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**Ukrainian Databases as a Competitive Alternative to International Databases**

**Objective.** To assess the potential of modern Ukrainian open-access databases initiated by national or technical libraries as a viable alternative to international commercial and open databases for retrieving metadata on periodicals and their articles, including Ukrainian scholarly journals. **Methods.** The study involved the analysis of databases such as Scopus, Web of Science Core Collection, OpenAlex, "Scientific Periodicals of Ukraine" (developed by the Vernadskyi National Library of Ukraine), "Scientific Periodicals of Ukraine" (developed by the Association of Users of Ukrainian Research and Academic Network), Open Ukrainian Citation Index, Ukrainian Research Information System, and "Ukrainian Scientific Periodicals." A tabular method (three comparative tables were developed), analytical methods (quantitative and qualitative analysis), and statistical methods were applied. **Results.** It was found that the completeness of metadata representation varies depending on the resource. Commercial databases like Scopus and Web of Science Core Collection offer the most comprehensive metadata, while Ukrainian resources provide unique data relevant to Ukraine, including information on state registration, knowledge categories, and specializations aligned with Ukrainian regulatory documents. **Conclusions.** Ukrainian databases developed by national or technical libraries are continuously improving and have the potential to serve as an effective alternative to international commercial databases due to their free access, unique data, and extensive coverage of national scholarly periodicals. Although they cannot fully replace databases like Scopus and Web of Science Core Collection, their combined use holds promise. Given the challenges related to the high subscription costs and content quality in commercial databases, Ukrainian resources have the potential for further development within the global movement towards open science.

*Keywords:* international databases; domestic databases; open access; Ukraine; libraries; metadata; journals; statistics

**Introduction**

Since the inception of computational tools, including the rapid development of computer technology and the emergence of the first databases, over 60 years have passed. During this time, significant changes have occurred in the electronic environment: from the advent of the Internet in the late 1960s as a global library and free-access knowledge database, to the creation of international and local databases with pre-selected resources. Among these resources there are open access databases of publications and journals, such as ArXiv.org (1991), Registry for Open Access Repositories (2003), OpenAlex (2022), E-LIS repositories (2003), DOAJ (2003), as well as commercial databases like Scopus (2004) and Web of Science (the idea originated in 1950, with all indices integrated into the online platform Web of Knowledge in 1997), and free scholarly citation databases such as Google Scholar (2004).

The open access movement, initiated in 2001, played an important role in promoting open science and free access to research results through open databases. This movement is reflected in key documents like the Budapest Open Access Initiative, the Berlin Declaration on Open Access to Knowledge in the Sciences and Humanities, and the European Commission's "Open Innovation, Open Science, Open to the World" initiative (European Commission, 2017). At the same time, libraries, both foreign and Ukrainian, actively contributed to the development of electronic databases by creating and filling their own electronic catalogs, libraries, repositories, etc.

Ukrainian librarians also focused on developing electronic resources, including facilitating access to and promoting them. Most projects dedicated to creating databases that meet the modern needs of researchers and other stakeholders were initiated by national or technical libraries.

Scopus and Web of Science (WoS) have established themselves in the academic community as the most comprehensive sources of data for various purposes (Zhu & Liu, 2020). However, subscription access remains a significant drawback, as subscription costs are constantly rising and are quite high, even for developed countries. This forces institutions to choose between databases by comparing them (Bianco, Gras, & Sutz, 2016). Another widely discussed issue in the academic community is the bias towards national journals published in languages other than English, resulting in a low percentage of such journals being indexed in these databases (Aksnes & Sivertsen, 2019). This trend is also evident in the case of Ukraine (Kaliuzhna & Hauschke, 2024).

As a result, there has arisen a need to investigate the potential of national open access databases to compete with international commercial and open-access databases.

