

Measuring the benefits from research

Organisations that fund research are under increasing pressure to justify their expenditure and to demonstrate that research provides value to the community. This trend is evident throughout the developed and developing world.

In the UK, a RAND Europe study conducted on behalf of the National Audit Office (NAO) concluded that government departments 'have no systematic mechanisms for measuring the overall impact of their research effort'. In the US, the Government Performance and Results Act of 1993 required federal agencies—including those that fund research—to set strategic goals and to use performance measures for management and budgeting. In 1998, John Porter, who at the time was Chairman of the US House of Representatives Appropriations Sub-Committee on Labor, Health and Human Service, stressed the need for measuring the impact of research. When taking evidence from a research funding organisation, he noted, 'what we really want to get at is not how many reports have been done, but how many people's lives are being bettered by what has been accomplished. In other words, is it being used, is it being followed, is it actually being given to patients?' Finally, a 1994 report by the Canadian Auditor General concluded that departments and agencies should establish the mechanisms and practices required to demonstrate the results of their science and technology activities and to ensure that their resources are allocated effectively.

To date, much thinking about research measurement and evaluation has been concentrated in the biomedical and health sciences, but there is increasing recognition that all funders of research—ranging from music to microbiology or from economics to engineering—need to be in a position to:

- Justify public expenditure on research.
- Demonstrate that their own research policies are effective, or at least informed by effective practice.
- Be able to engage with stakeholder communities in illustrating the research process as well as the outcomes of research.

Abstract

To date, much thinking about research measurement and evaluation has been concentrated in the biomedical and health sciences. However, there is increasing recognition that funders of public research—in areas ranging from music to microbiology or from economics to engineering—need to justify their expenditure and demonstrate added value to the community. Furthermore, they need to be able to engage with stakeholder communities in illustrating the research process as well as the outcomes of research.

The challenge facing funders to measure benefits from research is considerable. This Policy REsource provides some insight into the issues involved and offers ways to approach the objective.

Of course not all research funders are the same. Some are state-funded—such as the Research Councils in the UK, the ZonMw in the Netherlands, and the National Institutes of Health in the USA. Others are funded through the generosity of a philanthropic benefactor—such as the Gates Foundation and the Wellcome Trust. A third group includes organisations that raise funds from the public in order to sponsor research. Typically, these are disease specific and include, for example, the UK Arthritis Research Campaign and Breakthrough Breast Cancer. A final and significant source of research funding is industry, which is typically driven by market forces and evaluated in terms of return on investment. This Policy REsource comments on the evaluation of so-called 'public good' research that is aiming to address a more speculative 'market failure' or disease-specific 'orphan' topic.

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RB-9202-RE

A measurement too far?

Despite the diversity of sources for non-profit research, the challenge for funders is the same: how do you measure the benefits of research? This question is undoubtedly complex: many research impacts are not easily quantifiable; there is a significant time lag between the funding and benefits; and it is difficult to attribute a policy or impact to a particular research result. But are these challenges a reason for not trying to measure the benefits of research? No—such an argument is surely unsustainable. Research in areas of public life—in education, defence, and health, for example—are required to demonstrate value or a return for taxpayers and donor benefit. All these areas have grappled with developing performance measures and all of them have a legitimate claim to be unique. For example, buying and building a naval warship takes over a decade—how do you develop meaningful performance measures over that period? Likewise, patients entering a health service have different characteristics that influence health outcomes—some are rich, others are poor, some young, others old. How do you ensure that you are comparing like with like when looking at a surgeon's performance? These issues, and they cover most public sectors, are important and should not be trivialised. Just because it is difficult is not a reason for not doing it.

The research measurement toolkit

More recently, the research community has begun to engage with the vexing issue of measuring research. Traditionally, researchers have used a system of self-regulation or peer review. But there is an increasing acknowledgement that while this may be appropriate for the distribution of research funds—you need experts to recognize excellence—it can be too incestuous for demonstrating value to the wider community, be they donors or stakeholders. In the table we identify a range of methods—bibliometrics, economic analysis and qualitative modelling. While not an exclusive list, it serves to illustrate some of the methods available to funders wanting to evaluate research outcomes. Since each method has its own strengths and weaknesses, we would argue that funders should take a multi-indicator, multi-method approach.

