

SCIENTIFIC & TECHNICAL AND OTHER TYPES OF POLICIES,
INSTITUTIONAL CHANGES IN SCIENCE, MODELING IMPACTS

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IN SEARCH OF AN ALTERNATIVE
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Abstract. In the context of the recent developments in Russia, such as the termination of activities of several major scientific publishers and the blocking of access to two prominent bibliographic databases, Scopus and Web of Science, Russian scientists face a challenge in continuing their research and contributing to the scientific and educational community. This article aims to explore the potential of open bibliographic databases as a viable alternative to these two databases in addressing the main objectives of scientific and educational policies. The research methodology employed in this study involves a content analysis of relevant sources that examine science as a specialized field of human activity. Additionally, various aspects of utilizing bibliographic databases in decision-making processes related to scientific and educational policies and during actual research are considered. A comparative analysis is conducted on selected open databases to assess their suitability for different stages of scientific knowledge production. The study resulted in the characterization of several open access bibliographic databases: Russian Index of Scientific Citation (RISC), AMiner, The Lens, Dimensions, and OpenAlex. The criteria used for the analysis were: volume of content, period covered, availability of filters, data visualization tools, data upload capabilities, and additional features. Based on these criteria, it was proposed to form a subject area research program using these open bibliographic databases. It was concluded that these databases can fully replace Scopus and Web of Science in terms of solving the problem of defining the boundaries of world science and conducting scientific research. However, at the moment, there is no alternative to Scopus and Web of Science for evaluating scientific results. The study emphasizes the importance of using open bibliographic databases in scientific research and the need to develop them further. The results of the study can be useful for researchers, scientists, and policymakers who are interested in improving the quality and efficiency of scientific research in Russia.

Keywords: bibliographic databases, scientometric indicators, production of scientific knowledge, scientific and educational policy, academic research.

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НАУЧНО-ТЕХНИЧЕСКАЯ И ИНЫЕ ВИДЫ ПОЛИТИКИ, ИНСТИТУЦИОНАЛЬНЫЕ ИЗМЕНЕНИЯ В НАУКЕ, МОДЕЛИРОВАНИЕ ВЛИЯНИЙ

ОРИГИНАЛЬНАЯ ИССЛЕДОВАТЕЛЬСКАЯ СТАТЬЯ

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ОТКРЫТЫЕ БИБЛИОГРАФИЧЕСКИЕ БАЗЫ ДАННЫХ: В ПОИСКАХ АЛЬТЕРНАТИВЫ SCOPUS И WEB OF SCIENCE

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Аннотация. В условиях прекращения деятельности в России ряда мировых издательств научной литературы и блокировки российским ученым доступа к базам Scopus и Web of Science возникает необходимость их замены для решения основных задач научно-образовательной политики. Цель данной статьи состоит в выявлении возможностей использования открытых библиографических баз данных в качестве альтернативы Scopus и Web of Science. Методология исследования включает контент-анализ источников, посвященных изучению науки как особой сферы человеческой деятельности, исследованию различных аспектов использования библиографических баз при принятии решений в сфере научно-образовательной политики и непосредственно в ходе проведения исследований; а также сравнительный анализ отобранных библиографических баз с точки зрения возможности их использования на отдельных этапах производства научного знания. Результатом исследования стала характеристика библиографических баз открытого доступа: Российский индекс научного цитирования (РИНЦ), AMiner, The Lens, Dimensions, OpenAlex с использованием таких критериев, как объем контента; охватываемый период; наличие фильтров; наличие инструментов визуализации данных; возможность загрузки данных; дополнительные возможности, предоставляемые базой. Предложен план формирования программы исследования предметной области с использованием открытых библиографических баз данных. Сделан вывод о том, что открытые библиографические базы могут в полной мере служить заменой Scopus и Web of Science в решении задач определения фронтиров мировой науки, а также при разработке и проведении научных исследований. Подчеркнуто, что для стадии оценки научных результатов у государства пока нет альтернативы Scopus и Web of Science.

Ключевые слова: библиографические базы, наукометрические показатели, производство научного знания, научно-образовательная политика, академические исследования.

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INTRODUCTION

In 2022, Clarivate Analytics and 15 of the world's largest scientific literature publishers including Elsevier decided to cease operations in Russia. The Russian scientific community was initially perplexed and even confused by this decision. Blocking access to the Web of Science (WoS) and Scopus databases was

the most serious manifestation of the “cancel culture” towards Russian science. Several high-profile statements were made about the impending isolation of Russian science and its catastrophic consequences (The Russian Academy of Sciences stated...).

