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## **Challenges of Open Science: Problems of Metadata Research and Analysis of Scientometric Indicators of Scientists (Experience of the Scientific Library of Yaroslav Mudryi National Law University)**

**Objective.** The scientific publication aims to analyze the development of open science based on international and national experience, as well as to show efforts of the National Law University in the direction of promotion of open science and management of metadata related to scientometrics indicators of scientists. **Methods.** To attain the indicated objective, theoretical methods of scientific research were used: literature analysis and systematic approach. **Results.** The result of this research is systematization of scientometrics services developed by the Scientific Library of Yaroslav Mudryi National Law University to inform scientists about their scientometric indicators that reflect publication activity in the two main international scientometric databases Scopus and Web of Science. **Conclusions.** It is important to promote open science in university repositories, which are one of the services that manage metadata.

*Keywords:* open science; metascience; metadata; university repository; scientometrics services; Scientific library of Yaroslav Mudryi National Law University

### **Introduction**

The continuous development of open science requires innovative decisions, which are based on modern research of the international scientific community, namely: 1) open access (Schöpfel et al, 2023; Holley, 2018; Eve & Gray, 2020) and open science (Center for Open Science, n.d.), its promotion (Boyack, Smith, & Klavans, 2020); 2) definition of the concept of metadata (Qin & Zeng, 2022) and management of metadata (Metascience, 2023); 3) roles of universities (Robinson-Garcia, Costas, & van Leeuwen, 2020), repositories and the importance of academic libraries in the promotion of knowledge in relevant areas (Khosrow-Pour, 2019; Lo, Cho, Chiu, & Allard, 2019; Information Resources Management Association, 2020).

At the same time, the field of activity of university librarians in Ukraine still needs an understanding of the general picture of metadata formation and management.

The objective of the scientific publication is generalization and analysis of the development of metascience, metadata and presentation of the list of modern novation services and program products, which help to form and operate the metadata.

### **Methods**

To achieve this goal, the following theoretical methods of scientific research are used: literature analysis and systematic approach to the generalized and analyzed contents of the presented topic.

That is why the author singled out two subsections in the "Results" section: "Analysis of specialized literature" and "Scientific Library of Yaroslav Mudryi National Law University on the way to open science".

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## Results and Discussion

Analysis of specialized literature.

Metascience is a scientific social movement that seeks to use quantification and experimentation to diagnose problems in research practice and improve efficiency. It draws together data scientists, experimental and statistical methodologists, and open science activists into a project with both intellectual and policy dimensions. Metascientists have been remarkably successful at winning grants, motivating news coverage, and changing policies at science agencies, journals, and universities. The social movement lens is useful for understanding the popularization and impact of the reproducibility crisis narrative and suggests ways the institutions of science are adapting to meet a changing political and technological landscape (Peterson & Panofsky, 2023).

Constant change, continuous innovation. Through partnerships, integrations, and support of cross-stakeholder initiatives in RightsLink for Scientific Communications (RLSC), we support Open Access (OA) funding workflows that serve everyone in the community — publishers, institutions, funders, and authors. We've been an active partner in the evolution of hybrid and pure OA publishing models, working with publishers to put the author and institution experience first, and manage shared infrastructure in a scalable and sustainable way (CCC. Metadata Challenges, 2023).

As the scholarly communications community continues its shift to full OA, stakeholders recognize that new strategies, inclusive policies, and a robust network of interoperable data and systems are essential for making critical infrastructure improvements, and much progress is underway. In that environment, a dedication to data stewardship across each stakeholder group, and the service providers supporting them, will lead not only to a smoother OA transition, but also to greater research integrity; data sharing; reliable, trustworthy metrics on research impact; and a responsive, equitable rewards and recognition system (CCC. Metadata Challenges, 2023).

Jamie Carmichael, Jessica Thibodeau, Roy Kaufman published the results of the study "The State of Scholarly Metadata: 2023" (Jamie, Thibodeau, & Kaufman, 2023; Copyright Clearance Center, 2023). Working with Media Growth Strategies, the authors interviewed representatives from institutions, publishers, funders, researchers, service providers, PID providers, and industry associations to capture a broad view of the current state of metadata and PIDs across the ecosystem.

