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# Methods for online search of databases with scientific articles

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Abstract. The selection and use of bibliographic sources in doctoral research is a very important process that takes place until the thesis is finished. How researchers carry out those activities can have a major impact on the quality of the doctoral thesis and scientific publications. This article tries to answer the following questions: "how do researchers choose a database of scientific articles to document the current status in the field the study ?" and "how do researchers look for information relevant to the topic of doctoral research ?".

Keywords: scientific database, academic search engine, scientific articles, online search.

#### 1. Introduction

The review of the literature and the scientific research results in a specific discipline or a multidisciplinary topic is an important first step in a doctoral research project. The increasing volume of research materials makes it increasingly difficult for researchers to keep track of past and current findings. If researchers fail to connect empirical or theoretical analyses with past knowledge, scientific continuity may suffer, so the relevance and impact of research can be reduced.

Searching in databases or through search engines, with the highest efficiency and efficiency, is a necessary skill in education and research practice. Thus, researchers should be encouraged to be responsible and aware of the need to acquire the online search ability, so that they can use the appropriate tool for research defined objective.

Considering the above ideas, in this article will be presented the important criteria used to identify the databases with scientific articles relevant to the subject studied and how these tools can be used to achieve the research objectives.

#### 2. Criteria for selecting databases with scientific articles

**Credibility** is a very important criterion when selecting databases with scientific articles to build the reference list for a research project. At the top of the pyramid of publication classification are ISI journals, for which Thomson Reuters calculates and publishes the impact factor in Journal Citation Reports [1] as the ratio between the number of citations by other authors of articles and the number of articles published in a certain period of time. The Romanian Minister of Education and Research provides researchers and doctoral students with a list of the journals from the Science Citation Index Expanded or the Social Sciences Citation Index, ranked in descending order by the non-impact factor (IF), according to the JCR 2018 edition of June 2019. [3], and the requirements regarding the accepted databases for each particular research area [2]. For example, for Mechanical Engineering, Mechatronics and Robotics are indicated as accepted Web of Science and SCOPUS databases. Other sources

considered to be reliable are articles published in BDI indexed journals, articles for conferences (ISI proceedings, indexed BDI, international and national), ISSN / ISBN publications, patents and doctoral theses [4].

Access to databases with scientific articles, books, collections from conferences, etc. is not entirely free. Therefore, the selection of databases is limited by the access possibilities that the Educational Institutions have. Romanian researchers can check which databases can access throught Education Institutions they study at, on Anelis website (http://www.anelisplus.ro/?page\_id=68). From the comparative analysis of the list of ISI publications made available by the Romanian Ministry of Education and Research [3], with the list of publications from the two databases, Web of Science and Scopus, results that 99-100% of journals in the "Science" filed are indexed in Web of Science database and 96-98% in SCOPUS. Basically, in the field of "Science", the researchers can use either of these two databases (see figure 1).



Figure 1. Weight of publications in the field of Science

In the field of "Social science", the SCOPUS database has a much greater coverage than the Web of Science (see figure 2).



Figure 2. Share of publications on the field of "Social science "

As an alternative to the databases are search engines, such as Google Scholar, which indexes documents with an apparently academic structure, thus offering potentially more comprehensive coverage of the scientific literature [5], access is free or partially free to some parts of the documents (eg title, author, summary, publisher). The evaluation criteria used by Google Scholar are established almost similar to ISI databases, based on the number of citations in a given time period (see

https://scholar.google.com/intl/en/scholar /metrics.html#metrics). When using Google Scholar as a search engine, the researchers must consider the following:

Google Scholar has potentially more comprehensive coverage of the scientific literature compared to the two databases, Web of Science (WoS) and Scopus [5]

Google Scholar finds significantly more references (articles cited) than WoS and Scopus. Almost all citations found by WoS (95%) and Scopus (92%) were also found by Google Scholar. On the other hand, Google Scholar found a substantial amount of unique citations that were not found by the other databases (see Figure 3) [5].

About 50% of the results displayed by Google Scholar are not from journals, but from theses/dissertations, books or book chapters, conferences, unpublished materials and other types of documents. Thus, the scientific impact is much lower than the results obtained from searches in Web of Science or Scopus, because many of the documents found by Google Scholar have a low impact [5].