Scopus and WoS undoubtedly occupy a pivotal position in the advancement of modern

science. These databases provide valuable insights into scientific and technological frontiers, enabling the evaluation of academic leadership among researchers and universities and the contribution of individual countries to global scientific advancement. Furthermore, using bibliographic databases can significantly enhance the efficiency and productivity of scientific research. Thus, a study that involved 52 universities and was published on the WoS website demonstrates a significant correlation between database resources and academic research productivity, particularly for applied sciences (Rafi, Jian Ming, Ahmad, 2018).

This challenging situation in Russia is further complicated by contradictory official statements. The Russian government has imposed a moratorium on the requirement to publish in journals indexed in international databases (Decree of the Government of the Russian Federation, 2022; Decree of the Government of the Russian Federation, 2023). However, scientometric indicators from Scopus and WoS remain in use when evaluating applications and reports from universities that have joined the Priority 2030 programme (Order of the Ministry of Science and Higher Education of the Russian Federation, 2024), as well as Russian Science Foundation grant applications and reports. They are also used in incentive systems and requirements for effective contracts for scientific and teaching staff at leading Russian universities.

Given these circumstances, bibliographic databases should be objectively evaluated in terms of their role in contemporary Russian science. This requires an analysis of the actual process of scientific knowledge production, which is characterized by its staged nature, the involvement of various actors, and objectively determined features specific to the Russian context. Comprehension into the specifics of the organisation, the interests of key actors and Russian determinants would reveal whether the issue of access blocking is genuine or contrived.

Therefore, this article aims to explore the options for using alternative open bibliographic databases while Scopus and WoS are blocked.

In order to achieve this aim, the following objectives were addressed:

1. Characterize the use of bibliographic databases at different stages of scientific knowledge production, while considering the particularities of the organisation of science in Russia.
2. Justify the selection of the sample of alternative open bibliographic databases.
3. Assess the potential for using alternative open resources at different stages of scientific knowledge production.
4. Provide recommendations on the use of alternative bibliographic databases in conducting research and shaping scientific policy.

METHODOLOGY

The methodological basis of the study consisted of three groups of sources. The first group comprised publications devoted to the study of science as a distinct sphere of human activity.

Adhering to the views of Russian scientists on science as a special type of activity aimed at obtaining and systematizing objective knowledge about nature and society (Edronova, Ovcharov, 2013; Mirsky, 2004; Stepin, 2015), the authors deem it feasible to consider science primarily as a process of producing new knowledge. This process includes various stages, which were identified in accordance with the requirements and conditions of the current National Standards (GOST, 2021).

The second group of sources covers issues related to the use of bibliographic databases directly in the course of scientific research (Chichorro et al., 2022; Aswathy, Suresh, 2023; Chernova, Turgel, Usoltceva, 2023; Dzhunushaliev, Teuber, 2024).

Finally, the third group of sources refers to the use of bibliographic databases for decision-making in the field of science policy and science management. Among these, the works of Akoev and Moskaleva, which focus on the use of bibliographic databases for managing university research activities, are particularly noteworthy (Akoev, 2021;

Moskaleva, Akoev, 2020). Additionally, studies revealing the peculiarities of using scientometric tools to assess the development of science at the level of individual countries are of great importance (Kochetkov, 2023; Sukharev, 2024; Braun, 2022).

As new data sources emerge, an increasing number of publications are focusing on their comparison, including in relation to WoS and Scopus. For example, an article by Lutai and Lyubushko presents a comparison of the meta-data quality of the most popular open-access search tools for scientific publications with free data export capabilities (Lutai, Lyubushko, 2022). Similar research has been conducted by Delgado-Quirys and Ortega, contrasting the volumes of metadata represented in the seven most popular databases in the scientific world (Dimensions, Google Scholar, Microsoft Academic, OpenAlex, Scilit, Semantic Scholar and The Lens) (Delgado-Quirys, Ortega, 2024). Using citation metrics from Microsoft Academic, Dimensions, and COCI, Мартн-Мартн et al. assess the scope of scientific sources in different subject areas (Мартн-Мартн et al., 2021).

Investigating whether CrossRef coverage helps track publications in the arts and humanities, Borrego, Ardanuy and Arguimbau from the University of Barcelona conclude that this platform offers more sources than Scopus, as it includes journals from Eastern and Southern Europe, as well as the Global South. The geographical diversity of sources in CrossRef enhances the platform's potential for exploring accumulated knowledge in scientific fields with a pronounced national focus and orientation toward local audiences (Borrego, Ardanuy, Arguimbau, 2023). HSE University (Russia) held a series of academic seminars on new data sources, discussing the main features of OpenAlex, Web of Science, Scopus, Google Scholar and the Russian Index of Scientific Citations (RINC) bibliographic databases (Online manuscript on scientometry, 2022).