«Many stakeholders we interviewed recognize that new metadata strategies, inclusive policies, and a robust framework of interoperable systems are essential for modernizing this element of scholarly communications. It's also clear that an ecosystem-wide commitment to improving data quality across all groups will facilitate the transition to open science while helping to preserve research integrity, expand discoverability, and improve impact measurement. If the industry works collectively to shrink these gaps by reexamining metadata policy and practice, stakeholders will undoubtedly feel less pain. Or, we can continue the current system of entropy, friction, and frustration. Together, we can decide our path».

Expansion of the areas of activity of the previously initiated projects, such as ORCID (ORCID, n.d.a), KUDOS (Kudos, n.d.) and new services OSF (OSF, n.d.), OPTIMETA (OPTIMETA, n.d.), etc., is aimed at improvement of the metadata management processes.

What is Data Management? Data management refers to the process of organizing, storing, protecting, and maintaining data throughout its lifecycle. Companies need physical and logical data management because they serve different but equally important purposes in managing data. However, often logical data management is an overlooked and underused data management style. Logical data management can add tremendous productivity and agility gains to existing data

management practices. Here is a quick overview of these two data management styles (“Data management overview”, n.d.).

In order to publish more research, faster, without compromising on quality, it’s more important than ever to invest in a robust research infrastructure – the tools and systems that enable researchers to spend more time doing research and less time managing it. Whether they are applying for a grant, identifying possible collaborators, searching for the right information, or submitting a manuscript, we can make their lives easier and more productive by providing them with equitable access to reliable, openly available, and user-friendly services.

Persistent identifiers (PIDs) – for people (researchers), places (their organizations), and things (their outputs and other research objects) – are essential to many of these services. Being able to correctly identify and connect a researcher with their institution(s), publications, and other works and routinely including that information in metadata improves search and discovery, facilitates credit and recognition, reduces errors, and enables other efficiencies. Open PIDs, such as DOIs (Digital Object Identifiers), ORCID iDs, and ROR (Research Organization Registry) identifiers have additional benefits. Not only are they free to end users, they are also fully interoperable, resolvable, and enable the creation of open, well-defined provenance information (Meadows, 2020).

The most important thing about PIDs is the metadata that is associated with them – that is, the information that can be retrieved when a piece of software, platform, or web application requests data from the PID provider’s API, which can, and often does, contain other PIDs. Metadata enables connections to be made between published articles, researchers, datasets, computer programs, institutions, grants, funders, and more (Phill & Meadows, 2021).

After working with multiple stakeholders to encourage ORCID adoption, it became clear very quickly that other open PIDs and open technologies are integral to creating a more efficient scholarly communication ecosystem for all. The more we can link PIDs together, the more easily we can gauge research activity (Meadows, 2023a).

Common PIDs (not all of which are open) that have already been identified in the RDA WG’s work include: ORCID or ISNI for researchers; ROR or ISNI for research organizations; Crossref DOIs for research articles; DataCite DOIs or Handles for research data; Crossref DOIs for grants; RAiD for projects; and DOIs, IGSN and RRID for samples and specimens.

While there are many similarities in approach and intention among the countries participating in the RDA group, there are also many differences among them. The research endeavor is global, but research policy and funding are largely executed on a national level — and, of course, other local needs must also be addressed in any national PID strategy (Meadows, 2023b).

To be the most effective, PIDs would not only be created for the people, places, and things associated with research, but would also be collected and used by funders, institutions, and publishers, at the earliest possible point in the process. For example, ORCID IDs for researchers would be captured by funders during grant application; grant IDs would be captured by institutions at the point of award; and so on (Meadows & Phill, 2021).

The PID-optimized Research Lifecycle is presented on infographic (Brown, Jones, Meadows, & Murphy, 2021).

**Scientific library of Yaroslav Mudryi National Law University on the way to open science.**

At the national level, the implementation of open science has begun in Ukraine from the creation of the National Repository of academic texts, academic repositories (including the repository of Yaroslav Mudryi National Law University (“DSpace at NLU”, n.d.).

At the legislative level in Ukraine, the national plan for open science (Cabinet of Ministers of Ukraine, 2022) is approved. The document is another step on the path of Ukraine's integration into the European research space. Its implementation ensures the realization of the Agreement between Ukraine, on the one side, and the European Union and the European Atomic Energy Community, on the other side, on Ukraine's participation in the Research and Innovation Framework Program "Horizon Europe" (2021–2025), which is complementary to the Framework Program on Research and Innovations "Horizon Europe". From now on, Ukraine joined the EU countries, which have an approved plan for implementation of the open science principles (Ministry of Education and Science of Ukraine, 2022).

