

AIRS

Advanced Information Research Skills

AIRS Module 11

Metrics 



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Module 11 Metrics

TRACKING RESEARCH METRICS

This module first distinguishes between research impact and research metrics. Second it provides an overview of both quantitative and qualitative measures (metrics) used to assess research output, identifies the tools that can supply the measures and how to derive them. At the end of this module you will be able to:

- Access and search relevant citation indexes to discover the metrics associated with the use of scholarly work, author level metrics and those that indicate quality journals.

What is research impact?

First, it is important to distinguish between research impact and publication metrics.

Measuring and showing evidence of the impact of academic research is becoming an everyday event in institutions across Australia and the world.

Types of research impact include:

- Academic impact - Evidence that the research(er) has contributed to scientific advances including significant advances in understanding, method, theory and application.
- Economic and societal impact - Evidence that the research has been taken up and used by policymakers, and practitioners, has led to improvements in services or business.

The Research Excellence Framework (REF) Assessment framework and guidance on submissions defines impact as:

an effect on, change or benefit to the economy, society, culture, public policy or services, health, the environment or quality of life, beyond academia.

<https://qutvirtual4.qut.edu.au/group/staff/research/research-impact>

Examples of research impact include:

- policy decisions or changes to legislation, regulations or guidelines which have been informed by research evidence
- costs of treatment of health care have changed as a result of research-led changes in practice
- growth of small businesses in creative industries through the development of new products and services.

<https://qutvirtual4.qut.edu.au/group/staff/research/research-impact>

What are publication or citation-based metrics?

Publication or citation-based metrics are often described in terms of what can be counted, quantitative methods such as journal impact factors, individual researchers rankings such as their *h*-index and the citation counts are often referred to as bibliometrics.

Bibliometrics are based on research outputs; a researcher must have published several publications to be able to measure the possible influence of that research. Research students are encouraged to use bibliometrics to find and evaluate quality literature and consider possible collaborators for the future.

Other ways of determining value can include qualitative measures such as peer review, letters of recommendation, institutional affiliation, successfully acquitted research grants, book reviews, conference publications, holdings in library catalogues and recommended readings for courses.

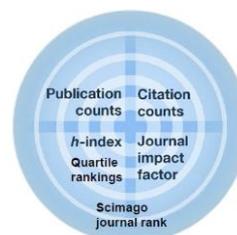
11.1 Main metrics

Introduction

There are a number of metrics to evaluate the possible influence of authors, articles, journals and other publications. They include publication counts, the *h*-index, citation counts and journal measures such as the Journal Impact Factor and the SciMago Journal Rank.

Examples of questions that can be answered by these types of metrics are:

- What are the best journals in the field of engineering?
- Who is citing my articles?
- How many times have I been cited?
- How do I know this article is important?
- In which journal should I publish?
- What is my supervisor's *h*-index?



Publication counts

A basic metric to measure author productivity is the publication count. The publication count is the total number of publications produced by an author. The more publications a researcher, unit or institution has, the more active they are within the research community.

Citation counts

A citation means that a scholarly work has been cited in the text and reference list of a publication. Citations counts indicate the usage and engagement with the cited work by other authors. The citation count has been used as a proxy for quality – with quality indicated by a high level of citations, although this is not always the case and citation counts alone as an indicator of influence/quality of an output are unable to determine:

- if the citations were viewed positively or negatively
- the quality of the journal the article are published in or cited by
- the ranking of researchers from different disciplines.

An example of a highly cited paper where the study was flawed, ethical behaviour of the research team was questionable who claimed incorrectly that the combined measles, mumps and rubella vaccine caused autism in children has been cited **2559** (Google Scholar, 15/6/17). The retracted paper *Ileal-lymphoid-nodular hyperplasia, non-specific colitis, and pervasive developmental disorder in children*, has been **scientifically discredited** but continues to be cited. See <https://sciencebasedmedicine.org/lancet-retracts-wakefield-article/> for more information.

The message here is not to use citation analysis in isolation – it is just one part of the story.

Consider citation analysis when you want to find:

- how often an output has been cited (times cited)
- the total citations and average citation per article for an author
- the average cited count for articles published in a specific journal
- additional resources on your topic also called tracking citations. In addition to checking the reference lists of papers you find useful, you can also check who has cited the paper.