Although there are publications analyzing various data sources, contemporary scientific literature does not provide sufficient comparative analysis of scientometric search tools,

covering only certain aspects of using bibliographic databases alternative to Scopus and WoS. Therefore, this study analyzes open bibliographic databases that are most frequently used by Russian researchers. The analysis covers a range of indicators considered relevant for the development of specific scientific and educational policy objectives. As the review of sources shows, no similar studies have been conducted to date.

The study consisted of four stages. First, the study identified the features of Russian scientists' use of bibliographic databases at different stages of scientific knowledge production.

Second, bibliographic databases were selected using the PRISMA method, the most prevalent method for conducting systematic reviews of scientific research (Siddaway, Wood, Hedges, 2019). A complete list of possible alternatives to Scopus and Web of Science is provided in the Appendix. The method involved using Yandex and Google search engines to find 31 bibliographic databases using the query term "bibliographic database." Furthermore, during the screening stage, narrow-profile (thematic) databases, academic search engines, professional networks (Research Gate) and the CORE research aggregator were excluded from this list. During the analysis stage, a list of five bibliographic databases was compiled (Table 1). The main criteria for selecting the databases included:

- open access (access via free subscription);
- provision of tools for conducting scientometric analysis;
- no prior registration required;
- free access within the Russian Federation.

The third stage of the study involved a comparative analysis of selected bibliographic databases in terms of their potential use in shaping state scientific and educational policy. The comparison criteria were as follows:

- the volume and depth (covered period) of content;
- the availability of criteria for indexing publications in the database;
- the availability of scientometric analysis tools;

Table 1. Bibliographic databases selected for the analysis**Таблица 1.** Библиографические базы данных, отобранные для проведения анализа

Database	Owner / Country	Founder / Owner	Language
RINC https://elibrary.ru/	Russia	Scientific electronic library eLIBRARY.RU	Russian
AMiner https://www.aminer.org/	China	Tsinghua University	Chinese
The Lens https://www.lens.org/	Australia	Non-profit organisation Cambia	English
Dimensions https://app.dimensions.ai/	United Kingdom	Digital Science (international group of developers)	English
OpenAlex https://openalex.org/	United States	Non-profit organisation OurResearch	English

Note. Source: compiled by the authors.

– data export options and formats.

The corresponding Scopus and WoS indicators were used as a basis for comparison.

When compiling the list of criteria, we proceeded from the assumption that the volume and comprehensiveness of the content covered is a key parameter of databases that ensures reliable results (Kalistratov, 2019; Pranckute, 2021). The period covered was determined by the availability of a fully digitized data archive rather than individual publications. The practical focus was on the technical capabilities for data export, the availability and variety of filters as well as the availability and quality of data visualization tools.

The final stage draws conclusions about the advantages and limitations of bibliographic databases alternative to Scopus and WoS, as well as the possibilities for their use in the formation and implementation of scientific and educational policy tasks at various levels.

RESULTS

Using bibliographic databases at different stages of scientific knowledge production

Two global processes that have been unfolding since the second half of the 20th century determine the role of bibliographic databases in the development of science. On the one hand, there has been explosive growth in the volume of information flows and scientific sources of information. While at the beginning of the 20th century there were about 1,000 scientific journals published worldwide

(Solodkin, 2013), at the time of publication of this article, according to Scimago Journal & Country Rank, the Scopus database includes 68.65 million documents and indexes 29,200 journals (SJR, 2024). Bibliographic databases developed using modern information technologies enable researchers to optimize their work with information flows, which would be impossible to master relying solely on human cognitive abilities.

On the other hand, government control over the activities of the scientific community has been expanded and deepened. The transition to intensive scientific development has stimulated its integration into the system of political and economic institutions of the state. Regardless of the commitment to academic freedom, the actual opportunities for individual scientists and research teams to make choices and set goals have been significantly reduced. The state has become a direct participant in the production of scientific knowledge, transitioning over several decades from monitoring the economic efficiency of individual expenditure items to comprehensively assessing the effectiveness of science and scientific communities using a variety of quantitative indicators.

As a result, the use of bibliographic databases becomes increasingly significant, as it provides insight into the objectives and trends of research development in specific subject areas, and contributes to decision-making in the field of public science policy related to

resource allocation and performance evaluation. However, according to the authors' analysis, the scale, objectives and nature of their use will vary significantly depending on the stage of production of new scientific knowledge and the needs of its key actors. The results of this analysis are summarized in *Table 2*. The key actors are the state, scientific organisations, researchers and/or research teams. While the corporate sector increasingly plays a role in the development of modern science, the authors believe that it cannot be considered a key actor¹ in Russia at this stage and is therefore excluded from the analysis. The stages of the scientific knowledge production are distinguished with consideration of the incorporation of the state as a key actor that makes decisions

when justifying scientific policy and evaluating its effectiveness.

