Measuring Research Impact:
Concepts, Methods, Limitations and Solutions

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Background

- Very few well-recognized metrics for the impact of scientific research
- Bibliometric roots
- Other forms of scientific output (e.g. code, data, experimental protocols, animals, equipment) largely ignored

Open Metrics gives stakeholders the data and tools they need to develop and share novels measures of scientific impact

Methodology

- Informal review of the literature
- Definition of research impact
- Inventory of available tools
- Categorization of impact metric users
- Identification of key open issues
- 22 one-hour, semi-structured interviews with scientists, bibliometricians, metrics providers and publishers

Uses of research metrics

- *Researchers:* guiding their research, and careers
- *Institutions:* managing and developing strategies for research, to compete for prestige, and to manage students, staff and resources
- *Policymakers:* evaluating public spending on higher education and research, allocating resources to institutions and projects

Limitations of current metrics

- Available impact factors present a limited view of the reality of scientific research. They,
  - Create distorted incentives
  - Are easily gamed
  - Encourage publication bias
  - Do not take account of scientific outputs other than publications
- Market dominated by a small number of metrics providers – no role for scientific communities
- Lack of easy reproducibility

Providers of current metrics

- Short term: views, downloads, media attention

Altmetric PLUM ANALYTICS Crossref Event Data

- Medium term: bibliometric data

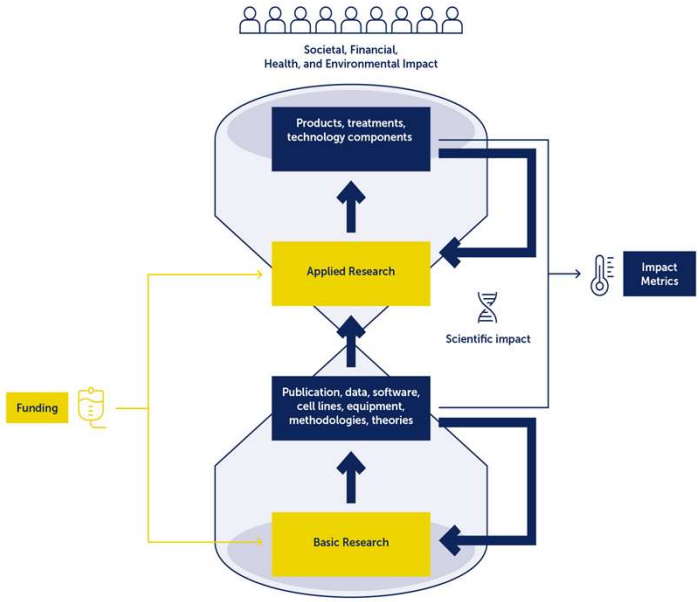
Clarivate Analytics Google Scholar Scopus Crossref I4OC

- Medium to Long term: patents, grants, policies

LENS.ORG Dimensions

What is Return on Investment for research?

- The main impact of basic research is *scientific impact* (societal impact only in the long term)
- *Scientific impact:* Improvements in knowledge of the physical, biological and social world
- The main impact of applied research *is societal impact*
- *Societal impact:* Impact on health, environment, the economy, etc.
- Impacts are hard to measure and only apparent decades after investment
- Strong demand for metrics that *predict* impacts



- ***Basic Research outputs:*** publication, data, software, cell lines, equipment and methodologies
  - *Short term metrics:* downloads, views, presence in social media etc.
  - *Medium term metrics:* citations
  - Measuring the societal impact of basic research is rarely possible
- ***Applied Research outputs:*** publications, as well as products, treatments, technology components, medicines etc.
  - Uses outputs from Basic Research
  - Measuring societal impact is difficult
- The key question: ***How to predict the impact of basic and applied research?***

OpenUP Impact Data Services Platform

- ***Increased coverage*** - includes data that is not widely used in current metrics (e.g. citations of data, code, animals, laboratory equipment, experimental protocols, products, technology components, treatments, medicines)
- ***New citation standards, and methods to link data*** - introduces new citation standards, and new ways of counting citations for data, code, animals, laboratory equipment, experimental protocols, products, technology components, treatments
- ***Data collection*** – provides data required to calculate impact metrics including article meta-data, links to data and code, reference lists, data for downloads, views etc.) and other data provided by publishers (social and media mentions, patents, etc.).

Contacts

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