**National bibliographic indexes as an alternative to proprietary databases.** The mention of WoS (<https://www.webofknowledge.com/>) and Scopus (<https://www.scopus.com/>) first appeared in Ukrainian regulatory documents in 2010. In particular, the Resolution of the Cabinet of Ministers of Ukraine dated February 17, 2010, No. 163 (now invalid) included a requirement for the number of articles in professional journals indexed in international abstract and citation databases, such as WoS and Scopus, as a criterion for granting or confirming the status of a research university (Cabinet of Ministers of Ukraine, 2010). However, the widespread use of these databases in Ukraine occurred only in 2017, following a competition held by the Ministry of Education and Science of Ukraine to obtain access to databases funded by the state budget. As a result, from October of that year, 64 institutions gained access to WoS and 68 to Scopus (Ministry of Education and Science of Ukraine, 2018). By 2019, the limit on the number of connected institutions had increased to 500, with over 400 institutions taking advantage of this opportunity (Ministry of Education and Science of Ukraine, 2019).

With the start of Russia's full-scale invasion of Ukraine, the companies owning WoS and Scopus expressed support for the Ukrainian academic community (Nazarovets & Teixeira da Silva, 2022), providing free access to these resources until the end of 2024. As of 2024, more than 500 institutions have access to them. However, due to existing shortcomings of these databases, other countries continue searching for quality alternatives or creating new open-access products. One such product is OpenAlex, an open, free international bibliographic database created by the company OurResearch. OpenAlex provides information on journals, authors, and institutions, offering tools for conducting research, including bibliometric studies, across a wide range of scientific fields (OpenAlex, n.d.). Launched in 2022, OpenAlex is still relatively unknown among Ukrainian researchers, which may be due to insufficient promotion of this resource at the government level.

In Ukraine, the first open-access resource aggregating metadata on professional Ukrainian periodicals was the 2006 project "Scientific Periodicals of Ukraine," supported by the Vernadskyi National Library of Ukraine (VNLU). The idea was to display metadata about the scientific research of institutions of the National Academy of Sciences of Ukraine. Over time, the project evolved into a national portal for scientific periodicals (Symonenko, 2009). The developers position the portal as one of the largest full-text resources in Ukraine, with retrospective coverage for some publications extending back to 1991.

Later, other initiatives emerged, including the platform "Scientific Periodicals of Ukraine," developed by the publishing service of the Association of Users of Ukrainian Research and Academic Network "URAN" (SPU URAN) based on Open Journal Systems (2013), and the

information and reference system "Register of Scientific Professional Publications of Ukraine" (2018), developed by the Ukrainian Institute of Scientific and Technical Expertise and Information (UkrISTEI), which later became the Integrated Information System "Ukrainian Scientific Periodicals."

Key resources for promoting open science and ensuring access to scientific publications in Ukraine include projects of the State Scientific and Technical Library of Ukraine (SSTL of Ukraine) – the Open Ukrainian Citation Index (OUCI) and the Ukrainian Research Information System (URIS). The development of OUCI began in 2018 at the request of the Ministry of Education and Science of Ukraine, and it was launched in 2019. OUCI is a search engine and an open bibliographic database of scholarly citations, covering information about all publications that use the Cited-by service from Crossref and support the Initiative for Open Citations (Zharinova, Zharinov, & Hauschke, 2023).

The development of the next project, URIS, began in 2020 at the request of the Ministry of Education and Science of Ukraine. URIS is a multifunctional information and telecommunication system designed to collect, process, store, and utilize data on scientific and scientific-technical activities in Ukraine, as well as to provide informational support to entities involved in these activities (Kaliuzhna & Auhunas, 2022).

Projects of the SSTL of Ukraine have received support from the Ukrainian government and are reflected in regulatory documents. On October 8, 2022, the government approved the resolution "On the Adoption of the National Open Science Plan." One of the indicators of the implementation of this plan is the creation of URIS (Cabinet of Ministers of Ukraine, 2022). In 2024, SSTL of Ukraine was designated as the technical administrator of URIS (Ministry of Education and Science of Ukraine, 2024). At the same time, in accordance with one of the requirements of the Verkhovna Rada of Ukraine's Resolution "On the Adoption of the National Informatization Program for 2022-2024," OUCI is scheduled for further development in line with the latest trends in scientometrics and open science (Verkhovna Rada of Ukraine, 2022).

**The purpose** of this study is to investigate the role of modern Ukrainian open-access databases, developed by national and technical libraries, in enhancing access to scholarly metadata and their potential contribution to the global academic ecosystem.