The strategic priority of Yaroslav Mudryi National Law University ("Development strategy", n.d.) is to achieve the European, and in the future the world level in the main areas of its activities.

In order to develop integrative, competence-based, innovative approaches to educational and scientific activities, the Scientific Library of Yaroslav Mudryi National Law University (hereinafter, NLU) joins directions in the strategic support of educational and scientific tasks of the University, among which is the continuation of the implementation of the integration of NLU to open science with the help of open access and the creation of open resources (Pasmor & Kulyk, 2020) for specific educational areas, in particular, such resources as "Standardized electronic educational and methodological complex (SENMK)" (Scientific Library of Yaroslav Mudryi National Law University, n.d.d), "Digital projects" ("Digital projects", n.d.) etc. were created.

A special sector (hereinafter referred to as Scientometrics and Bibliometrics service), created as a structure in the library supporting publication activity of university scientists, plays an important role among the units of Scientific Library in the strategic support of the educational and scientific tasks of NLU (Kulyk, 2021). During the Russian military aggression on the territory of Ukraine, the above sector, despite certain difficulties, continues to perform the work provided for by the scientific and educational activities of NLU and its Scientific Library (Scientific Library of the Yaroslav Mudryi National Law University, 2023). Considering the legal specialization of our University (Kulyk, 2018), which is a humanitarian field of activity (Sooryamoorthy, 2021), the University has its own peculiarities (Barabash & Danilyan, 2021) in promoting scientific research, analysis and management of large metadata among institutions of higher education (Welch, & Li, 2021).

The need for analysis and management of large metadata in scientometrics required the creation and improvement of special programs that would help any organizations in measuring their scientometric indicators and performing a comparative analysis with other specialized institutions of higher education. To carry out analytical activities with metadata in the Scopus database, the ELSEVIER company has software tools: 1) keys API ("Elsevier developer portal", n.d.); 2) SciVal analytical system (SciVal, n.d.); 3) Scopus Data Fetcher ("*Elsevier API Query Tool*", n.d.) etc. The CLARIVATE company has similar analytical tools: 1) keys API (Clarivate, n.d.a); 2) analytical system InCites ("InCites Benchmarking & Analytics", n.d.); 3) Converis (Clarivate, n.d.b), etc.

The author of the book "Scientometrics for the Humanities and Social Sciences" (Sooryamoorthy, 2021) – the first ever book on scientometrics, which considers the historical development of both quantitative and qualitative data analysis in scientometric research, compares the three main scientometric platforms: Web of Science, Scopus, Google Scholar. Also, the author R. Suryamurt cites individual cases of scientometric research in the humanities and social sciences, explaining their research goals, data sources, and methodologies.

Although, during the last decade, there was a significant growth of available bibliographic data sources and metrics, Web of Science (WoS) and Scopus databases (DBs) still remain the two

major and most comprehensive sources of publication metadata and impact indicators. Therefore, they serve as the major tools for a variety of tasks: from journal and literature selection or personal career tracking to large-scale bibliometric analyses and research evaluation practices in all possible levels (Pranckutė, 2021).

Institutions of higher education (hereinafter, IHEs) of Ukraine received support from the companies ELSEVIER (Elsevier, n.d.) and CLARIVATE (Clarivate, n.d.c) and have the opportunity to use analytical capabilities of two scientometric platforms Scopus and Web of Science.

Internet resources on scientometrics, formed by specialists of the NLU Scientific Library before the beginning of the Russian invasion of Ukraine, were effectively used during this period to inform teachers about publication activity with the aim of increasing it in the international scientometric databases Scopus and Web of Science. This is a compilation with references to indicators for 35 departments ("Scientometric indicators", 2023), which reflects scientometric indicators in the author profiles of the academic community in the Scopus and Web of Science databases (Scientific Library of Yaroslav Mudryi National Law University, n.d.a). The employees of the Scientometrics sector record the specified metadata in consolidated tables for each of the 35 departments once per year, which allows one to carry out certain analytical activities and get an idea on the formation of the image of a scientist (Iatsyshyn et al., 2021).