Hence, bibliographic databases are implemented into the process of scientific knowledge production guided by a strict internal logic. When determining research directions, bibliographic databases are primarily used to analyze the relevance of research areas and collaborations. When developing the research design and conducting the research, a key consideration is the ability to use the bibliographic and abstract resources provided by the databases. For the state as one of the key actors, bibliographic databases allow for the rationalization of funding decisions based on quantitative indicators, enabling a clear and formally objective ranking of applications, priorities, research teams, etc.

Table 2. Specifics of the use of bibliographic databases in the production of scientific knowledge

Таблица 2. Специфика использования библиографических баз в процессе производства научного знания

	Stage of scientific knowledge production	Key actor			Features of database usage
		State	Scientific organisation	Researcher/ research team	
1	Identification of frontiers and selection of research directions		+	+	Scientometric analysis of the prominence of research areas and identification of potential collaborations in Russia and abroad
2	Allocation of resources	+	+		Scientometric analysis of the potential for implementing applications from scientific organisations and/or researchers (teams) based on previously published and planned research results
3	Development of a research strategy		+	+	Using bibliographic and abstract resources from databases
4	Conducting research		+	+	Using bibliographic and abstract resources from databases
5	Monitoring and evaluation of results	+	+		Quantitative scientometric analysis of reports using the results published during the research

Note. Source: compiled by the authors.

¹ In 2022, Russia's domestic research and development expenditures amounted to 1,435.9 billion rubles. Of this amount, 207.6 billion rubles, or 14.5%, came from the business sector (Russian Statistical Yearbook, 2023).

Consequently, it becomes clear that the lack of access to current scientific information is by no means the only repercussion of blocking access to Scopus and WoS databases. Furthermore, due to their built-in analytical tools, these databases have proven to be virtually the only data source for ensuring the external formal rationality of decisions in scientific policy in the Russian Federation, both at the initial and final stages of the research cycle.

Overview of open bibliographic databases alternative to Scopus and WoS

RINC (Russian Index of Scientific Citations) is a national bibliographic database founded in 2005 by the Federal Agency for Science and Innovation to create a unified registry of scientific publications by Russian authors for public access. RINC focuses exclusively on Russian researchers, thus preventing an assessment of global scientific trends. However, many publications by Russian authors in foreign journals (including those from Scopus and WoS databases) cannot be viewed on the platform, further hindering an adequate assessment of a researcher's scientific standing.

AMiner (formerly ArnetMiner) is a relatively new bibliographic database from Tsinghua University that has been in operation since 2006. This database is designed to assist researchers in conducting academic research and intellectual data analysis, thereby gaining a deeper understanding of the large and diverse networks formed by authors, scientific publications, journals, and organisations.

AMiner offers researchers a sufficiently large set of analytical functions, including analysis of the social impact of publications, recommendations for collaboration, analysis of the thematic similarity of scientific publications and research into the evolution of a field of knowledge (Wan et al., 2019). AMiner was originally created as a project for analyzing and extracting data from social networks. Some of its filters can be considered innovative, with options such as gender characteristics of authors and the ability to sort researchers by publication activity and

academic status. Of particular interest is the identification of "rising stars" in a given field, which allows AMiner to be used not only for retrospective analysis, but also as a tool for scientific forecasting.

Since AMiner does not offer data visualization tools, its analytical capabilities are to some extent inferior to those of other databases, e.g., Lens or Dimensions. Nevertheless, it is useful for obtaining an overview of the academic world of Chinese researchers. The provision of unique filters for sorting authors and the availability of a large number of sources not only in English but also in other languages suggests that AMiner could be used in conjunction with other bibliographic databases to form a more complete picture of the scientific world.

The Lens is a bibliographic database of patents and scientific publications that aggregates data from other bibliographic databases such as PubMed and Crossref into a single deduplicated array (excluding duplicate copies) with a unified search syntax. As with other bibliographic databases, Lens offers analytics and visualization capabilities for information by country, organisation, and area of research. When searching for information, filters can be set by year, document type, and funding source. Publications without citations can be excluded. To a large extent, Lens' functionality is similar to that of the Science Direct platform, although in contrast to it, Lens offers significantly greater coverage of scientific sources. In addition, as opposed to Science Direct and other competing databases, Lens allows data to be exported in JSON format with greater detail compared to RIS and CSV formats. Along with built-in analytics visualization, a key advantage of Lens is the ability to use exported data to create bibliometric networks using VOSviewer.

