience or use of technical artifacts and systems
- Knowledge (c): *engineering know-how*, related to the construction and development of technical artifacts and systems

In the Rathenau Institute case study, all three levels of know-how are addressed and realized through cross-disciplinary collaboration. The artist-in-residence plays a central role in coordinating these levels of know-how and is instrumental to their integration. The scientists at the Rathenau Institute contribute to the speculative know-how through desk research, while programmer Allan Lyon provides the engineering know-how by developing the software application for *Mirror World*.

However, it is important to note that not every instance of artistic assessment involves all three levels of epistemic assessment, and the degree of involvement

may vary. For example, in cases where artistic methods are applied to the assessment of radioactive materials and technologies, experiential and engineering know-how may not be accessible to the artist. This would result in a different trajectory of artistic assessment, both in terms of process and outcomes.

Moreover, artistic methodology allows for a flexible and non-linear structuring of these different levels of know-how. While each level can function independently, their interconnectedness becomes evident when brought together. This reflects the organic nature of research—both scientific and artistic—as Groothuizen observes: “I discovered that a research trajectory, just like creating a work of art, is not linear but often organic” (Lin 2024).

4.2 Communicative Assessment

Communicative assessment comprises three key elements: artistic perspective, medium, and form.

An *artistic perspective* should not be conflated with an *artist’s perspective*. The latter refers to an individual’s subjective stance, whereas the former is intended to foster critical thinking and reflection. In critical design practice, for instance, an artistic perspective often serves to critique consumerism and capitalism. Artists and designers use speculative design proposals to provoke thought and stimulate dialogue. In the Rathenau Institute case study, Groothuizen referred to her work as a “provotype”—a hybrid of provocation and prototype (Rathenau Institute 2021).

The other two elements—medium and form—provide the conditions and concretization of the artistic message. As media theorist Marshall McLuhan famously stated, “the medium is the message” (McLuhan 1964, pp. 23–35). An artistic message seeks to integrate an artistic perspective with a specific medium. To elucidate the relation between form and medium, I draw on Niklas Luhmann’s conceptualization, which emphasize the dynamic process of artmaking and its internal logic. According to Luhmann, a medium consists of loosely coupled elements that offer possibilities for selection and recombination into condensed structures. The continuous process of loosening and tightening these elements—forming and reforming—constitutes an evolutionary dimension of medium and form (Luhmann 1987, p. 109). Luhmann argues that works of art serve the communication of meaning and “only exist if and insofar as possibilities of communication about them can be reckoned with.” This necessitates a step in which the difference of primary medium and form itself becomes a medium. In this sense, communicative assessment is concerned with second-order communication, that

is, communication about communication. As such, an artistically coded message is a medium at a higher level—operating within the realm of possibilities for communication about art.

These communicative possibilities are grounded in the epistemic assessment discussed earlier. The availability of different levels of know-how in a given instance of artistic assessment constitutes an environment rich in affordances for the formation of diverse forms and media as concrete and tangible outcomes.

In the Rathenau Institute case study, artistic creativity utilizes these affordances and generates a variety of expressive forms and media. The visually depicted future scenarios of augmented reality combine speculative know-how with experiential know-how. The browser-based smartphone game results from the integration of speculative know-how, experiential know-how, and engineering know-how. The speculative design exercise is grounded solely in speculative know-how.

4.3 Diplomatic Assessment

Diplomatic assessment involves orchestrating the movement and procession of a complete (or sometimes incomplete) cycle of artistic assessment. In the Rathenau Institute case study, artistic assessment is practiced at the level of research, where artistic design proposals and prototypes are employed as research tools. Hence, diplomatic assessment catalyzes and effectuates decisive steps throughout the entire procedure of artistic assessment.

Diplomatic assessment highlights the principle of artistic neutrality, which implies an openness to accommodate different views and values, as well as the capacity to mediate between conflicting interests. However, this neutral stance does not contradict an artistic or critical perspective. On the contrary, *neutrality* and *criticality* coexist in an open work of art and are intended to complement one another. They function as two vectors within a dynamic, evolving environment, and their interplay directly influences the shaping of a work of art—for example, by informing artistic choices regarding medium and form.

