Responsible nanotechnology R&I – Societal engagement practices

Societal Incubator for Nanotechnologies of the Rathenau Instituut

Introduction

NANO2ALL is an initiative funded by the European Union's Horizon 2020 Research and Innovation programme under the Grant Agreement Number 685931. It supports the establishment of Responsible Research and Innovation (RRI) policy and governance on nanotechnologies. NANO2ALL also aims to identify RRI practices, with a focus on societal engagement in nanotechnology research and innovation (R&I) across Europe and beyond, with the purpose to share knowledge, experience and recommendations with other nanotechnology stakeholders and motivate a wider application of such mechanisms in our region.

RRI is an "*approach that anticipates and assesses potential implications and societal expectations with regard to R&I, with the aim to foster the design of inclusive and sustainable R&I*"[1]. As a dimension of RRI, societal engagement implies interactions between relevant stakeholders (companies, research organisations, policymakers, civil society organisations (CSOs), consumers, affected citizens and others) in order to align research, development and innovation with the values, expectations and needs of the society. Such interactions can take various shapes, such as brainstorming, scenario workshops, user committees, online forums, dialogues, informal/formal meetings, or other formats.

This short report provides brief insights into the Societal Incubator for Nanotechnologies initiative of the Rathenau Instituut, which comprised the development of the concept and a short experimentation of it[2]. The description also touches upon the benefits and objectives of developing a societal incubator. Finally, it presents the structure and operationalisation of the societal incubator as well as findings and recommendations. Data for this report was gathered via desk research and a structured interview with Dirk Stemerding, a former Senior Researcher of the Rathenau Instituut.

[1] European Commission website: https://ec.europa.eu/programmes/horizon2020/en/h2020-section/responsible-research-innovation

[2] https://www.rathenau.nl/en/knowledge-policy/beyond-public-acceptance

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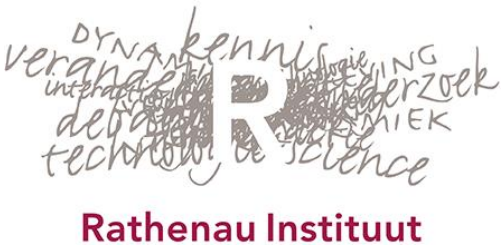
Rathenau Instituut and the Societal Incubator concept

Rathenau Instituut (https://www.rathenau.nl/en) is an independent technology assessment organisation based in the Netherlands. The institute stimulates public and political opinion on social aspects of science and technology. To do so, it conducts research and organises debates relating to science, innovation and new technologies.



Rathenau Instituut took up nanotechnology as an important issue to address around 10 years ago when the Dutch government started to support the development of this technology on a programme basis. One of the elements of the national programme on nanotechnology was technology assessment in which Rathenau Instituut played an important role. Another key priority of the programme was linked to nanotechnology valorisation and the stimulation of the commercial application of the technology and of new economic activities and start-ups that may emerge from the development of nanotechnology. Linked to these programme elements, Rathenau Instituut **was requested to explore the societal incubator concept (**original concept / idea was conceived beforehand[3]) **for nanotechnologies (design the concept and experiment it) in 2015**.

The societal incubator concept came as a possible solution to deal with the controversiality surrounding nanotechnology. While nanotechnology can help address major societal challenges, in practice, several uncertainties linked to the new developments (for instance health and safety risks, environmental problems, and socio-ethical matters) as well as consequent "waiting games" (companies wait for others, and for particular signs of others to move on with further developing a particular innovation) have become an obstacle to commercialisation and to fully taking advantage of the potential offered by nanotechnology. In such a complex scenario, collective actions and learning processes may be needed to overcome uncertainties. **The societal incubator could be framed as platform / institution that offers the opportunity to organise a collective action or learning process to accelerate responsible innovation and increase the chances of social success of nanotechnology. The societal incubator can serve two different but related purposes.** It serves the interest of innovators who have an idea of a particular innovation and recognise the surrounding uncertainties that may negatively influence its societal acceptance. On the other hand, the societal incubator may also offer a particular opportunity to bring together different stakeholders around specific issues such as societal matters, environmental problems, health issues, etc related to nanotechnology in a broader context rather than with a focus on a particular innovation.