## Methods

In the study, several foreign databases, including Scopus, WoS Core Collection (WoS CC), and OpenAlex, as well as domestic databases such as "Scientific Periodicals of Ukraine" (supported by Vernadskyi National Library of Ukraine), SPU URAN, OUCI, URIS, and "Ukrainian Scientific Periodicals," were analyzed.

A table-based comparison method was used, enabling a structured comparison of the databases. Four tables were created, grouped by the following categories: general information about the databases, metadata on journals, metadata on articles, and usage statistics (number of visits to the resource).

To ensure objectivity, the study used various analytical methods to compare the parameters and metadata of the databases. The data for the analysis were obtained from open sources within the databases themselves.

Quantitative analysis allowed for calculating the number of journal titles and articles in each database, which provided an opportunity to assess their coverage and significance.

Qualitative analysis focused on reviewing the functionality of the databases, including user interface and the availability of additional services, such as analytical tools.

Statistical analysis was employed to compare usage data over several years. The statistical data for Scopus and WoS CC were provided by the companies that own these databases, while data for OUCI and URIS were obtained through Google Analytics (based on the Total Item Investigations metric). However, such data were unavailable for OpenAlex, “Ukrainian Scientific Periodicals,” and “Scientific Periodicals of Ukraine”, SPU URAN.

## Results and Discussion

The popularity of both international and domestic scientific resources can be illustrated through the analysis of usage statistics. One key metric used in this study is the total number of investigations into records or related information (Total Item Investigations). It is important to note that the usage statistics for Ukrainian databases, such as OUCI (<https://ouci.dntb.gov.ua/>) and URIS (<https://nauka.gov.ua/>), include visits from both Ukrainian and international users. Meanwhile, the statistics for international databases like WoS CC and Scopus allow for filtering requests from the Ukrainian consortium.

The full-scale invasion of Ukraine did not significantly affect the use of these resources. Some Ukrainian higher education institutions and research centers had to relocate from occupied or front-line territories, while others continued to operate despite missile threats and power outages – both emergency and planned ones. The introduction of remote work and learning schedules helped maintain access to commercial databases. Ukrainian institutions had already gained experience in setting up remote access during the COVID-19 pandemic. A notable step was the initiative by Scopus’s owner to create a dedicated center for Ukrainian researchers, simplifying the process of setting up remote access.

The overall trend indicates growing interest in both foreign and Ukrainian resources (Figure 1).

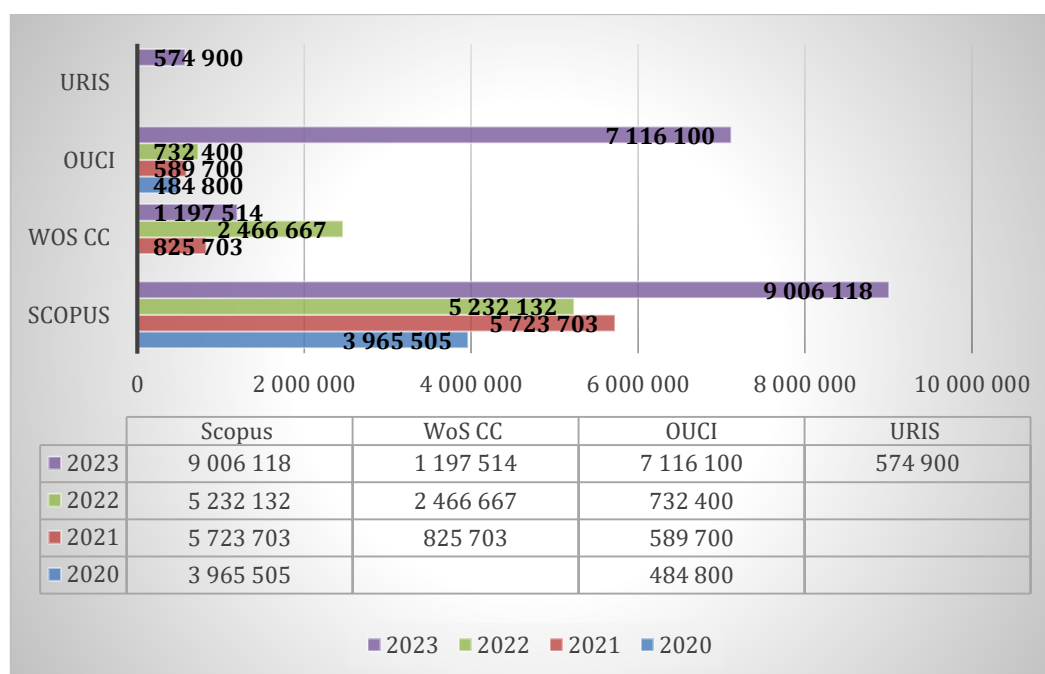


Fig. 1. Popularity of commercial international and Ukrainian resources based on the Total Item Investigations metric (2020–2023)