Since the beginning of 2023, the number of scientific and pedagogical workers of Yaroslav Mydryi National Law University with publications in Scopus is equal to 377 authors, and on the Web of Science platform – 369 authors (data as of April 2023) (Yaroslav Mudryi National Law University, n.d.).

To display the indicators of the publication activity of the university's scientists, a resource was created on which the internal accounting of authors' publications by departments is carried out in Scopus (Scientific Library of Yaroslav Mudryi National Law University, n.d.b) and Web of Science (Scientific Library of Yaroslav Mudryi National Law University, n.d.c).

In order to solve problematic issues related to the arrangement of Publons author profiles, which have been transferred to the Web of Science platform since August 18, 2022, communication activities are carried out directly with the authors of publications indexed on the Web of Science platform by sending appropriate messages with a request to create an author profile, add and/or delete publications in the author's profile, confirm the author's profile and/or confirm publications in the author's profile, etc. with the provision of relevant recommendations, presentations and video instructions. Since August 18, 2022, 78 messages were sent followed by individual online/offline consultations.

In order to reliably display the indicators of publication activity in the author profile in the Scopus database, the employees of the Scientometrics and Bibliometrics sector edit the authors' profiles by sending requests to the Scopus service (118 requests were sent).

## Conclusions

Unfortunately, not all IHEs in Ukraine have access to the SciVal analytical program (Ministry of Education and Science of Ukraine, 2021), which provides more analytical capabilities and settings. As for the access to the analytical software product InCites, it is provided to only one institution in Ukraine – the Ukrainian Institute of Scientific and Technical Expertise and Information, where scientists from other institutions can use this access (Nauka ta Metryka, 2020).

Technical component, which requires experienced engineering staff to set up free API services in their own software products, is becoming a challenge for academic libraries of humanitarian higher education institutions in Ukraine.



The number of members of the ORCID-Ukraine consortium is increasing in view of further opportunities (ORCID, n.d.d). Thus, 35 institutions of Ukraine have already joined the ORCID-Ukraine consortium (as of 28.08.2023) (ORCID, n.d.c), but out of more than 191 IHEs of Ukraine with a law orientation (Освіта.ua, 2023), only one has become a participant in this project - the National University "Odesa Law Academy" (ORCID, n.d.b). This is connected with certain difficulties.

In conclusion, we note that the leadership of each organization (university or scientific institute) determines the choice of ways to integrate and adapt to modern innovative services and software tools for the formation and management of metadata in order to improve the image, subject to the existence of financial and technological capabilities and trained personnel of specialized structural units, which can be included in libraries. Among the available tools for working with metadata, there is offered an update of the software for university repositories, which makes it possible to present the work of scientists in the open access and for free, and to raise not only the image of the author, but also that of the organization where he/she works. High-quality technical and software configuration of the repository contributes to: 1) quick indexing of publications in the system Google Scholar; 2) increasing the visibility of publications and increasing their citation rate; 3) advancement in international rankings tracking the specified scientometric indicator; 4) receiving new opportunities in the international educational and scientific community.

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## **Виклики відкритої науки: проблеми дослідження метаданих та аналіз наукометричних показників науковців (досвід Наукової бібліотеки Національного юридичного університету імені Ярослава Мудрого)**

**Мета.** Наукова публікація спрямована на аналіз розвитку відкритої науки з огляду на міжнародний національний досвід, а також демонстрацію напрацювань Національного юридичного університету в напрямі просування відкритої науки та управління метаданими, пов'язаними з наукометричними показниками науковців. **Методика.** Для досягнення зазначеної мети використовувалися теоретичні методи наукового дослідження: аналіз літератури та системний підхід. **Результати.** В якості результатів цього наукового дослідження стала систематизація сервісів з наукометрії, які напрацьовані в Науковій бібліотеці Національного юридичного університету імені Ярослава Мудрого для інформування науковців про їх наукометричні показники, що відображають публікаційну активність у двох основних міжнародних наукометричних базах Scopus та Web of Science. **Висновки.** У підсумку зазначено про важливість просування відкритої науки в університетських репозитаріях, які є одними з сервісів, що здійснюють управління метаданими.

*Ключові слова:* відкрита наука; метанаука; метадані; університетський репозитарій; сервіси з наукометрії; Наукова бібліотека Національного юридичного університету імені Ярослава Мудрого

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