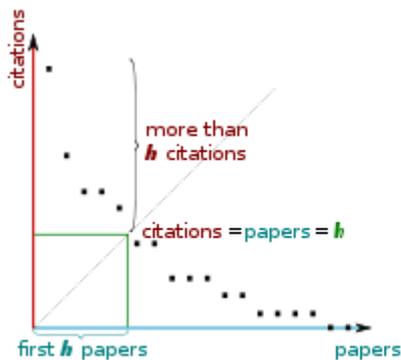
The 'count' of citations differs according to the citation tool used because different databases have different content coverage including the number of publications, and the years indexed.

Example: Scopus has better coverage for Education than Web of Science because Scopus is more interdisciplinary and Web of Science specialises in the scientific disciplines.

In all disciplines, citations take time to accrue. However, some disciplines (e.g. chemistry and biomedical science) have faster peer-review and publication processes and consequently higher citation rates than others (e.g. education, creative industries). Publishing norms and citation patterns can differ between disciplines. Consequently, there are different ways to track and measure influence across subject areas.

h-index

The *h-index* is a variation on the concept of times cited and is an author level metric that attempts to measure both the productivity (number of papers) and the citation impact of a researcher's publications. It provides a mechanism for the work of individual researchers to be compared with others in the *same discipline*.



A researcher with an index of h has published h papers with at least h citations each.

Example: If a researcher has an h -index of 4, this means that the researcher has four papers that have each been cited four times or more.

Example: If a researcher has an h -index of 15, the researcher has fifteen papers that have each been cited fifteen times or more.

Benefits

The h -index is a simple, cumulative indicator of research performance and can be calculated using citation tools such as Web of Science, Scopus and Google Scholar Profile.

- It is most appropriate for researchers who are established and have published extensively.
- It measures “durable” performance, not only single peaks, and avoids skewing by one highly cited paper.
- It is not limited to journal document types can include conference papers and book chapters.

Limitations

- It is not a good indicator for early career researchers, as both their publication output and citation rates will be relatively low.
- It is highly dependent on the length of a researcher’s career, meaning only researchers with similar years of service can be compared fairly.
- It provides no indication of peaks and dips in publication performance.
- It is a less appropriate measure of academic achievement for researchers in the humanities and social sciences.
- It can be inflated by self-citations.

Remember 2 basic rules when using the h -index:

1. Compare across disciplines.

2. Benchmark against average or expected citations in a field of research.

Hirsch (2005) provides a strong caveat for use of the *h*-index:

“Obviously a single number can never give more than a rough approximation to an individual’s multifaceted profile, and many other factors should be considered in combination in evaluating an individual. (p. 16571)”

Journal quality

Assessing the quality of a journal may involve looking at:

- Journal metrics – e.g. [Scimago](#) quartile for the journal, the prestige metric (Scimago Journal and Country Rank (SJR)), the Journal Impact Factor (based on citation data)
- Editorial board membership
- Peer review process
- Journal indexation
- Journal scope
- Publication lag
- Reach.

For more information see [Which journal?](#).

Journal ranking and tools

Journal ranking and journal impact factors are quantitative measures which attempt to rank and estimate the importance and performance of a journal in a particular field.

- The [Scimago Journal & Country Rank \(SJR\)](#) is a metric representing the number of citations received by a journal and weighted according to the prestige of the journals from which they originated over a three year period.
 - The SJR is an objective measure of overall quality of journals within a discipline. More prestigious journals have higher SJRs.
 - The Source Normalized Impact per Paper (SNIP) can be used to make comparisons between journals from different disciplines and is considered a popularity metric (does not matter where the citation comes from each citation is counted as one, which varies to the SJR with the metric being calculated based on the origin of the citation).
 - Find the journal quartile ranking on this website.
- [Scopus Compare sources](#) compares up to 10 journals on various indicators including Scimago Journal Rank (SJR), SNIP and [CiteScore metrics](#).
- The **Journal Impact Factor (JIF)** is a metric representing the average citation counts of papers published in a journal over a two year period.

- The JIF is an objective measure of overall quality of journals within a discipline. More prestigious journals have higher JIFs.
- If the journal has an impact factor it can be found at the journal publisher's website, or access the archived [Journal Citation Reports data](#) for impact factors and quartile ranking per subject for journals indexed by Thomson Reuters.
- **Journal Quartile rankings** are derived for each journal in each of its subject categories according to which quartile of the **Impact Factor (IF)** distribution the journal occupies for that subject category:
 - Q1 comprises the quarter of the journals with the highest values (top 25%).
 - Q2 the second highest values (between top 50% and top 25%).
 - Q3 the third highest values (top 75% to top 50%).
 - Q4 the lowest values (bottom 25% of the IF distribution).