Dimensions is a scientometric database and search and analysis platform that provides scientometric information through a range of information products and solutions. Dimensions distinguishes itself by offering a significant volume of information free of charge, including

data visualization as tables and charts by researchers and sources, ranked by number of citations, as well as data on publication and citation trends. However, some of the advanced information related to searching for patents, grants, or metadata downloads requires payment.

OpenAlex is a bibliographic database of scientific works launched in 2022 that categorizes information by author, institution, publication source, and research subject. Numerous scholars consider it an alternative to Google Scholar, Scopus and WoS. Although OpenAlex has no expert selection of sources, the service has application programming interfaces (APIs) that allow users to filter and group information to obtain scientometric data. Since February 2024, OpenAlex has been assigning topics to all publications, in line with the Scopus subject classification system. In this regard, an important advantage of OpenAlex is that topics are assigned to individual articles rather than defined at the journal level, thus allowing for a more accurate construction of a global knowledge network. In addition, in 2024, OpenAlex launched a new interface, which provided researchers with fundamentally new opportunities for conducting publication analytics, obtaining and visualizing information about publications,

authors, research organisations, etc., whereas previously programming skills in R and Python were required.

Comparative analysis of the scientometric potential of open bibliographic databases alternative to Scopus and WoS

Currently, Scopus covers over 82 million publications from more than 29,000 scientific journals in various scientific fields. The Web of Science (WoS) platform hosts over 34,000 journals with a total of over 70 million scientific papers. The volumes of content covered by alternative databases compared to Scopus and WoS are shown in *Figure 1*.

When analyzing the content included in bibliographic databases, not only the number of publications should be taken into account, but also the period covered by the archive and the existence of selection criteria for indexing in the database. Data describing the content of the analyzed bibliographic databases are presented in *Table 3*.

With rigid criteria for selecting journals for indexing, Scopus and WoS provide a higher degree of reliability and scientific significance (Pranckutė, 2022). Meanwhile, Scopus and WoS face criticism for bias against non-English publications and unequal representation of

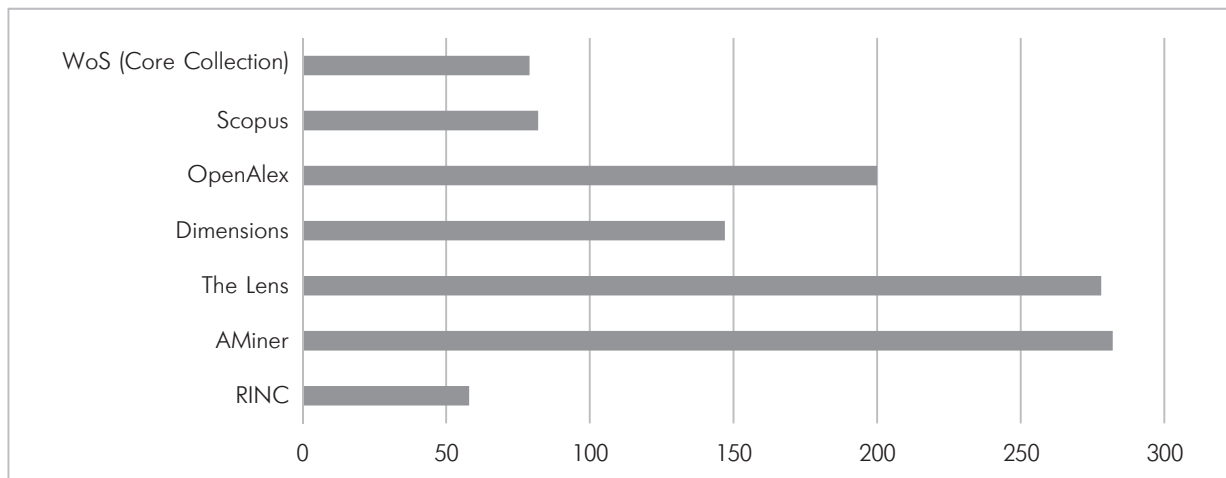


Figure 1. The number of publications in bibliographic databases, mln.

Рисунок 1. Число публикаций в библиографических базах, млн шт.

Note. Source: compiled by the authors.