In 2023, Ukrainian researchers and other users mostly engaged with the familiar Scopus database, with over 9 million visits. Regarding WoS CC, data has been available since 2021, when Clarivate announced changes to the WoS interface and introduced a new reporting format similar to the Counter Code of Practice (R5 or COP5). These changes are reflected in the usage statistics for the WoS platform and WoS CC database.

A noteworthy development is the tenfold increase in the number of visits to the Ukrainian resource OUCI in 2023 (over 7 million visits) compared to 2022 (over 700,000 visits), bringing it closer to the Scopus level. One factor contributing to this growth could be the openness of the resource, no subscription fees, continuous improvement, the addition of new filters and search categories, and the use of SEO technologies. These ensure that when searching for open-access articles through Google, one of the first results displayed is a link to OUCI.

Statistical data on visits to URIS are available only for 2023, as the database was launched that year. It is expected that with further enhancements to URIS and the launch of new modules – seven modules were launched as of August 2024, with five more in development – the number of users will increase, which will be reflected in the corresponding statistical indicators.

Regarding other Ukrainian resources, such as "Ukrainian Scientific Periodicals" (<https://nfv.ukrintei.ua/>) and SPU URAN (<https://journals.uran.ua/>), there is currently no open information available about their usage. It is only known that, according to the article by Samokhina N. and Peliukhovska I., researchers at the VNLU, from 2013 to 2016, 15 million queries were made to the "Scientific Periodicals of Ukraine" ([http://www.irbis-nbuv.gov.ua/cgi-bin/irbis\\_nbuv/cgiirbis\\_64.exe?C21COM=F&I21DBN=UJRN&P21DBN=UJRN](http://www.irbis-nbuv.gov.ua/cgi-bin/irbis_nbuv/cgiirbis_64.exe?C21COM=F&I21DBN=UJRN&P21DBN=UJRN)) resource, with over 4.6 million queries in 2016 alone.

The website of the "LibNAS UA" project (<http://libnas.nbuv.gov.ua/uk/>) – Library Portal of the National Academy of Sciences of Ukraine, initiated by the VNLU in 2021, provides data indicating that the "Scientific Periodicals of Ukraine" resource is visited more than 5,000 times daily. This suggests that over 1.8 million sessions occur annually.

The international Scopus database indexes over 27,000 journal titles, of which only 152 are Ukrainian. In another database, WoS CC, the number of indexed journal titles is slightly smaller, totaling over 21,000, with 88 Ukrainian journals. The low number of Ukrainian journals in these databases is due to strict selection criteria, which include specific requirements for the content and quality of publications, as well as the work of expert groups responsible for selection. As for OpenAlex, specific data on the number of journals is not available, as they are combined with other types of resources such as conference materials, preprint repositories, and institutional repositories, totaling over 249,000 units. However, the data sources for OpenAlex include Crossref, the ISSN network, and MAG, which suggests the indexing of all journals supporting open access, the Open Citations initiative, and having a DOI. The Ukrainian resource OUCI operates on a similar principle, containing metadata for all publications using Crossref's Cited-by service, providing some insight into the number of Ukrainian journals that may be represented in OpenAlex. However, there is a significant difference between OpenAlex and OUCI: OpenAlex data is automatically aggregated from various sources without expert verification, whereas specialists at the SSTL of Ukraine conduct continuous monitoring and verification of the data for Ukrainian journals. Information is provided only on Ukrainian journals in the "Ukrainian Scientific Periodicals" (2229 journals), "Scientific Periodicals of Ukraine" (2984 journals), and the SPU URAN (782 journals).