Note that both Scopus and Web of Science provide access to journal quartiles based on their individual metrics.

QUT's strategy is for researchers to focus on the journal ranking found in [Scimago Journal & Country Rank \(SJR\)](#) which is Scopus indexed data).

- Australian Business Deans Council's [ABDC Journal Quality List 2013](#) contains journals in the disciplines of business with each given a ranking from A* to C. The list is administered by the Australian Business Deans Council.
- [MIS Journal Rankings](#) provides information about the rankings of journals in the area of MIS (management information systems), compiled by the Association for Information Systems.
- ERA (Excellence in Research for Australia) evaluates the quality of research undertaken in Australian universities against national and international benchmarks. In the most recent [2015 ERA rankings](#), 100% of our research was rated at world standard or above (scores between 3 and 5). See [the submissions journal lists 2010-2015](#) (not ranked).
- The [Journal Quality List](#) compiled by Dr. Anne-Wil Harzing can assist academics to target papers at journals of an appropriate standard. It covers the areas of economics, finance, accounting, management, marketing, tourism, psychology and sociology.

Limitations of journal measures

- Journal measures relate to the entire journal based on average citations. They cannot assess the quality or account for the impact of individual articles in a journal
- In research areas such as computer science and engineering where the main form of scholarly communication is conference papers rather than journal articles, the Journal measures may be less relevant.
- In some research areas such as the humanities and social sciences, the number of journals

listed in the tools for deriving journal measures may be low.

- The coverage of a database providing journal measures may be unevenly distributed across subject areas, or not provide measures for some journals at all.
- Journal measures are available for only a small number of journals that publish in languages other than English.

Summary

There are a number of metrics (Bibliometrics) you need to use as a researcher, such as publication counts, citation counts, *h*-index and journal impact or prestige factors. Use metrics to choose high quality authors and publications for your research and to identify high impact researchers for collaboration.

11.2 Choosing a tool

Introduction

There are three main tools used for analyses of author, article and journal impact measures: Web of Science, Scopus and Google Scholar. Each of these tools is a citation database where you can search and view the citations of articles and conference papers, and identify journals for publication. Databases vary in:

- the journals indexed (sources)
- the range in years of these sources (depth of coverage)
- the citation analysis features available.

Scopus

Key facts about Scopus:

- Coverage in life science, social science, physical sciences and health sciences.
- Interdisciplinary coverage. Generally better coverage than Web of Science for the disciplines of Arts and Humanities, Business, Education, Engineering, Health, IT (conferences), Social Sciences, and Law.
- Covers over 21,000 journal titles as well as content from books, conferences and patents.
- Titles from all geographical regions are covered including non-English titles as long as they have an English abstract.
- Scopus has been used as the source of citation data by the Australian and other governments in national research performance evaluations.
- Updated daily.

Scopus[®] Scopus can help you find article citation counts, the author *h*-index, Journal Impact Factors, and much more.

Activity – Use [Scopus](#) to find the following metrics

- **Article citation counts:** do a title search using the article title, and to the right of the result, note the '*Cited by*' count
- **Author *h*-index:** in the list of results, click on the author name to view the *h*-index and more. Alternatively, search on a specific author, select all relevant results, and select '*View Citation Overview*'.
- **Journal measure:** in the list of results, click on the title of the journal. Note the SCImago Journal Rank (SJR) alternatively, search on the Journal title.

Further help:

- Watch the video on [Cited Reference Searching](#).
- See citation analysis instruction in the [Quick Reference Guide](#).
- View how to compare journals for choosing where to publish using the [Compare sources](#).

Web of Science

Key facts about Web of Science:

- Coverage of literature in sciences, social sciences, arts and humanities.
- 12,000 journals and some conference proceedings.
- Interdisciplinary database, comprising the Arts & Humanities Citation Index, Social Science Index, and Science Citation Index Expanded.
- Access to Current Chemical Reactions, Index Chemicus and Book Citation Indices Covers.
- Some indices cover information dating back to 1898.
- Updated Weekly.

