RISKS AS A POINT OF VIEW

Scientists’ social representations of nanotechnology

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Nanotechnologies and the public

- Nanoscience and its major impacts on electronics, telecommunication, construction, food technology, drug development, etc.
- Between 1993 and 2003, worldwide investments in nanotechnology research grew from $430 million to about $3 billion (Roco, 2003)
Nanotechnologies and the public

- About 51-54% of the participants reported knowing ‘nothing at all’ about nanotechnology (Eurobarometer, 2010; Satterfield et al., 2009)

Social representations, nanotechnologies and the public

- **Social representations**
  - *how scientific ideas are integrated by society at large and become shared social knowledge* (Moscovici 1961, 2001).
  - *The public proceeds thus to a reconstruction of the scientific object on its own terms*

- Example of biotechnology

- it would be unlikely that we could talk about "social representations" of nanotechnologies in a broader sense. The public does not seem to have sufficiently become sufficiently familiarized with the issue.
  - *This is not the case of nanoscientists!*
Study 1 - Exploring scientists’ representations of nanotechnology

- As socially shared beliefs, the “logic” of social representations can be identified as arguments that contain pairs of oppositions

**GOALS**

1. What is the **content** that scientists from different fields associate with nanotechnology
2. How is this content “ organised” - i.e. which ideas that are seen as opposed

**Method**

- 39 participants (researchers involved in a multidisciplinary European project)
- Free-association task ‘When you think of NANOTECHNOLOGY, what are the five words or notions that first come to your mind?’
- Answers were content-analysed and submitted to a multiple correspondence analysis (MCA)
Study 1 - Exploring scientists’ representations of nanotechnology

Results

- Main ideas associated with nanotechnology by scientists
  - *new products* \((n = 27)\), *small* \((26)\), *risk* \((23)\), *new* \((11)\), *nanoparticles* \((10)\), *opportunity* \((9)\), *uncertainties* \((9)\)

- **Multiple Correspondence Analysis (MCA)**
  1. *Benefit vs. Risk* \((\alpha = .68, 14.1\% \text{ of variance})\)
  2. *Opportunity vs. Toxicity* \((\alpha = .63, 12.5\% \text{ of variance})\)

1. Benefit vs. Risk

2. Opportunity vs. Toxicity

Two possible interpretations

Meaning-making as a dilemma
Nanoscientists (in general) also think and argue about nanotechnology in a polarized manner (Billig et al., 1988)

Different representations of nanotechnology exist among scientists
Groups adopting different paradigms would possibly ‘cluster’ at either end of the overall risk-opportunity field (Babbage & Ronan, 2000; Kuhn, 1995)
Study 2 - Exploring the opportunity–risk dimension of the nanotechnology representation

1. Test the polarized risk-opportunity nature of nanotechnology’s social representations – through an instrument
2. Use this instrument to identify whether experts with different backgrounds are more (or less) inclined to represent nanotechnology as risk or as opportunity

Method
- **Construction of the risk-opportunity instrument:** content of the first study, a focus group with nanoscientists, and an internet review (nanotechnology projects and platforms).
  - 13 items
  - “Nanotechnology is an important sector for European economic development and competitiveness”
  - “The development of nanomaterials should be under strict regulatory control”

Study 2 - Exploring the opportunity–risk dimension of the nanotechnology representation

- **Administration of the questionnaire**: mailing list of the EU NanoSafety Cluster with 771 addresses. 163 recipients responded (21% response rate)

- **Role**: researchers (66.4%), policy actors (17.1%), administrators (15.1%), and regulators (5.9%)

- **Scientific background**: environmental sciences (38.2%), engineering (27.3%), toxicology (19.7%), biology (19.1%), physics (16.4%), chemistry (15.1%), social sciences (9.2%), medicine (7.2%), and pharmacy (2.6%).
Study 2 - Exploring the opportunity–risk dimension of the nanotechnology representation

Results

- Instrument submitted to a principal component analysis (PCA), which presented a 2-factor solution
  - Nanotechnology as opportunity (34.05% explained variance)
  - Nanotechnology as risk (15.45% explained variance) \( r = -.37^* \)

Do experts from different groups have distinct nanotech representations in terms of opportunity or risk?
Scores of the opportunity and risk representation scale per role

No significant differences between the representations of participants occupying different roles

- Nanotech as opportunity \( (F(3,122) = 1.26, \text{ ns}) \)
- Nanotech as risk \( (F(3,122) = .95, \text{ ns}) \)
Scores of the opportunity and risk representation scale per role

Participants represent nanotechnology “differently” in function of their scientific background

- **No differences** are found in relation to the perception of opportunity \((F(6,136) = .98, ns)\)

- **Differences** are found in how participants represent nanotech as risky \((F(6,136) = 5.47***))
Study 2 - Exploring the opportunity–risk dimension of the nanotechnology representation

- Consensus around the representation of nanotech as **opportunity**
- Lack of agreement in relation to the representation of nanotechnology **also as a risk**
  - **Hard science** experts (physics & chemistry) tend to **downplay the risk dimension**
  - **Life and social science** experts represent nanotechnology both as an opportunity and as a risk – “yes... but” logic (Mouro & Castro, 2010)
  - **Engineers and environmental scientists** agree more than the hard scientists that nanotech also constitutes a risk, yet less than the life and social scientists

Discussion

- A seemingly **consensual view** by scientists regarding nanotechnology as conveyed by the media (Friedman and Egolf 2011) – open to discussion

- Scientific backgrounds constitute the lens through which experts socially construct risk issues – issues in relation to which they are often requested to intervene

- Behind the “expert” label, a large array of choices (paradigms/scientific practices) are made and taken for granted
  - Importance of describing social contexts and implicit meaning making practices

Thank you for your attention!

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