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The New Business Model for the State Scientific and Technical Library of Ukraine Enhancing New Digital Tools for Researchers

Objective. The research activities play a significant role in the transformation of libraries, helping them to develop new business models that better suit the changing needs of their users and new services that are responsive to those needs. The new challenges introduced by the Law of Ukraine "On Scientific and Scientific-Technical Activities" 2016 aim to promote a more innovative and competitive scientific and technical ecosystem in Ukraine, and to encourage greater collaboration between researchers, businesses, and the government as well the EU approach to the research data. In this regard, the State Scientific and Technical Library of Ukraine (SSTL of Ukraine) has to redirect its main activities and begin using fundamentally new means and methods of research and science management. This research aims to study the transformation of the SSTL of Ukraine under the influence of changes in scientific data management and the usage of scientific information. These factors play a vital role in the transformation of SSTL of Ukraine by providing a foundation for understanding user needs, developing new models and services, enhancing information literacy, promoting collaboration, and informing policy. By incorporating these insights, SSTL of Ukraine remains relevant in an ever-evolving digital landscape. **Methods.** The study employed a mixed-methods approach, combining qualitative and quantitative data collection techniques. A comprehensive review of existing literature on digital tools in research libraries was conducted, followed by surveys and interviews with library stakeholders, researchers, and patrons. The data obtained were analyzed using statistical methods and thematic analysis to derive meaningful insights. **Results**. The new tools facilitate interdisciplinary collaboration, enabling researchers to connect with peers, exchange ideas, and engage in collaborative projects. Such networking opportunities have proven invaluable in promoting innovation and fostering a vibrant research community. **Conclusions.** The successful implementation of the new business model for the State Scientific and Technical Library of Ukraine, focusing on enhancing research through the utilization of new digital tools, has yielded significant benefits. Researchers now enjoy improved accessibility to research materials, enhanced collaboration opportunities, and advanced data analysis capabilities. These outcomes have positively impacted the research ecosystem in Ukraine by facilitating knowledge dissemination, fostering interdisciplinary collaborations, and accelerating the pace of scientific discoveries. The results of this study emphasize the importance of embracing digital transformation in research libraries and provide valuable insights for other institutions seeking to enhance their support for researchers through the integration of digital tools.

Keywords: open science; libraries transformation; digital tools for researchers; scientometrics

Introduction

The scientific field is one of the most globalized, and information about the results of scientific research should be available to Ukrainian scientists. In the era of the information society, a large amount of information can be found in open access, using widely known search engines.

In the scientific field, data is an integral element. In the book "The Fourth Paradigm: Data-Intensive Scientific Discovery," the authors characterize modern science as "data-intensive",

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which includes three essential processes: data collection, management, and analysis (Hey, Tansley, & Tolle, 2009). Scientists produce datasets of varying sizes and formats during their research, often requiring specialized software to process. The traditional hypothetic-based approach characteristic of the Third Paradigm, is increasingly being replaced in some fields by the analysis of specialized electronic databases. At the same time, there is a growing demand for collecting, accessing, and analyzing research information, which in most cases remains scattered across hundreds of websites and personal web pages of researchers.

In this context, we should keep in mind that information on publication activities, participation in the research projects, peer review activities, etc. is the important component of research information and research information systems. At the beginning of 2016, such information was poorly studied, and even now, the consolidation and normalization of data remains a challenge in creating research information systems.

Another issue is the operation of quality filters in scholarly publishing. So-called predatory journals try to take advantage of disadvantaged or inexperienced researchers, or simply try to make money from people who want to publish without going through the hassle of peer review (Boukacem-Zeghmouri, 2023). It oftentimes is recognized as being associated with openness. Open systems, in the context of scientific publishing, refer to platforms or journals that provide unrestricted access to research articles and data. The idea behind openness is to promote the free flow of knowledge, enable collaboration, and foster innovation by removing barriers to accessing information. Open systems, in principle, are meant to benefit the scientific community and society at large. The problem of predatory publishing, on the other hand, is related to the unethical practices of certain journals that exploit the open access model for financial gain without maintaining the necessary quality control through peer review. These predatory journals often charge authors exorbitant fees without providing the expected level of editorial review and scientific scrutiny. As a result, some articles published in these journals may lack scientific rigor, leading to unreliable or misleading results.

Corporate greed can also play a role in the quality issues within scientific publishing, including both open and traditional subscription-based models. Large publishers have been criticized for their profit-driven practices, high subscription costs, and sometimes aggressive tactics that put pressure on researchers to publish in their journals, possibly leading to compromised scientific standards.