Table 3. Characteristics of the content of bibliographic databases**Таблица 3.** Характеристика контента библиографических баз

Database	Content volume	Coverage period	Indexing criteria in the database
RINC	Over 58 million publications, including scientific articles, dissertations, book chapters, R&D	From 2005 to present	Scientific works released by publishing houses can be added to RINC after scientific review based on an agreement
AMiner	Over 282 million publications, open datasets, patents	From 2005 to present	Retrieves publications from electronic online libraries
The Lens	Over 278 million scientific publications and 152 million patents	From 1980 to the present	Extracts publications from other electronic databases, compiling them into a single source
Dimensions	Over 147 million publications, 30 million datasets, 7 million grants, 159 million patents, 1.8 million policy documents, 814,000 clinical trials	From 1665 to the present	Indexes publications with a DOI from open sources (Crossref, PubMed, etc.)
OpenAlex	Over 200 million scientific publications (including preprints), over 13 million authors from over 100,000 institutions	From 2000 to the present	Indexes publications using data from DOAJ, Crossref, and ORCID
Scopus	Over 82 million scientific publications, patents	From 1788 to the present	Compliance of journals with h-index, CiteScore, SJR, SNIP indicators set by agencies providing research grants
Web of Science	79 million in the Core Collection, with an additional 171 million publications in regional database platforms	From 1900 to the present	28 journal evaluation criteria, including 24 quality criteria and 4 impact criteria

Note. Source: compiled by the authors.

countries, reducing their ability to provide an objective picture of the scientific world.

When considering the instrumental capabilities of alternative bibliographic databases in conducting scientometric analysis, it should be noted that Elsevier and Clarivate Analytics, which own Scopus and WoS, focus primarily on scientific analytics and scientometrics to assist scientists and researchers. The companies provide analytical add-ons (SciVal and InCites) that allow users to visualize a wide range of metrics characterizing the scientific activity and scientific influence of individual countries, organisations, and researchers, as well as to obtain up-to-date information (Panin, 2019).

Nonetheless, the filters offered by alternative databases, as well as free analytical data visualization tools, allow for solving a considerable number of scientometric issues. A comparison

of scientometric analysis tools offered by alternative bibliographic databases with the instrumental capabilities of Scopus and WoS is presented in *Table 4*.

The format of the exported data has significant importance in terms of the possibilities for conducting scientometric analysis using free software products such as VOSviewer, CiteSpace, BibExcel and Bibliometrix. In particular, data in CSV format can be used to create bibliometric networks linking various objects (publications, authors, keywords, etc.) with the help of VOSviewer. *Table 5* outlines the data export capabilities offered by bibliographic databases.

DISCUSSION

Determining which alternative database will provide the most reliable information for characterizing trends in scientific research is quite

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and the Web of Science

Table 4. Characteristics of the analytical tools of bibliographic databases

Таблица 4. Характеристика аналитического инструментария библиографических баз

Analytical tool	Database						
	Scopus	Web of Science	RINC	AMiner	The Lens	Dimensions	OpenAlex
publication filtering tool:							
year	+	+	+	+	+	+	+
author	+	+	+	+	+	+	+
subject area	+	+	+	+	+	+	+
type	+	+	+		+	+	+
funding source	+	+			+		
organisation	+	+	+		+		+
publisher	+	+			+		
journal	+	+	+		+	+	
country	+	+		+	+		
open access	+	+			+	+	+
publication language	+	+		+			
h-index	+	+		+			
visualization tools:							
diagrams	+	+	+		+		
tables	+	+			+		
maps	+	+			+		
tag cloud	+				+		
Additional features:			Availability of analytical indicators reflecting the scientific impact of publications in a keyword-based data selection	Filtering authors by gender. Sorting search results by authors' scientific productivity indicators and academic status.	Exclusion of publications without citations		Obtaining additional analytical information using the R and Python programming languages

Note. Source: compiled by the authors.

Table 5. The possibilities of downloading data from bibliographic databases

Таблица 5. Возможности выгрузки данных из библиографических баз

Database	Data download option
RINC	Download by article
AMiner	Download by article
The Lens	Export in CSV, RIS, BibTeX, JSON, JSONLines file formats
Dimensions	Export in XLSX – Excel, CSV, BibTeX file formats
OpenAlex	Download search results in volumes of up to 100,000 at a time. Download analytics data in CSV format.

Note. Source: compiled by the authors.

difficult, since each has certain advantages in specific areas. We believe that the choice of a particular database should be determined by the opportunities it offers for solving specific research goals. *Table 6* summarizes the bibliographic databases that have proven most effective in addressing the challenges of developing and implementing scientific and educational policy at specific stages of scientific knowledge production.

Table 6 provides evidence that open bibliographic databases can fully replace Scopus and WoS in identifying the frontiers of global science and in developing and conducting scientific research.

Given the availability of various analytical tools provided by bibliographic databases, their comprehensive use in solving specific research challenges is advisable in order to form the most complete picture of the global scientific landscape of knowledge in a particular subject area.

For example, the following algorithm for using open bibliographic databases can be suggested in terms of developing a university research strategy and conducting research by scientific teams or individual researchers (*Fig. 2*).