Figure 3 . Percentage of unique citations resulting from the analysis of approx. 2.5 million articles cited

An efficient and advanced search system, a database or a search engine, should facilitate the finding of most relevant results, allow the rapid identification and retrieval of records and the reproduction of search results using the same methods [6]. From the comparative analysis, it turns out that the two Web of Science and Scopus databases can be used as primary sources of documentation, providing advanced search methods, while Google Scholar can be used as the secondary source of documentation (see Table 1).

	Web of Science	SCOPUS	Google Scholar
Торіс	multidisciplinary	multidisciplinary	multidisciplinary
BD size	73m +	70M +	389M +
Categories of records	21	13	3
Old data	1900	1861	1700
Access type	Surcharge	Surcharge	Open + access for some documents
Section search (eg conclusions)	YES	YES	NOT
Search for "full text"	NOT	NOT	YES
Maximum text length to search for	1000	1000	<256
Language support	EN	EN	EN
Boolean search	YES	YES	just NOT
Exact search	YES	YES	YES
Filtration	18	11	2 (title, the whole document)
Display the citation list	YES	YES	YES
Advanced search (date, author, publication, etc.)	YES	YES	YES
Help	YES	YES	YES
Maximum number of results	100000	2000	1000
Download documents	5000	20000	0
Reproducibility (time, location)	YES	YES	NOT
SOURCE TYPE	PRIMARY	PRIMARY	SECONDARY

Table 1 . Comparative analysis of WoS and Scopus databases, and Google Scholar

# 3. Search methods in databases with scientific articles

The next step in working with databases, after selecting the database relevant to the topic of doctoral research, the user guides will be consulted [7] [8] to identify the available search options and to draw up a list of search criteria. Databases like Scopus and Web of Science offer multiple search possibilities, by keywords, author, institution, sentences using logical operators. The displayed results can be filtered by date, the number of citations, author, etc. At the same time, the databases are becoming more and more intelligent, offering advanced analysis tools, the possibility of activating alerts and exporting documents. The search criteria must be relevant to the topic of doctoral research and can be modified at any time during the process of searching bibliographic references. The list of search criteria is limited by the options offered by the databases, respectively:

- year of publication: the researcher will evaluate which time interval is relevant for the field studies to obtain fresh information;
- **document type**: depending on the search objective, the relevant document type can be defined (articles published in magazines or conferences, books, etc.); for example, if the objective of the search is to establish the current state of the art, the researcher can start the search with the synthesis documents (literature review, systematic review, survey).
- **authors**: the researcher can identify relevant authors in the field that are most cited and have made major contributions;
- search terms and keywords: a list of relevant terms, synonyms and keywords will be drawn up and constantly updated; this list can be made by scanning the relevant documents from searches, both in databases and in Google Scholar;

- indicators: the selection of relevant documents can be done based on indicators, such as the number of citations, impact factor, h-index;
- **extended search**: the researcher can also scan the bibliographic references in the documents displayed after the search, and/or subsequent citations;
- **publications/topic**: relevant documents can be found by searching publications/topics relevant for doctoral research;
- language: Searches in WoS and Scopus databases can be done in English; google scholar offers much more search results in English than those in Romanian.

The type of searching the databases with scientific articles can be: simple - search by keywords and then the results can be filtered using other criteria; search for citations - articles that cited a particular article/magazine/author / etc .; search using multiple fields - for example, keywords, author, title, ISBN, publisher, etc .; advanced search - in addition to all the options mentioned above, the search can be done using the logical operators (AND, OR, NOT).

# 4. Conclusions

Determining the current stage of a research subject depends on the skills of the researcher to identify and use the appropriate tools for the defined goals. Searching for the results of scientific research with the help of search engines, such as Google Scholar, is not always the best solution because the search results list includes multiple categories of documents that have different levels of credibility. However, search engines can be used to find information that allows the researcher to become familiar with a topic, identify relevant keywords and search terms, publications and authors with a major impact on the filed studied. The databases will be selected according to the level of credibility, functionalities, and access available through the Education Institution where the researcher is enrolled. It is recommended that scientific articles be searched using specialized databases that offer the possibility of advanced search based on criteria established by the researcher, criteria that it is recommended to be constantly updated.

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