WEB OF SCIENCE[™] Web of Science can help you find article citation counts, the author *h*-index, Journal quartile ranking, and much more.

Activity – Use [Web of Science](#) to find the following metrics

- **Article citation counts:** do a title search using the article title, and to the right of the result, note the '*Times Cited*' count.
- **Author *h*-index:** do an author search, ensure the results are relevant and pertain to the author of interest. On the upper right hand side of the screen look for the option *Create Citation Reports*, to view the author's *h*-index and more.
- **Journal quartile ranking:** to find out the ranking for a journal listed in your results, click on the journal title to find the quartile information.

Further help:

- For author analysis based on citation counts, **watch the video:** [Citation Report training](#).
- Participate in [live online training](#) or view other presentations.

Google Scholar

 Google Scholar can help you find article citation counts.

Activity – Use [Google Scholar](#) to find the following metrics

- **Article citation counts:** do a search using the article title, and below the relevant result, note the '*Cited by*' count.

Google Scholar Citations

Google Scholar has a feature where authors can create a profile page that lists their publications and citation metrics.

A Google Scholar Citations profile allows you to keep track of citations to your outputs, increases the visibility of your work through making your profile public on Google Scholar and provides others with a mechanism to create alerts to follow your new articles and new citations to your work.

Searching for others in your field who may have a profile allows you to find potential collaborators, and research that may be of interest.

See an [example Google Scholar Citations profile](#) – note the **times cited** adjacent to the list of references, **Follow** – set up an alert to follow the author, list of **metrics** and **collaborators** and lastly the ability to **search** for other authors who have created a profile.

For more information see [To get started with Google Scholar Citations](#).

Activity – citation metrics

Use the general instructions above, and refer back to the further help if necessary.

1. Find and select an article by a researcher in your discipline who is well published.
 2. Choose a tool for impact analysis, from [Web of Science](#), [Scopus](#) or [Google Scholar](#).
 3. Find or generate a) the article citation count; b) the author *h*-index, and, c) the journal impact measure.
- If your article or author is not listed in one impact analysis tool, try the next one.
 - Compare the metrics. Which tool gave the most positive numbers? Why do you think these results differed?

Summary

There are three main tools used for bibliometric and citation analyses: Web of Science, Scopus and Google Scholar. Take note of the advantages and limitations of each to your particular disciplinary and research requirements. In the next section we'll be looking at alternative measures and tools.

11.3 Other indicators of use, value or popularity

Introduction

This section outlines a number of alternative methods and tools for establishing a publications use influence, value or popularity. A number of tools provide metrics made possible by online social networks. Non-traditional metrics based around social media are known as Altmetrics and propose an additional or alternative way to describe the use or activity around a piece of information. Consider various measures to determine use, influence or value including library holdings, downloads, and popularity in social media.

Library holdings of a book

The number of Libraries that hold a book is a general indicator of value proving there is a wide audience for the publication.

Use [WorldCat](#) to find the number of international libraries that hold a book:

1. In the '*Advanced Search*', perform an Author and Title search. In the results, click on the title of the book to open the entry.

2. Scroll down, and under *Find a copy in the Library*. Enter your location as 'Australia' and click: *Find Libraries*.
3. The total count of the libraries displayed will now be found directly underneath the location entry box.

Use [Trove](#) to find the number of Australian libraries that hold a book:

1. Select the 'Books' tab, enter the book title and the first author family name, and click 'Search'.
2. Identify the book in the results, and find the number of libraries at the bottom right of the entry, in the format: 'At ##Libraries'.

Altmetrics

Altmetrics are generally article-level metrics based on metrics from the social web for analysing and informing scholarship. Altmetrics measure the number of times a research output gets cited, tweeted about, liked, shared, bookmarked, viewed, downloaded, mentioned, favourited, reviewed, or discussed. It harvests these numbers from a wide variety of open source web services that count such instances, including open access journal platforms, scholarly citation databases, web-based research sharing services, and social media. For example:

- viewed: HTML views or PDF downloads of articles and papers, such as in [PLOS one](#)
- cited: used in mashups, forked on [GitHub](#), cited in [CrossRef](#) or by [Wikipedia](#)
- saved: by scholars in [Mendeley](#), [CiteULike](#), or [Zotero](#); bookmarked in [Diigo](#)
- discussed: [Twitter](#), [ResearchBlogging](#), [NatureBlogs](#)
- recommended: liked in [Facebook](#), reviewed positively in a journal or by an expert
- online attention: aggregation of mentions and number of sources.

