Te Pūnaha Matatini
Data ▪ Knowledge ▪ Insight

The Impact of Science and the Science of Impact

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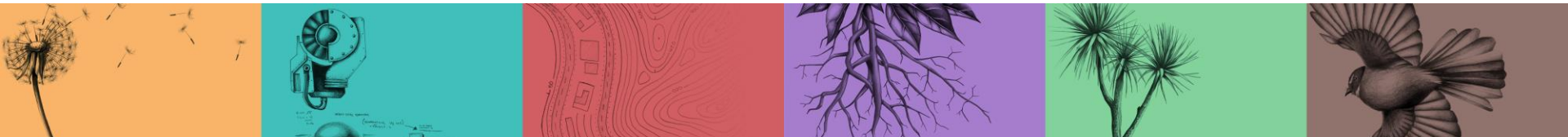

Messages

- Funders of research have an obligation to measure and seek to maximize the effectiveness of their programmes in terms of their public objectives.
- While advancement of science is a legitimate public objective, broader economic and social impact is increasingly sought.
- Policy choices seeking to maximize impact should be based on systematic evidence.

Programme evaluation

- A policy or a programme is like a new drug. We would like to know if it is effective, and how its effectiveness compares to alternatives.
- With a drug, it is not enough that the patient gets better. With a policy, it is not enough that some good things happen.
- Want to measure the treatment effect, i.e. how the state of the policy objectives compares to what it would have been without the policy (the “but for” state of the world).

Measuring the Treatment Effect

- Government funds research and good things happen. Funding was effective, right?
- Only if there is some sense in which funding caused the good outcomes.
- Requires comparison of outcome to “but for” outcome.
- Can never observe that—but statistical techniques can be used to estimate how actual differs from but-for.

Foundation for systematic evaluation

- Track all research proposals—successful and unsuccessful
- Record and preserve internal proposal evaluations
- Unique identifier for all researchers—PIs and students.

Prototype Dimensions of Research Impact

Economic

- New or improved products or services
- Reduced operating cost or reduced commercial risk
- Increased wages or improved job opportunities

Environmental

- Reduced pollution or other anthropogenic environmental impact

Public policy

- Improvement of public policy or of the delivery of public services

Capability

- Enhancement of the scientific and technological capabilities of the work force

Social

- Improved morbidity and mortality, or reduction in the cost of maintaining health
- Increased communal knowledge and interest in science
- Reduction in real or perceived communal risk
- Enhancement of international reputation, or contribution to sustainable development
- Enhancement of other social, cultural or community values

Examples of Metrics

Impact dimension	Direct Measure	Proxy or indicator	Intermediate outcome
1. New or improved products or services	additional revenue	enumeration of new products and processes	private sector development investment
4. Reduced pollution or other anthropogenic environmental impact	reduction in emissions or other environmental impact (tons; percent of total emissions)		
5. Improvement of public policy or of the delivery of public services	issuance or implementation of policy or practice incorporating research results		workshops or other delivery of policy, programmatic or operational advice to governmental body
7. Improved morbidity and mortality, or reduction in the cost of maintaining health.	increase in quality-adjusted life years		adoption of new technology or practice in health care
8. Increased knowledge and interest in science			time spent in interactions with public
			development and use of educational materials
9. Reduction in real or perceived communal risk		expert assessment of communal risk reduction	
		survey results regarding public risk perceptions	
11. Enhancement of social, cultural or community values		expert assessment of values impacts	

Impact measurement

- MBIE "Science Domain Plan" will create a government-wide data infrastructure on publicly funded research.
- Will provide key baseline data on researchers, research proposals and research funding.
- This will allow *ex post* research to investigate impacts in creative ways:
  - Structured case studies
  - Web-scraping
  - Etc.

Science of science policy

- Conventional wisdom and personal experience are not good enough. Need evidence. E.g.:
  - Are “good science” and “impactful science” complements or substitutes? (complements)
  - Does peer review select the best proposals? (weak yes)
  - Do panel discussions improve outcomes relative to anonymous scoring? (no)
  - Do conflicted reviewers make biased choices? (yes, but also “better” choices)

Concerns/counter-arguments

- It's obvious that funding is necessary to produce good science. Why should we have to prove it?
- We will never be able to measure all of the impacts. Any actual attempt at measurement will under-estimate the benefits.
- Attempt at measurement "buys into" argument that science for its own sake is not enough. We should resist the corporatization of science.
- Results will be mis-used/abused.

"Although Hardy disparaged any math that could be applied to real life as "ugly," "dull" and "trivial," surely usefulness should be an additional measure for a mathematician's worth?"

The Mathematician's 90th-Birthday Party

Manil Suri

Today's New York Times

Parting thoughts

- Being scientific in our analysis of science policy choices is the best way to avoid being seen as just another interest group.
- If we don't participate, others will do the analysis without us. (I say "we" because everything I've said applies to social science research.)
- We should fight the innate tendency to believe that our personal experience provides a reliable basis for empirical conclusions about the world at large.

Happy to discuss further:

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