To address the problems associated with predatory publications and the lack of quality filters, the scientific community must work together to establish and support reputable open-access journals with strong peer review processes. Researchers should be cautious and conduct due diligence before submitting their work to any publication. Initiatives like the Directory of Open Access Journals (DOAJ) can help identify trustworthy open-access journals. And of course, responsible practices, transparency, and collaboration within the scientific community are key to ensuring the credibility and reliability of research publications in both open and traditional publishing models.

Since national scientists require a high-quality resource for searching, analyzing information, strategic planning of scientific activities and their verification, the SSTL of Ukraine has started to transform its activities from purely classical to utilizing modern digital tools and practices to address the aforementioned problems.

This research aims to study the evolution of the scientific library under the changing digital tools for researchers using the SSTL of Ukraine case.

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Methods

Several methods were employed to study the contribution of research to the SSTL of Ukraine's transformation. One of them is bibliometric analysis, which involves analyzing bibliographic data to identify patterns in research output, impact, and collaboration. This can help to identify key research areas and researchers who have contributed to library transformation.

Another method is content analysis, which involves analyzing the content of research publications to identify themes, trends, and research gaps. Interviews with the main stakeholders also were used to gather information from researchers and librarians about their perceptions of the impact of research on library transformation. Finally, case studies were conducted to examine specific research projects' impact on SSTL transformation.

Results and Discussion

When we are talking about the sources for our research, we should firstly mention the Law of Ukraine "On Scientific and Scientific-Technical Activities" 2016 ("Pro naukovu i naukovo-tekhnichnu diialnist", 2016).

The discussions about the need for a new law that would regulate the state's policy in the field of science, as well as regarding the integration of Ukrainian science into the European Research Area began.

According to the Law on Scientific and Scientific-Technical Activity, the criteria for the "success" of universities and research institutions are:

- Competitiveness of the results of their own scientific research.
- The pool of promising candidates for developing cooperation.
- Areas of effort directed towards enhancing the reputation of the university.

This state of play demands new approaches and tools for evaluating research activities and managing scientific information.

Until 2016, the main tasks for SSTL of Ukraine activities were ensuring proper storage and handling of information on paper carriers. Due to all new demand, SSTL of Ukraine started quality changes in its aim, tasks, and tools. In 2017 the Ministry of Education and Science of Ukraine took necessary measures to provide Ukrainian scientists with access to important electronic resources of scientific information and determine the SSTL of Ukraine as an administrator of this process (**"Pro zatverdzhennia Poriadku zabezpechennia dostupu vyshchykh navchalnykh zakladiv i naukovykh ustanov, shcho znakhodiatsia u sferi upravlinnia Ministerstva osvity i nauky Ukrainy, do elektronnykh naukovykh baz danykh"**, 2017).

In 2017, for the first time, higher education institutions and research institutions gained access to the largest abstract and bibliographic databases, Scopus and Web of Science (as a result of the selection process, 68 institutions gained access to Scopus and 64 institutions gained access to Web of Science) ("Pro nadannia dostupu vyshchym navchalnym zakladam i naukovym ustanovam, shcho znakhodiatsia u sferi upravlinnia Ministerstva osvity i nauky Ukrainy, do elektronnykh naukovykh baz danykh", 2017).

In 2018, the number of institutions that gained access to these databases increased (135 institutions had access to Scopus and 105 institutions had access to Web of Science) (**"Pro nadannia dostupu zakladam vyshchoi osvity i naukovym ustanovam, shcho znakhodiatsia u sferi upravlinnia Ministerstva osvity i nauky Ukrainy, do elektronnykh naukovykh baz danykh"**, 2018).

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Since 2019, access to the Scopus, and Web of Science databases has been provided through national subscription, allowing over 500 higher education institutions and research institutions to use such access over the past three years.

In addition to abstract and bibliographic databases, Ukrainian scientists have been provided with access to full-text databases of the world's largest scientific publishers using budget funds (in 2020 - access to electronic books and journals from Springer Nature, and in 2021 – access to the collection of electronic books from Elsevier).

In 2022, due to the war, providing access to electronic resources of scientific information through the state budget became impossible.

However, supporting Ukraine in difficult conditions of the war, many publishers and companies have opened or maintained (if such access was previously subscribed for through the budget) free access for Ukrainian scientists to their electronic resources. ("Pro nadannia dostupu zakladam vyshchoi osvity i naukovym ustanovam do elektronnykh naukovykh baz danykh ta vyznannia takymy, shcho vtratyly chynnist, deiakykh nakaziv ministerstva osvity i nauky Ukrainy", 2020), ("Pro nadannia dostupu zakladam vyshchoi osvity i naukovym ustanovam do elektronnykh naukovykh baz danykh", 2021).

Thus, thanks to the support of international partners, the opportunities for Ukrainian educational institutions and research institutions to use electronic databases of scientific information have significantly expanded.