However, alternative databases including RINC should not be expected to resolve the challenges of objective evaluation of Russian scientists' research outcomes and understanding their contribution to global science.

These factors largely determine the continued use of Scopus and WoS scientometric indicators in the criteria for evaluating the effectiveness of scientific activity at universities and by individual researchers.

CONCLUSION

The study revealed that, given the current restrictions on Russian researchers' access to the Scopus and WoS analytical tools, the use of a number of alternative open-access bibliographic databases provides equally valuable

Table 6. The possibilities of using bibliographic databases at different stages of scientific knowledge production

Таблица 6. Возможности использования библиографических баз на разных стадиях производства научного знания

Stage of scientific knowledge production	Bibliographic database	Key advantages of use
The definition of frontiers and the selection of research directions	AMiner	Comprehension of new breakthrough areas of research
	OpenAlex	Significant coverage of sources, which, however, does not play a major role in perspective analysis. Provides extensive opportunities provided that information is processed in API.
Development of a research strategy	Dimensions RINC	Search for foreign and Russian scientific partners
Conducting research	The Lens	Provides the most comprehensive source of basic information on key areas of scientometric analysis, as well as access to scientific publications.
	AMiner	Particularly interesting for providing a social portrait of researchers, identifying new breakthrough areas and their representatives.
Monitoring and evaluation of research results	RINC	Serves as a tool for comparative analysis of the activities of individual Russian researchers, taking into account differences in publication activity and citation practices

Note. Source: compiled by the authors.

Open bibliographic databases: in search of an alternative to Scopus and the Web of Science

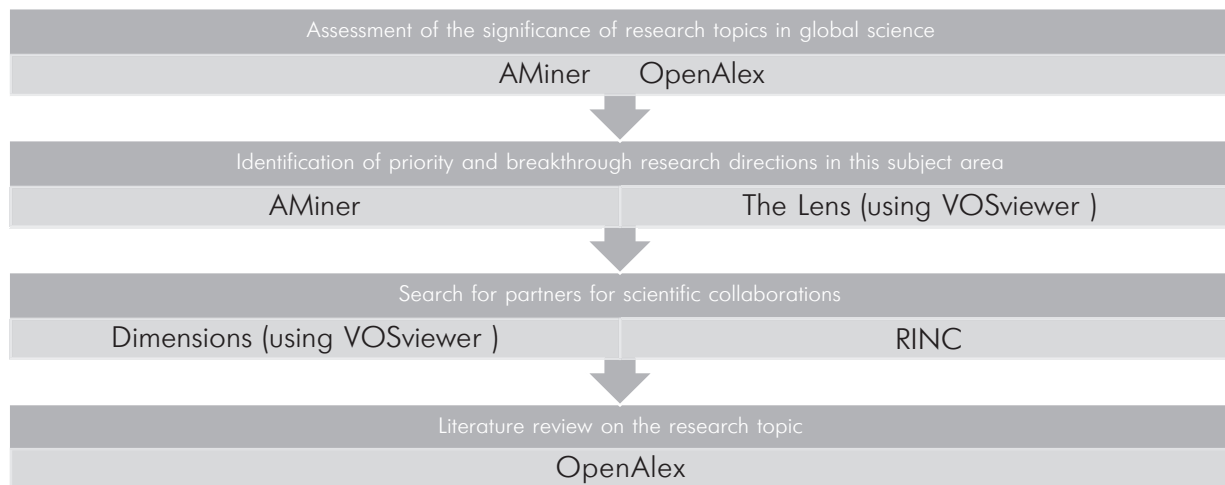


Figure 2. The algorithm for the creation of a program for studying a subject area using open bibliographic databases.

Рисунок 2. Алгоритм формирования программы исследования предметной области с использованием открытых библиографических баз

Note. Source: compiled by the authors.

information on trends in global scientific development. Moreover, in terms of some parameters, alternative databases appear to be more effective in the stages of scientific knowledge production related to defining global frontiers and developing and implementing research strategies. On the other hand, no adequate tools have been developed by the state to replace Scopus and WoS in the stage of evaluating scientific results. The creation of such tools requires joint efforts on the part of the state and the scientific community to further develop the domestic bibliographic database, expanding the range of scientometric tools it provides and broadening its coverage of global scientific content.

