Lecture notes 2.

Scientific information and its sources: search, accumulation and processing. Scientometrics

Welcome to the second lecture on the Research Methods course.

Before we start, let's summarize what have you already learned.

You are now aware of definitions of science, basic and applied research

You learned about Branches and Hierarchy of Science

Research method (quantitative and qualitative)

Scientific method and its stages.

Ethics of scientific research.

Steps of research organizing and PACS

Moreover, you have classified the area of your own research and designed 6 steps of your research. We will certainly discuss this your control task assignments later.

Now I am going to help you to understand the basic metrics for evaluating and accounting for scientific publications so that you can use them to further plan and organize your research.

By the end of this lesson

you will know about sciencemetrics and main scientometric indexes

you will gain knowledge and skills to search for scientific information via scientometric platforms

you will be able to work with the Scopus platform

We live in an era of digitalization, where most scientific publications become data that can be processed and found.

For the convenience of working with such data, papers are assigned with a digital object identifier DOI , and authors assigned ResearcherID and ORCID

ResearcherID is an identifying system for scientific authors. The system was introduced in January 2008 by Thomson Reuters database.

The ORCID (Open Researcher and Contributor ID) is a nonproprietary alphanumeric code to uniquely identify scientific and other academic authors and contributors.

This addresses the problem that a particular author's contributions to the scientific literature can be hard to recognize as most personal names are not unique, they can change (such as with marriage), have cultural differences in name order.

So, the point is to provide a persistent identity for the author.

The combined use of the DOI with the ResearcherID allows a unique association of authors and research articles.

You can see examples of my research ID and DOI for the article here. As you can see, research IDs are different in different scientometric platforms. You are probably wondering how an author gets an ID or an article gets DOI. We'll come back to this later, for now, just take note of this.

Many scientists write and publish articles, how to find the publications you need?

How to ask a question to the author?

How do you know which of the journals and which scientist is the most "respectable" in a particular field of research?

So, you start looking for information. An acquaintance with scientometrics and its main indexes will help you with this.

Scientometrics is the field of study which concerns itself with measuring and analysing scientific literature.

Scientometrics is a sub-field of bibliometrics.

Major research issues include the measurement of the impact of research papers and academic journals, the understanding of scientific citations, and the use of such measurements in policy and management contexts.

In practice there is a significant overlap between scientometrics and other scientific fields such as information systems, information science, etc

Common scientometric indexes are as follows

Impact factor (IF)

Science Citation Index (SCI)

and Acknowledgement index

SCI is a citation index originally produced by the Institute for Scientific Information (ISI) and created by Eugene Garfield. It was officially launched in 1964. It is now

owned by Clarivate Analytics (previously the Intellectual Property and Science business of Thomson Reuters).

Acknowledgement index is a method for indexing and analyzing acknowledgments in the scientific literature and, thus, quantifies the impact of acknowledgements.

Like a citation index, it measures influences on scientific work

The impact factor (IF) of an academic journal is a measure reflecting the yearly average number of citations to recent articles published in that journal. It is frequently used as a proxy for the relative importance of a journal within its field; journals with higher impact factors are often deemed to be more important than those with lower ones.

The impact factor also was devised by Eugene Garfield, the founder of the Institute for Scientific Information. Impact factors are calculated yearly starting from 1975 for those journals that are listed in the Journal Citation Reports.

As you can see, calculating the impact factor is quite complicated. These calculations are performed by scientometric platforms.

A tricky question arises, since platforms are different, can the impact factors of one journal be different?

Alas, yes, a scientific journal may even have no impact factor at all in a particular database.

The impact factor of the journal should be checked in the Clarivate Analytics (or in the Thomson Reuters, it will be the same), this impact factor is the most valuable.

Other journal metrics can be journal quartile and percentile.

The h-index is an author-level metric that attempts to measure both the productivity and citation impact of the publications of a scientist or scholar.

The index is based on the set of the scientist's most cited papers and the number of citations that they have received in other publications.

The index can also be applied to the productivity and impact of a scholarly journal as well as a group of scientists, such as a department or university or country.

The index was suggested in 2005 by Jorge E. Hirsch, as a tool for determining theoretical physicists' relative quality and is sometimes called the Hirsch index or Hirsch number**.**

The h-index reflects both the number of publications and the number of citations per publication. The index is designed to improve upon simpler measures such as the total number of citations or publications.

The index works properly only for comparing scientists working in the same field; citation conventions differ widely among different fields.

Journal Impact Factor Percentile

In October 2015, Journal Citation Reports incorporated the Average Journal Impact Factor Percentile metric. This metric calculates the average Journal Impact Factor Percentile (JIF Percentile) scores from each field in which a journal is indexed.

The Journal Impact Factor Percentile transforms the rank in category by Journal Impact Factor into a percentile value, allowing more meaningful cross-category comparison**.** It is calculated by using the following formula:

$$Journal\ Impact\ Factor\ Percentile = \frac{(N - R + 0.5)}{N}$$

Where:

- ***N*** is the number of journals in the category
- ***R*** is the Descending Rank
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- As an example, if a journal has a JIF Percentile of 95.161 for Acoustics and a JIF Percentile of 80.573 for Chemistry, Multidisciplinary, the Average JIF Percentile will be (95.161%+80.573%)/2 = 87.867%.

Journal Impact Factor Quartile

The Journal Impact Factor quartile is the quotient of a journal's rank in category (X) and the total number of journals in the category (Y), so that (X / Y) = Percentile Rank Z.

Q1: $0.0 < Z \leq 0.25$

Q2: $0.25 < Z \leq 0.5$

Q3: $0.5 < Z \leq 0.75$

Q4: $0.75 < Z$

Note: InCites displays the best quartile for journals that appear in multiple Web of Science Research Areas. When a research area is specified, the quartile for that particular journal and research area is displayed

So, how to find out the impact factor of a particular journal? Or h-index? I can assure you that finding scientific information requires skills, just googling doesn't work! To trust the source of information, it would be good to check it first, right? Very reputable organizations are engaged in such verification and analysis.

International databases - the gold standards for research discovery and analytics. Amon them Scopus, Google Scholar, Publons, that is Clarivate Analytics owned platform, Web of Science where researchers can track their publications, peer reviewing activity, and journal editing work.

Scopus is the largest abstract and citation database of peer-reviewed literature: scientific journals, books and conference proceedings. You can find there the journal percentile.

ResearchGate is a network dedicated to science. You can download papers there for free.

We use the Web of Science database to determine "impact factor" and "ranking" for a journal.

You also can check a journal quartile (Q) here
https://www.scimagojr.com/journalrank.php

Enter Journal Title, ISSN or Publisher Name

The SCImago Journal & Country Rank is a publicly available portal that includes the journals and country scientific indicators developed from the information contained in the **Scopus**® database (Elsevier B.V.).

Learning Outcomes

you learned about sciencemetrics and main scientometric indexes

you obtained knowledge and skills to search for scientific information

you are able to work with the Scopus platform