[3] See: Harro van Lente (2015) "The societal incubator as a solution to waiting games in emerging technologies". In: Bowman, D.M., A. Dijkstra, C. Fautz, J. Guivant, K. Konrad, H. van Lente, & S. Woll (eds.) *Practices of Innovation and Responsibility. Insights from Methods, Governance and Action*. Berlin: AKA, pp. 43-52.

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The societal incubator can be operationalised in three crucial steps: (I) collection of information and organisation of interaction, (II) analysis and (III) deciding whether to continue the development trajectory or bring it to a halt. These steps are important to enable collective and social learning, on all possible outcomes, on the significance, and the implications of technological innovations. The societal incubator's process is shown in Figure 1

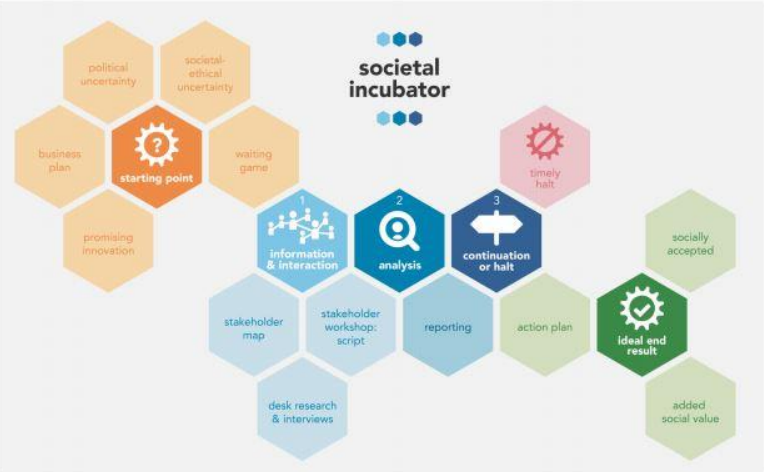

Figure 1: Societal Incubator Process

Source: Rathenau Instituut[4]

Step I is a combination of desk research, interviews and interaction in ideal cases**.** The information phase consists of stakeholder mapping and a literature study to understand the possible stakeholder views about comparable technological innovations. This should be completed with interviews to fill remaining knowledge gaps. The interaction phase consists of the organisation of interactive workshops that bring together the technology developer and different stakeholders, including producers, academicians, regulators, policymakers, and consumers, to have a more in-depth discussion on a particular innovation. This step is relevant to exchange views, enhance mutual learning and understanding, and build trust.

Step II is a follow-up of Step I and ends in a report that is sent to all participants of the interaction process. It **provides an analysis of the information gathered**, including stakeholder views on societal needs, socio-ethical acceptability, and (risk) regulation.

Finally, **Step III** is a decision step in which the technology developer, based on the results of the previous steps and the knowledge and understanding he/she gathered, **takes a decision on whether or not to continue with the technology development.** If he / she decides to continue the development, the analysis can serve as guidelines to achieve a socially accepted product with added social value. The analysis report can identify important aspects, such as for instance potential conditions to be met or alternative design choices. In the case that the technology developer decides not to continue with the product's development, the analysis is able to provide timely and informed decision which minimises any potential financial damage.

Societal Incubator experiment

With a view to prove the viability of the societal incubator, an experiment was conducted focusing on Step I of concept. **The experiment tested an imagined nano-enabled innovation that allows to combat iron deficiency in young females**. Nanotechnology can encapsulate iron in a way that it does not affect taste and thus it can be added to food, for instance to chocolate. Encapsulation can be done in such a way that there's no health risk whatsoever. Nanotechnology in food was chosen as a target application area as there is strong conviction that nanotechnology has a lot to offer here. However, this is also a controversial area and firms have been reluctant to take up nanotechnology in their portfolio due to the fear for how the public would respond to it.