Some guidance

In using these methods, research funders need to keep in mind three, interrelated issues.

First, what is the relationship between an evaluation and the strategic framework of the funding organisation? For example, if the mission of an organisation is to 'generate new knowledge', then a bibliometric assessment of research publications may be entirely appropriate in the science, engineering and technology disciplines. (In the arts, humanities and social sciences, the issue is more challenging as the publication in peer-reviewed literature is not necessarily an indicator of quality or impact, and the dominant bibliometric indices have poor coverage in these disciplines). However, if an agency's mission is to improve the lives of people with arthritis, for example, then it is important to understand how new knowledge is (or is not) being translated into effective clinical practice or preventive medicine.

A second consideration in any evaluation process is the type of research that is being undertaken. For example, bibliometrics provides an indicator of knowledge production that is more robust for fundamental research (which is typically published in the peer-reviewed literature), than applied research (which may be published in the more targeted, less academic literature).

The final issue is that the tendency to use single indicators can be misleading, and that all research evaluation criteria need a qualitative and quantitative information base. For example, an analysis of the payback of early clinical research in diabetes illustrated that some papers with few citations were considered to be of significance in interviews (Hanney et al., 2005). More generally, the study showed that bibliometric data could inform the qualitative approach and provide indicators against which to correlate or challenge accounts from interviews.

A concluding thought

Indeed, there is an irony in that much current research policy is itself based on little or flimsy evidence given that the sole purpose of research is to generate evidence for a given field. Once we develop ways of measuring the benefits of research, then funding agencies will be able to see what strategies and policies are more effective.

The Toolkit

Method	Advantages	Disadvantages
<p>Bibliometric analysis</p> <ul style="list-style-type: none"> • ‘Epidemiology’ of research publications • Looks at patterns of publication and citation • Can include quality, quantity, collaboration, etc. 	<ul style="list-style-type: none"> • Quantitative • Useful to see large-scale trends • Repeatable analysis possible 	<ul style="list-style-type: none"> • Estimates of quality may not be reliable • Difficult to compare across fields • Care in interpretation is needed • May be skewed by biases in data
<p>Economic rate of return</p> <ul style="list-style-type: none"> • Assess rate of return on investment, for example how many £ returned for every £ spent 	<ul style="list-style-type: none"> • Quantitative • Useful for political lobbying • Easy to understand 	<ul style="list-style-type: none"> • Focuses on financial benefits, rather than social or health quality • Requires many assumptions which may be controversial and unreliable
<p>Peer review</p> <ul style="list-style-type: none"> • Qualitative assessment by peer 	<ul style="list-style-type: none"> • Well understood and accepted by researchers • Provides qualitatively informed evaluation 	<ul style="list-style-type: none"> • Time consuming • Concerns regarding objectivity and variability of practice • Can focus on quality to the exclusion of relevance
<p>Case studies</p> <ul style="list-style-type: none"> • In-depth examination of research • Provides ‘narrative’ of research process and outcome 	<ul style="list-style-type: none"> • Provides in-depth understanding • Informs reforms of system • Illustrates all types of benefits of research • Can produce ‘good news’ stories for public relations 	<ul style="list-style-type: none"> • Hard to compare • Single study may not be ‘representative’ • Difficulties in generalising • Expensive
<p>Logic modelling</p> <ul style="list-style-type: none"> • ‘Picture’ of how a programme works • Value in creating, validating and modifying model • Develops a series of ‘if . . . then’ statements 	<ul style="list-style-type: none"> • Useful to identify linkages between funding programmes and innovations over time • Builds shared understanding among stakeholders 	<ul style="list-style-type: none"> • Not useful for short-term evaluation as time lag between research and outcomes may be many years • Can be inflexible
<p>Benchmarking</p> <ul style="list-style-type: none"> • Comparing across different countries, organisations or programmes • Identifies variation • Allows identification of ‘effective practice’ 	<ul style="list-style-type: none"> • Useful tool for comparison across programmes and countries • Provides alternate ideas 	<ul style="list-style-type: none"> • Focuses on fields not research programmes

Further reading

- Hanney S, Home PD, Frame I, Grant J, Green P and Buxton M (2006). Identifying the impact of diabetes research, *Diabetic Medicine*, 23(2), 176–84.
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