From artistic neutrality arises a diplomatic awareness, which enables artistic assessment to continuously register its own limits and potentials. This awareness enhances the interoperability of epistemic assessment and communicative assessment. Once the boundary of knowing is determined in epistemic assessment, the affordances of a communicative environment become explorable. Conversely, the process of concretizing communication possibilities reveals the limit of know-how.

Three instances in the case study demonstrate how diplomatic awareness operates. The first arises from the tension between art and science and resolves it through a methodological dialogue. In this instance, diplomatic awareness recognizes both the limits and potentials of communicative possibilities, advocating for synergies across disciplines and fostering the integration of artistic and scientific methodologies without compromising the integrity of either. The other two instances occur during game prototype testing phase. The first involved the board game *The Cycle of Innovation* used for speculative design exercises. The scientists express skepticism about the scientific validity of the pattern that the artist identifies and visualizes. Admittedly, a work of art does not claim to present objective truth; nevertheless, it holds diplomatic potential to facilitate discussion and debate about truth in a heuristic manner. This potential is explored in the third instance involving *Mirror World*. The game is tested by a group of art students at the Central Station of The Hague, followed by a questionnaire, discussions, and interviews on the ethical implications of implementing augmented reality in public space.

5. Conclusion

The findings of this study reveal that artmaking, when positioned as a mode of TA, offers methodological complementarity to mainstream TA. To fully harness its potentials, it is essential to understand its internal dynamics and the ways in which it (co)operates within specific settings.

Bibliography

- Bishop, C. (2012): *Artificial Hells: Participatory Art and the Politics of Spectatorship*. New York
- Buchanan, R. (1992): *Wicked Problems in Design Thinking*. In: *Design Issues* 8(2), p. 5–21
- Century, M. (2022): *Northern Sparks: Innovation, Technology Policy, and the Arts in Canada from Expo 67 to the Internet Age*. Cambridge
- Dunne, A.; Raby, F. (2013): *Speculative Everything: Design, Fiction, and Social Dreaming*. Cambridge
- Dunne, A.; Raby, F. (2015): *United Micro Kingdoms: A Design Fiction* (2013), *Critical Design FAQ* (2007). In: Bast, G.; Carayannis, E.; Campbell, D. (Hg.): *Arts, Research, Innovation and Society*. Cham. DOI: 10.1007/978-3-319-09909-5_10

- EU – European Union (2014): Policy Handbook on Artists' Residencies. Open Method of Coordination (OMC). Working Group of EU Member States Experts on Artists' Residencies. https://ec.europa.eu/assets/eac/culture/policy/cultural-creative-industries/documents/artists-residencies_en.pdf [accessed 31.05.2025]
- Fraaije, A.; van der Meij, M. G.; Kupper, F.; E.W. Broerse, J. (2022): Art for public engagement on emerging and controversial technologies: A literature review. In: *Public Understanding of Science* 31(6), p. 694–710
- Lin, N. (2024): Interview with Roos Groothuizen. Unpublished
- Luhmann, N.; Roberts, D. trans. (1987): The Medium of Art. In: *Thesis Eleven* (18/19), p. 101–113
- McLuhan, M. (1964): *Understanding Media: The Extension of Man*. New York
- Rathenau Institute (2020): Art and Science Jointly Explore Urgent Questions. www.rathenau.nl/nl/digitalisering/kunst-en-wetenschap-onderzoeken-samen-urgente-vragen [accessed 21.05.2025]
- Rathenau Institute (2021): Fake for Real: Ethical and Societal Implications of Augmented Reality. www.rathenau.nl/sites/default/files/2022-04/FakeforReal_corrections_20-22.pdf [accessed 31.05.2025]
- Synenergene – Synthetic Biology Engaging with New and Emerging Science and Technology in Responsible Governance of the Science and Society Relationship (2014): Call for Artist in Residence at Synthetic Biology Lab. www.synenergene.eu/news-item/call-artist-residence-synthetic-biology-lab.html [accessed 31.05.2025]