Each analyzed database contains metadata about journals, but the extent and detail of this data vary. For instance, WoS CC provides general brief information about journals, and detailed data can only be accessed via another Clarivate service – Journal Citation Reports. A similar situation exists in SPU URAN: only general information is displayed, which can be viewed by

selecting the publisher list with their journals, and to obtain detailed information, one must go directly to the journal's website. In contrast, OUCI provides metadata exclusively for 1881 Ukrainian journals.

In terms of metadata completeness, all analyzed resources include the journal title. However, in URIS, this is the only available metadata about the journal, which appears only after opening a specific publication, and this field is not hyperlinked. All other analyzed resources contain metadata about the publisher, ISSN, resource type, and website. Other metadata varies depending on the resource. For example, the journal's short title is only present in WoS CC and OpenAlex, the language of the publication in WoS CC, SPU URAN, and "Ukrainian Scientific Periodicals", and information about the country is available only in WoS CC. The address and frequency of publication are provided in WoS CC, "Scientific Periodicals of Ukraine," and SPU URAN. Metadata about the years covered by the database is absent in SPU URAN and "Ukrainian Scientific Periodicals". Data on availability is missing in OpenAlex, OUCI, and SPU URAN, while subject area, category, and topic information is available in OpenAlex. Various metrics are presented in databases that collect information about scientific citations, such as Scopus, WoS CC, OpenAlex, and OUCI. Meanwhile, information about indexing is presented in "Scientific Periodicals of Ukraine," SPU URAN, and "Ukrainian Scientific Periodicals", OUCI, emphasizing the importance of demonstrating recognition, quality, and authority of Ukrainian journals through their representation in international databases. Ukrainian databases also typically present specific or legally mandated information. Specifically, in OUCI, "Ukrainian Scientific Periodicals," and "Scientific Periodicals of Ukraine," journals are classified according to certain categories, fields of knowledge, and specialties in accordance with the list approved by Cabinet of Ministers' resolutions. Additionally, "Ukrainian Scientific Periodicals" and "Scientific Periodicals of Ukraine" also provide information about state registration, editorial boards, etc.

All resources aim to provide accurate, verified, and up-to-date information; therefore, data corrections in these databases are free of charge, either through technical support services or using special tools. However, in Ukrainian Scientific Periodicals, data correction is fee-based and performed by journal representatives (responsible persons). The possibility of correcting article metadata is almost nonexistent, except through direct requests to journal representatives by the author of the article.

The completeness of article metadata representation significantly varies depending on the resource. For example, in Ukrainian Scientific Periodicals and SPU URAN, metadata is available exclusively about journals. In the "Scientific Periodicals of Ukraine" database, publication data is presented as a bibliographic description according to DSTU GOST 7.1:2006, which provides quick information identification for professionals but may be less comprehensible to ordinary users. In all other resources, the article title, authors, and abstract (except for "Scientific Periodicals of Ukraine") are presented, along with the journal title. Other metadata is partially provided: only Scopus and WoS CC offer affiliation data for authors, keywords, funding information (if available). References metadata – Scopus, WoS CC, OUCI. ISSN metadata and publisher information are available in Scopus and WoS CC, as well as OpenAlex and OUCI when navigating to the journal's page.

Document type information is missing in the "Scientific Periodicals of Ukraine" database; volume/issue numbers are not listed in OpenAlex (only upon viewing journal information) and URIS; pages are not indicated in OpenAlex and URIS; the publication date is missing in OpenAlex, OUCI, and the "Scientific Periodicals of Ukraine" database, and related documents are not presented in URIS, OUCI, or "Scientific Periodicals of Ukraine." Access information, which is crucial for researchers, is available in Scopus, OpenAlex and OUCI, but it is absent in WoS CC and URIS. In the "Scientific Periodicals of Ukraine" database, there is an option to download all

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indexed documents; in Scopus, WoS CC, OUCI, OpenAlex – there is an option to download open access documents.

Today, it is hard to imagine reputable journals without DOIs for the entire publication and for each individual article. However, in OpenAlex and "Ukrainian Scientific Periodicals," the metadata lacks a DOI field.