New to QUT in 2017 – Altmetric Explorer. QUT researchers can now see who is talking about their research, and where. [Altmetric Explorer](#) aggregates mentions of their works in a number of sources, including news outlets, blogs, policy documents, social media and Wikipedia, to calculate an 'Attention Score'. This is represented by a multi-coloured 'doughnut', where each colour corresponds to a type of source; the more colourful the doughnut the wider the reach.



Downloads, page views

Article PDF Download or article view data can indicate interest or popularity. Tools that provide download information might be databases, repositories or a journal's website and include QUT ePrints and PLOS Journals.

Activity – Use [QUT ePrints](#) to find downloads, article and researcher statistics

To find the number of article or paper downloads:

1. Type the journal article title in quotation marks and click '*Search*'.
2. In the results, find the number of downloads next to the green arrow under the reference.

To find other article levels statistics, including altmetrics:

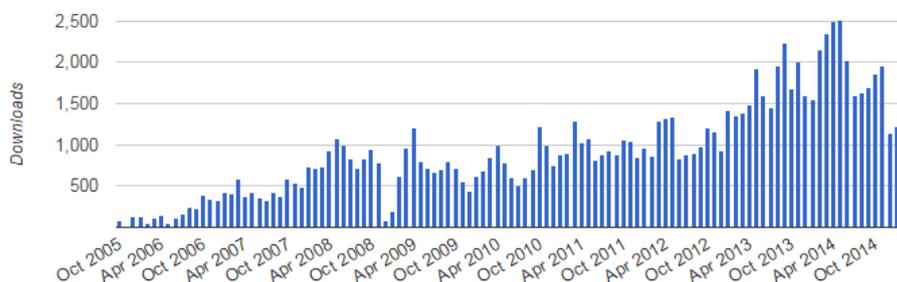
1. Type the journal article title in quotation marks and click '*Search*'.
2. In the results, click on the article title to open the article description
3. Under the abstract, from bottom left of the '*Impact and interest*' bar, click '*More statistics*'.

For a download statistics overview of specific researchers:

1. From the menu on the left, click on '*Person*', browse alphabetically, and click the entry.
2. At the top right of the resulting publications list, click: '*Statistics dashboard*'

The statistics dashboard gives a graphical overview, key figures, and most popular works. From the bottom of the page there are full reports.

Example: Here is a screen capture image from February 15, 2015 of downloads for QUT researcher [Marcus Foth](#).



Further information is available for [downloads by country](#) or downloads from [Downloads from QUT vs from elsewhere](#).

Activity – Use [PLOS Journals](#) to find article PDF downloads and more.

1. Enter the journal article title in quotation marks in [Google Scholar](#) or the search box in the specific [PLOS Journal's site](#).
2. In the results, click on the article title
3. In the article record, above the article title, click: 'Metrics'.

Example: This is a screen capture image from February 26, 2015, of key statistics for [this article in PLOS one](#).

Total Article Views		HTML Page Views	PDF Downloads	XML Downloads	Totals
8,831 <small>May 4, 2011 (publication date) through Feb 26, 2015*</small>	PLOS	7,355	1,142	56	8,553
	PMC	182	96	n.a.	278
	Totals	7,537	1,238	56	8,831

16.43% of article views led to PDF downloads

Benefits of altmetrics

- Immediate response to output – did you know that a research output is mentioned online every 1.8 seconds?
- Gather evidence of interest and engagement with the public, broader society.
- Interest outside of formal publishing.
- Altmetric aggregators provide contextual information about online attention.
- Altmetrics can improve the visibility of your work and your research profile.

Limitations of altmetrics

- Acceptance amongst members of the academic community is split and its use can be controversial.
- Measures attention not quality.
- Misuse of metrics has been raised as a concern by some.
- The value of metrics generated varies and is dependent on the user groups, measures, and fields of research.

Summary

The social web is increasingly used to share, interact with, comment on and enhance the visibility of scholarly research. Data on activity or level of attention an output receives is represented in many forms including number of downloads, tweets, mentions etc. Tools such as Altmetric Explorer have been developed to assist researchers and academics understand how mention of, and attention to their scholarly work in newspapers, interviews and other social web platforms may translate to their work being integrated into policy, guidelines etc. resulting in “research impact” as discussed earlier.