Bibliometrics – an overview

- Research impact can be measured in many ways: quantitative approaches include publication counts, amount of research income, number of PhD students, size of research group, number of PI projects, views and downloads of online outputs, number of patents and licenses obtained, and others
- Use of bibliometrics and citation analysis is only one of these quantitative indicators, but is widely and increasingly being used
- The ability to apply citation analysis meaningfully in the overall assessment of research varies from field to field
- Attempts at quantitative measures can be contrasted with the main alternative assessment approach - qualitative peer review in various forms
- The balance between use of bibliometrics and peer review in assessing academic performance at both the individual and unit levels is currently a “hot topic” being played out locally, nationally and internationally
- This datasheet provides an introductory overview of the field - other datasheets in the series look in more depth at: the key uses of bibliometrics for journal ranking and individual assessment; the main metrics available; the main data sources and packaged toolkits available

What’s in it for me?

- Bibliometrics are quantitative measures used to measure the impact of published scholarly output
- Used alongside qualitative measures such as peer-review, the benefits of using bibliometric indicators are that they can be produced relatively easily, they are internationally recognised, and are considered an objective method of assessing research impact and influence.
- The use of bibliometrics as indicators of the impact of research output remains controversial, even in those disciplines where there is good coverage of research output in the main citation data sources

“In our view, a quality judgment on a research unit or institute can only be given by peers, based on a detailed insight into content and nature of the research conducted by the group …. impact and scientific quality are by no means identical concepts.”
Bibliometric Study of the University College Dublin

- Bibliometric analysis often forms one part of a university’s assessment strategy, looking at the impact of the research at institutional and unit level
- The two other key areas where bibliometrics are commonly used are:
  1. As evidence to support an individual in relation to consideration for promotion, tenure and grant funding
  2. In deciding where to publish research, to obtain maximum visibility and citation rate by targeting high impact titles
- Despite its many shortcomings ranking tables for universities give considerable weighting to bibliometrics in their calculations

The building blocks

A source dataset
- The main source datasets are those of ISI, Scopus and Google Scholar plus subject-specialist options in some fields
- Each collects the citation information from the articles in a select range of publications only – the overlap between the content of these sources has been shown to be quite modest in particular studies. So a health warning needs to be applied to using only one data source as many research offices, for example, tend to do

Metric tools and techniques applied to the data source
- Basic building blocks are a series of techniques such as h-index, Journal Impact Factor (JIF), SCImago Journal Rank Indicator (SJR) - these formulate transform the raw data into various quantitative evaluations

The main metric types
Publication counts - measure productivity but arguably not impact. For example: using ISIs Web of Science we see that Institution X published 10,454 items between 2000 and 2015. 31% were not cited other than self-citations. Overall as much as 90% of the papers published in scientific journals are never cited.

Citation analysis
- Most current bibliometric indicators are based around analysis of citations to publications
- The key concept is that the number of times you get cited is meaningful – the more citations the greater the relevance
- There are three main approaches to citation analysis:
  - Citation counts - total number of citations, total number of citations over a period of time, total number of citations per paper
  - More sophisticated counts such as: number of papers cited more than x times; number of citations to the x most cited papers
  - Normalisation and “crown indicators” Citation counts alone are commonly used but this is meaningless unless normalised by some combination of time, journal of publication, broad or narrow field of research and type of publication. This normalised approach, allowing benchmarking, is the most commonly used at present

Issues & Limitations

- In some fields it is not the tradition to cite extensively the work that your scholarship and research is building upon – yet this is the whole principle of the citation analysis system
- Seminal research is also often taken for granted and not cited
- The data sources are selective and journal-focused and often do not index the publications where research in a field is typically published and the citations occur – local publications, non-English publications, monographs, conference and working papers are poorly indexed

“...We publish in books and monographs, and in peer-reviewed journals. However, we have a range of real requirements that include official reporting to state agencies and authorities; public archaeology and communication in regional and local journals and in interdisciplinary publication across several journals, that most bibliometrics are incapable of measuring” [Academic]

- Negative citations are counted as valid
- Manipulation of the system by such means as self-citation, multiple authorship, splitting outputs into many articles, citing work of others in your research group, and journals favouring articles over reporting primary research
- Defining the broad or narrow field to benchmark. This can dramatically alter the result for an individual or group when using normalised benchmarked scores. A number of metrics such as the Scopus SNIP metric for journals and the universal h-index are trying to weight sufficiently to allow cross-discipline comparison to take place
- Inappropriate use of citation metrics, such as using the Journal Impact Factor of a journal to evaluate an individual researcher’s output, or comparing h-index across fields

“...The terrible legacy of IF is that it is being used to evaluate scientists, rather than journals, which has become of increasing concern to many of us. Judgment of individuals is, of course, best done by in-depth analysis by expert scholars in the subject area. But, some bureaucrats want a simple metric. My experience of being on international review committees is that more notice is taken of IF when they do not have the knowledge to evaluate the science independently”

[Alan Fersht “The most influential journals: impact Factor and Eigenfactor” PNAS April 28, 2009 vol. 106 no. 17]

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