This study focuses on the most commonly used bibliographic databases: RINC, AMiner, The Lens, Dimensions, and OpenAlex. The study included the RINC database, which is actively used to evaluate the efficiency of Russian researchers, scientific organisations, and scientific journals; and AMiner, which

more fully represents the research areas of Chinese scientists who actively set global science trends (compared to the other databases presented). However, this study did not consider the analytical capabilities of other types of data sources, such as academic search engines, the professional network Research Gate, niche databases and less popular bibliographic databases, which undoubtedly limits the conclusions that can be drawn. Nevertheless, the review of open bibliographic databases in terms of the opportunities they provide for the formation and implementation of scientific and educational policy at various levels of its implementation is presented for the first time in this context. These findings are theoretically significant as they can be used to develop a methodological basis for researching the frontiers of global science. The practical significance of this research lies in the possibility of using its recommendations when developing research strategies for universities and individual research teams.

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**Bibliographic and scientometric databases, search engines, alternatives to Scopus
and Web of Science²**

No.	Database / search engine	URL	Main features	Access
1.	RINC (Scientific Electronic Library eLIBRARY.ru)	https://www.elibrary.ru/	National bibliographic database	Open access
2.	Google Academy	https://scholar.google.ch/	Search engine for scientific publications	Open access
3.	Microsoft Academic	https://microsoft.academia.edu/	Free search engine using semantic search technologies	Open access
4.	Index Copernicus	https://journals.indexcopernicus.com/article/search	Scientometric database	Open access
5.	RePEc Research Papers in Economics (including EconPapers and IDEAS)	http://repec.org/	Bibliographic database powered by crowdsourcing	Open access
6.	MedLine	https://www.nlm.nih.gov/medline/medline_overview.html	Bibliographic database of the US National Library of Medicine	Open access
7.	PubMed	https://pubmed.ncbi.nlm.nih.gov/	Search engine for scientific publications on biomedical research	Open access
8.	Science Direct	https://www.sciencedirect.com/	The Elsevier bibliographic database	Charged access to publications, except for open access publications
9.	Arxiv.Org	https://arxiv.org/	Bibliographic database of scientific articles in the fields of physics, mathematics, computer science, quantitative biology, quantitative finance, statistics, electrical engineering, systems science and economics	Open access
10.	CiteSeerX	https://citeseer.ist.psu.edu/	Search engine for scientific publications	Open access
11.	WorldWideScience	https://worldwidescience.org/	Search engine for scientific publications	Not available in Russia
12.	BASE	https://www.base-search.net/	Search engine for scientific publications of Bielefeld University	Open access
13.	AMiner	https://www.aminer.org/	Bibliographic database of the Tsinghua University	Open access
14.	Wizdom.ai	https://www.wizdom.ai/	AI tool that generates information about scientific publications and patents in various subject areas of knowledge	Not available in Russia

² Scientometric databases, along with catalogs of scientific works, contain a wide range of indicators for evaluating scientific activity, while bibliographic databases focus exclusively on publications. A search engine is an online service for searching for scientific publications based on keywords or phrases in bibliographic and scientometric databases.

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15.	The Lens	https://www.lens.org/	Bibliographic database of patents and scientific publications that uses information from other databases, combining it on a single platform	Open access
16.	Dimensions	https://app.dimensions.ai/	Scientometric database and search and analysis platform	Open access
17.	Research Gate	https://www.researchgate.net/	Scientific and informational social network for scientists	Open access
18.	CORE	https://core.ac.uk/	Scientometric database	Open access
19.	SJR	https://www.scimagojr.com/	Scientometric database containing information about scientific journals	Open access
20.	Directory of Open Access Journals (DOAJ)	https://doaj.org/	Open access journal bibliographic database	Open access
21.	SSRN	https://www.ssrn.com/index.cfm/en/	A bibliographic database of scientific articles and preprints in the field of management and economics, which also serves as a platform for discussing scientific publications	Open access
22.	Scinapse	https://www.scinapse.io/	Search engine for scientific publications	Registration on the website is required
23.	Semantic Scholar	https://www.semanticscholar.org/	Search engine for scientific publications	Open access
24.	Public Library of Science (PLOS)	https://plos.org/	Bibliographic database of open access journals on science, technology, and medicine	Open access
25.	ScienceOpen	https://www.scienceopen.com/	Scientometric database of open access journals	Open access
26.	PaperPanda	https://paperpanda.app	Search engine for scientific publications	Open access
27.	ERIC	https://eric.ed.gov/	Bibliographic database of research in the field of education	Not available in Russia
28.	Mendeley	https://data.mendeley.com/	The Elsevier bibliographic database, providing researchers with services for collaborative data sharing	Open access
29.	OpenAlex	https://openalex.org/	Bibliographic database of scientific works	Open access
30.	Baidu	https://www.baidu.com/	Chinese search engine for scientific papers	Open access
31.	Unpaywall	https://unpaywall.org/?locale=en	A search engine for academic works, integrated into the libraries of numerous academic publishers and universities	Open access

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