[4] Page 11: https://www.rathenau.nl/sites/default/files/2018-07/Beyond%20Public%20Acceptance_1.pdf

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The experiment limited itself to the interaction phase by organising a workshop bringing together relevant stakeholders to discuss this particular innovation. Ideally, this event should have been preceded by an investigative process of desk-research and interviews, but within the time constraints of this experiment it was not possible to properly meet these conditions. Nevertheless, some participants were interviewed before being invited to attend the workshop in order to ensure that they had the same level of conversation and understanding of the topic discussed in the workshop. The participants included a technology developer from the nanotechnology field (who acted as the owner of the particular innovation), as well as representatives from consumer organisations, regulatory agencies, also others more related to innovation policy making, science and technology studies and similar fields. The engagement of civil society though turned out to be difficult. This might be due to lack of time and interest in the topic / workshop outcomes. **The workshop followed the pre-designed script**, available in the report of the societal incubator concept[5]. This consisted of the following **major blocks**:

Welcoming the participants	Prioritising of uncertainties & points of interest
Introduction round	Further discussion of dominant uncertainties & bottlenecks
Business Case introduction	Broadening of the discussion
Societal Context	Lessons learned and options for action
First reactions	Closing

Societal Incubator Experiment's Findings

- Based on the experiment conducted, the consulted stakeholders in the workshop recognized the existence of the waiting game and positively received the idea of a social incubator. The stakeholders concluded that a social incubator could help technology developers to **gain more insight into the nature of waiting games, reduce the associated uncertainties, and better estimate their own chances** of success.

- An important point is that **the innovator should be the owner of the societal incubator process**. The incubation process might help to take a particular decision on how to proceed with the innovation, however, the decision should be taken by the innovator her-/himself. In addition, the process should be organised in such a way that everybody feels a commitment to the process but at the same time, everyone has the freedom to operate, especially the innovator.

- A key element of this process is **the diversity of people to bring around the table** in order to think about the particular idea of innovation. This adds to the richness of the discussion and allows for a variety of perspectives to emerge.

- In order to engage stakeholders in the societal incubation process, **having the commitment from the stakeholders,** including civil society organisation who are active around particular innovation issues is important. **Financial compensation** of stakeholders´ time & efforts can be one option to facilitate engagement. Regarding the reluctance of civil society to participate in the societal incubator interactions, a solution may be **inviting more independent actors, for instance journalists** or others

[5] Pages 11-13: https://www.rathenau.nl/sites/default/files/2018-07/Beyond%20Public%20Acceptance_1.pdf

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who are aware of societal debates and, therefore, can represent societal views. On the other hand, to increase their commitment, **the industrial sector could also be a financer / co-financer of societal incubators** which costs could be included in their already existing research and development investment. Related to this, the public-private partnership model could also be explored.

- **Business incubators could act as a platform for the societal incubator**, as these concepts are complementary and are related to support to businesses / start-ups. To take up this role, business incubators, however, need to acquire specific expertise allowing more understanding of complex interactions and knowledge in the field of social embedding issues.

- **The societal incubator could also be used on a more programmatic basis**, rather than just a platform to discuss particular cases of innovation. Within the societal incubator stakeholders could regularly explore technological innovation trajectories with a focus on solving urgent societal challenges. This would enable a collective learning process and could also help avoid waiting games.

The societal incubator concept is, indeed, strongly related to core questions raised by NANO2ALL, including the type of actions and interactions needed to better identify and integrate societal needs, concerns and values in nanotech R&I processes. The societal incubator concept proposes procedures that can be put in place to understand societal perspectives in regard of nanotechnology R&I and can be set up especially in the applied research and product development phases. It can also be used as a space for structural interaction and exchange of views between stakeholders, enhancing their mutual understanding. These features are also in line with some of the nanotechnology RRI related recommendations and needs identified by stakeholders in NANO2ALL (for more, please see the reports “Responsible Innovation Agendas at National Level” and “Responsible Innovation Agenda at European level” at www.nano2all.eu/resources).

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