Impact assessment methodologies: caveat emptor

Workshop
Efficiency, Effectiveness and Impact of Research and Innovation
Roma, 20 February 2015
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This workshop: Assessing Efficiency, Effectiveness and Impact of Research and Innovation …

Relevant JRC’s econometrics and applied statistics research:

Sensitivity analysis, sensitivity auditing, university ranking and composite indicators development,…
When testing the evidence some reasonable people (and guidelines) suggest that ‘sensitivity analysis would help’.

JRC fostered sensitivity analysis development and uptake (20 years of papers, schools and books).

Today we call it **sensitivity auditing** and teach it within the syllabus for impact assessment run by the SEC GEN.
• **Conceived for mathematical modelling**
• **Comes from uncertainty & sensitivity analysis**
• **Addresses model-based evidence used for policy**


http://issues.org/30-2/andrea/
Testing (composite) indicators: two approaches


Paolo Paruolo, Michaela Saisana, Andrea Saltelli Ratings and rankings: Voodoo or Science?, *J. R. Statist. Soc. A*, 176 (2), 1-26
Sensitivity analysis for university ranking

Michaela Saisana, Béatrice d’Hombres, Andrea Saltelli, Rickety numbers: Volatility of university rankings and policy implications

Research Policy (2011), 40, 165-177
This workshop: Assessing Efficiency, Effectiveness and Impact of Research and Innovation …

What if there are important tensions around some underlying narratives which militate against such an assessment?
Innovation

**Innovation** is at the hearth of the European Commission’s strategies to tame ongoing societal crises

But the **Innovation** narrative is under increased pressure and scrutiny against the insurgence of crises ...

Crises of trust, legitimacy, sustainability, inequality, fairness, trust, globalization, controversies among schools of economic thought,...

A workshop next week:
Innovation

A web-streaming service will be offered, with public access on the internet, to enable people, who cannot be physically present in the room, to follow the event. **The links will go live on the days of the workshop:**

26/02:
http://scic.ec.europa.eu/streaming/index.php?es=2&amp;sessionno=3d7d9461075eb7c37fbbfcad1d7042c1

27/02:

You are kindly invited to circulate these links among your colleagues.
Issues with trust also in the science ...
Issues with trust / quality in the scientific enterprise

• “Science still commands enormous—if sometimes bemused—respect. But its privileged status is founded on the capacity to be right most of the time and to correct its mistakes when it gets things wrong. [...] The false trails laid down by shoddy research are an unforgivable barrier to understanding”

The Economist, October 19, 2013, How Science goes wrong, p. 11.
Issues with trust / quality in the scientific enterprise

- Laboratory experiments cannot be trusted without independent verification (Sanderson 2013), rules are proposed to spot “suspected work [...in] the majority of preclinical cancer papers in top tier journals” (Begley 2013).

In a landmark study of results in cancer science Begley and Ellis were able to reproduce only 11 per cent of the original findings (2012). A death sentence for patients on experimental trials (with pharma having passed the pre-clinical phase).

A statistical problem?

J. P. A. Ioannidis, Why Most Published Research Findings Are False, PLoS Medicine, August 2005, 2(8), 696-701.
A statistical problem?

Why Most Published Research Findings Are False

John P. A. Ioannidis

relationships probed in each scientific field. In this framework, a research finding is less likely to be true when the studies conducted in a field are smaller; when effect sizes are smaller; when there is a greater number and lesser preselection of tested relationships; where there is greater flexibility in designs, definitions, outcomes, and analytical modes; when there is greater financial and other interest and prejudice; and when more teams are involved in a scientific field in chase of statistical significance.
A statistical problem?

Essay

Why Most Published Research Findings Are False

John P. A. Ioannidis

outcomes, and analytical modes; when there is greater financial and other interest and prejudice; and when more teams are involved in a scientific field in chase of statistical significance. Such is the trade; that if not statistical...
Issues with trust / quality in the scientific enterprise

- A Meta-Research Innovation Centre launched at Stanford (METRICS) to combat ‘bad science’.

- “85% of research funding ‘wasted’ …”

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“Currently, many published research findings are false or exaggerated, and an estimated 85% of research resources are wasted.”

“Shoddy science” is not confined to natural sciences: social sciences are also affected; “I see a train wreck looming” warns Daniel Kahneman; Joseph Stiglitz condemns perverse incentives in the modelling of financial products at the hearth of the present crisis.

Yong, E., Nobel laureate challenges psychologists to clean up their act, Nature, News, 03 October 2012.
Issues with trust / quality in the scientific enterprise

- Science/knowledge degenerates when it becomes a commodity for Lyotard (1979) and Mirowski (2011).


Issues with trust / quality in the scientific enterprise

• Mirowski’s take on science’s lost innocence:

After the eighties neoliberal ideologies succeeded in decreasing state intervention in the funding of science, which became increasingly privatized...

...Knowledge as a monetized commodity replaces knowledge as public good...
Issues with trust / quality in the scientific enterprise

- Mirowski’s take on science’s lost innocence:

  …In house science labs of major corporation were closed and research outsourced to universities which …

  … became more and more looking as corporations…

  … then research ended up outsourced again to contract-based private organizations.
Issues with trust / quality in the scientific enterprise

- The centrality of ethics for quality (1971).

"Two separate factors are necessary for the achievement of worthwhile scientific results: a community of scholars with shared knowledge of the standards of quality appropriate for their work and a shared commitment to enforce those standards by the informal sanctions the community possesses; and individuals whose personal integrity sets standards at least high as those required by their community.

An ethical problem?

Issues with trust / quality in the scientific enterprise
• The centrality of ethics for quality (1971).

“with the industrialization of science, certain changes have occurred which weaken the operation of the traditional mechanism of quality control and direction at the highest level. [...] The problem of quality control in science is thus at the centre of the social problems of the industrialized science of the present period. If it fails to resolve this problem [...] then the immediate consequences for morale and recruitment will be serious; and those for the survival of science itself, grave.”

“To make more published research true, ... the adoption of large-scale collaborative research; replication culture; registration; sharing; reproducibility practices; better statistical methods;”

“…Standardization of definitions and analyses; more appropriate (usually more stringent) statistical thresholds; and improvement in study design standards, peer review, reporting and dissemination of research, and training of the scientific workforce.”

“…Selection of interventions to improve research practices requires rigorous examination and experimental testing whenever feasible.”

“… Harness the motives of various stakeholders … Modify … reward system for science, affecting the exchange rates for currencies (e.g., publications and grants) and purchased academic goods (e.g., promotion and other academic or administrative power) and introducing currencies that are better aligned with translatable and reproducible research.”

“No formal system of imposed penalties and rewards will guarantee the maintenance of quality, for the tasks of scientific inquiry are generally too subtle to be so crudely assessed” (p. 407).

Could the movement known as ‘Citizens’ Science’ respond to official science’s predicaments (McQuillan, 2014) and ‘pick up the gauntlet’ thrown by official science’s contested hegemony?

“Is the internet to science what the Gutenberg press was to the church?”

Silvio Funtowicz, Centre for the Study of the Sciences and the Humanities, University of Bergen (NO)

“[...] the new social media have given strength to the extended peer community in science in a way reminiscent of the contribution of printing to the Reformation.”

“Collegial peer review is being rapidly transformed to review by an ‘extended peer community,’ raising important issues to the governance of science.”

DIY INNOVATION...