At the same time, all resources, except for URIS and "Scientific Periodicals of Ukraine" (which provides a link to Google Scholar), present document metrics: in Scopus, these include FWCI, citation count, views count, and altmetrics (PlumX metrics); in WoS CC and other WoS platform databases, OpenAlex, and OUCI, they include citation count. The document language is indicated only in Scopus.

### Conclusions

Ukrainian scientific resources initiated by national or technical libraries, drawing from international experience, are continuously improving and gaining increasing importance for both Ukrainian researchers and the global scientific community. OUCI and URIS, supported by the Ukrainian government, are prime examples of this progress. While some Ukrainian databases currently cannot fully replace international commercial databases such as Scopus and WoS CC, their comprehensive use can offer an effective alternative, especially in terms of metadata representation.

The advantages of Ukrainian resources include their free access, unique data specific to Ukraine, and wide coverage of national scientific periodicals. However, there remains the issue of the low representation of Ukrainian journals in commercial databases, which is largely due to the prioritization of English-language publications. Additionally, the high subscription costs for these databases pose a serious challenge for scientific institutions and universities, which must pay for access to data they themselves edit (e.g., researcher or institutional profiles), even though this data is owned by the commercial database companies.

At the same time, the high cost of subscriptions does not always guarantee the quality of the content provided. These databases may include predatory journals, where the number of co-authors can exceed a thousand, as well as articles produced by "research paper mills" or even generated by artificial intelligence. This raises serious concerns about the quality and reliability of the content in such resources. The global scientific community is increasingly questioning the quality of indexed journals and the indexing process, particularly in commercial databases like Scopus and WoS CC, which are marketed as carefully curated resources by specially appointed indexing boards.

Considering these factors, there is an active search for alternative data sources, such as national bibliographic indexes, and precedents are emerging for opting out of commercial resources. For instance, in 2024, Sorbonne University discontinued its subscription to Clarivate resources, including the WoS CC database, and began collaborating with the open international alternative product OpenAlex (Sorbonne University, 2023). A similar national resource in Ukraine is OUCI, which was developed and launched several years earlier.

Thus, in light of the current movement toward open science, open access, and open information ("Barcelona Declaration on Open Research Information", 2024), Ukrainian databases developed by national or technical libraries have the potential to become valuable data sources for both Ukrainian and international researchers, particularly in terms of Ukraine-specific data and user accessibility.

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## Українські бази даних як конкурентна альтернатива міжнародним базам даних

**Мета.** Оцінити потенціал сучасних українських баз даних відкритого доступу як життєздатної альтернативи міжнародним комерційним і відкритим базам даних для пошуку метаданих періодичних видань та їхніх статей, зокрема українських наукових журналів. **Методика.** У дослідженні було проаналізовано такі бази даних, як Scopus, Web of Science Core Collection, OpenAlex, «Наукова періодика України» (розробник – Національна бібліотека України імені В. І. Вернадського), «Наукова періодика України» (розробник – Асоціація користувачів Української науково-академічної мережі), Open Ukrainian Citation Index, Українська науково-дослідна інформаційна система та «Українська наукова періодика». Застосовано табличний метод (розроблено три порівняльні таблиці), аналітичні методи (кількісний та якісний аналіз), статистичні методи. **Результати.** Виявлено, що повнота представлення метаданих відрізняється залежно від ресурсу. Комерційні бази даних, такі як Scopus та Web of Science Core Collection, пропонують найбільш повні метадані, тоді як українські ресурси надають виключно актуальні для України дані, зокрема інформацію про державну реєстрацію, категорії знань та спеціалізації, узгоджені з українськими нормативними документами. **Висновки.** Українські бази даних постійно вдосконалюються і мають потенціал слугувати ефективною альтернативою міжнародним комерційним базам даних завдяки вільному доступу, унікальним даним та широкому охопленню вітчизняної наукової періодики. Хоча вони не можуть повністю замінити такі бази даних, як Scopus та Web of Science Core Collection, їх спільне використання є перспективним. Зважаючи на проблеми, пов'язані з високою вартістю підписки та якістю контенту в комерційних базах даних, українські ресурси мають потенціал для подальшого розвитку в рамках глобального руху до відкритої науки.

*Ключові слова:* міжнародні бази даних; українські бази даних; відкритий доступ; Україна; бібліотеки; метадані; журнали; статистика

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