Systems Engineering Advancement Research Initiative

Massachusetts Institute of Technology

MIT Portugal

# The Influence of Institutional Background on System Approval


David Andre Broniatowski, PhD in Engineering Systems (expected in 2009)

Committee: Prof. Christopher Magee, chair; Prof. Maria Yang; Dr. Joseph Coughlin


## Biography

David Broniatowski is a graduate student at MIT pursuing a Ph.D. in Engineering Systems. His work experiences include positions at the Center for Strategic and International Studies, the XPrize Foundation, NASA Headquarters, and the Avidyne Corporation. David received an S.B. (2004) degree and an S.M. (2006), both in Aeronautics and Astronautics, as well as an S.M. (2006) in Technology and Policy, all from MIT.

## Related Publications


Broniatowski, D.A., et al. *The Influence of Institutional Background on the Approval of Engineered Systems*. in *CSER 2008*. 2008. Redondo Beach, CA.

Broniatowski, D.A. and A.L. Weigel, *Articulating the Space Exploration Policy-Technology Feedback Cycle*. Acta Astronautica, 2008. **63**(5-6): p. 649-656.

Broniatowski, D.A. and A.L. Weigel, *The Political Sustainability in Space Exploration*. Space Policy, August 2008. **24**(3): p. 148-157


## The Problem: Expert Group Decision-Making

- Engineering Systems are **complex**. They therefore require **information aggregation from multiple subject-experts**.
- Concerns about **bias, conflict of interest** and **deep uncertainty**
- **Different perspectives & values** make it difficult to generate consensus on interpretation of data *(Gelijns, Brown et al. 2005)*
- **Institutional Framing**: Experts' interpretations of data influenced by institutional frames *(Douglas 1986)*
  - **Institution**: e.g., a particular profession, specialty, or organization

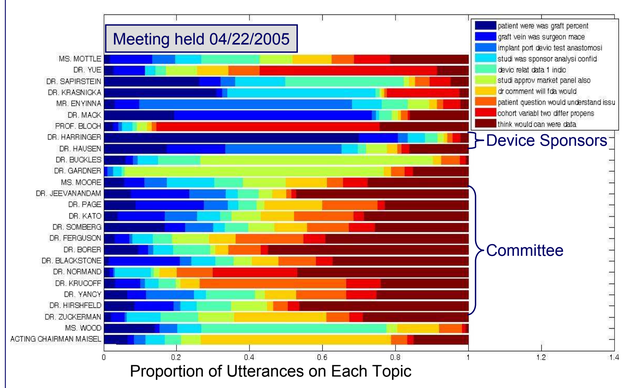
## Domain: Medical Device Approval Key Research Questions

1. How can we study, in a quantitative, consistent manner, the impact of institutional backgrounds of individual advisory panel members, and their interacts on a given device's approval?
2. How do advisory panel members' different institutional backgrounds affect their initial perceptions of a device, and how do those perceptions change and interact during the decision-making process?
3. How might we design approval processes so as to enable desirable behavior on the part of medical device approvals?

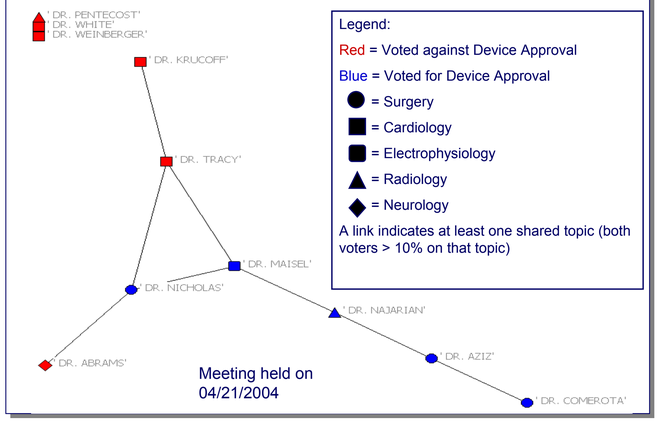
## Computational Approach: Studying Institutional Background via Language

- **Group membership** influences perception of data
  - *(Douglas and Wildavsky 1982; Elder and Cobb, 1983)*
- Group membership **is reflected in language** (problem definition; jargon; symbolic redefinition)
  - *(Douglas and Wildavsky 1982; Cobb and Elder, 1983; Elder and Cobb, 1983; Nelson 2005)*
- Analysis of language use patterns **provides insight into institutional frames** – **semantic** focus
  - *(Nelson 2005; Cobb and Elder, 1983; Elder and Cobb, 1983)*
- **Data Source**: FDA Advisory Panel Meeting Transcripts
  - **Data availability**: Hundreds of potential samples
    - 21 committees over 11 years with ~2 meetings per year
  - **Data consistency & validation**: Committee members' votes are recorded in "court-reported" transcript & minutes

## Can Identify Meeting "Roles" Using Author-Topic Model of (Rosen-Zvi et al., 2004)




## Semantic Links and Institutional Membership (Medical Specialty) Reflect Voting Patterns




## Expected Contributions

- **Methodological**: Computational algorithms and method for the analysis of expert committee meeting transcripts
- **Theoretical**: New insights into group decision-making focusing on linguistic sources of influence
- **Practical**: Policy recommendations for how best to structure approval committees to enable medical device safety and efficacy while still promoting innovation

For more information, please visit: http://seari.mit.edu

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