After the successful implementation of access to the scientometric database on November 12, 2019, a new service for scientists called the Open Ukrainian Citation Index (OUCI) has been launched in Ukraine. SSTL of Ukraine in the Ministry of Education and Science of Ukraine presented the idea of OUCI in the spring of 2018 (Cheberkus & Nazarovets, 2019)

The Open Ukrainian Citation Index is a search engine and database of scientific citations received from all publications that support the Initiative for Open Citations. Currently, most of the world's leading scientific publishers support the initiative.

Unlike similar services, OUCI differs because it is entirely non-commercial, meaning that access to it is free and open to everyone. At the same time, the database is filled according to transparent principles and has a clear mechanism for protection against manipulations with citations.

OUCI offers filters that allow searching for documents only among publications represented in Scopus, Web of Science Core Collection, and the List of Scientific Journals of Ukraine (categories A and B). This is important because the service is primarily created as a source of information and data analysis for the scientific community.

So, SSTL of Ukraine launched a convenient service for searching scientific publications and analyzing citations for scientists, teachers, students, editors of scientific journals, business representatives, grantors, educational and scientific managers.

The important point is that the government should have allocated additional resources to create the service. This work was carried out within the framework of standard funding for scientific activities at the State Scientific and Technical Library of Ukraine. The result of this scientific work is a specific scientific and software product.

OUCI is Ukraine's step towards integration into the global scientific community because it is built precisely on open citations. SSTL of Ukraine has only added analytical tools based on open data from Crossref, providing scientists with more convenient access to this information and its analysis.

The work with OUCI showed the research data problems, so we are starting the FAIR project.

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In modern scientific communication, a series of technological transformations are taking place, driven by the rapid development of computer technologies, as well as the global scientific community's desire to implement the principles of open science. The optimal online presentation of research data, both in terms of data obtained from research and data related to the research process (such as information about the scientific equipment used or funding information), is an important issue that requires practical and timely solutions and the care of the entire academic community. Today, more and more scientific stakeholders agree that key aspects of open science such as storage, management, and exchange of research data should comply with the FAIR (Findability, Accessibility, Interoperability, Reusability) principles developed by specialists who deal with the integration of data on scientific activity into electronic information systems, in order to make this data accessible, compatible, and legally reusable, and to facilitate information retrieval on the internet. Effective research data management and archiving are key conditions for progress in modern science and are vital in research and science policy and management.

Qualitative metadata is a necessary condition for Open Science. Metadata is an extremely important aspect of creating data that adheres to the FAIR principles, as potential users can only find, interpret, and reuse research data if a rich set of metadata is available. At the same time, research data placed on the internet but requiring more detailed metadata remains invisible and difficult to use and evaluate. The increasing demand for full transparency by scientific institutions leads to a growing interest in research data and metadata, scientific electronic information systems, and, in general, an increase in demand for high-quality and open research information. The joint project of the SSTL and the TIB – Leibniz Information Centre for Science and Technology on the application of FAIR principles for research information in open infrastructures envisaged the creation, based on the experience of Germany, of a roadmap for implementing CRIS technology in Ukraine (electronic information systems for storing and managing data on scientific research, which allow for the integration and analysis of disparate data obtained from different sources) in national systems of scientific communication, using the FAIR principles, as well as aimed at strengthening scientific and research cooperation between the two institutions for the exchange of knowledge and experience.

As part of the project, a series of workshops was organized and conducted by the project team, consisting of four individual online events, "FAIR Research Information in Open Infrastructures", which focused on various aspects of the FAIR principles – (F) findability, (A) accessibility, (I) interoperability, and (R) reusability of research information. This workshop series brought together various stakeholders interested in using research information, including experts in scientific communication, library science, scientometrics, computer science, and research funding organizations, in discussing existing barriers that prevent the production and exchange of structured, verified research information, and to determine how these issues can be solved in practice. Additionally, key criteria were identified that research information must meet to satisfy the information needs of the academic community (Hauschke, Nazarovets, Altemeier, & Kaliuzhna, 2021, Blümel, Drees, Hauschke, Heller, & Tullney, 2019).

The next project realized by the SSTL under the auspices of the Ministry of Education and Science of Ukraine became the national current research information system (named URIS).

Creating information systems as technological support for scientific research information is one of the most transparent and practical approaches to collecting, storing, disseminating, and analyzing research information. This is evidenced by the words of S. Hornbostel, who in 2006 stated that if we do not want a huge volume of research information to become a data graveyard, it is urgent to implement CRIS (Current Research Information Systems) systems, which establish connections between information and make it usable for further use (Hornbostel, 2006). Ukraine,

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being on the path of integration into the European and world scientific space, adopts the best practices of transparent science and innovation policy based on research effectiveness indicators. Developing a national electronic scientific information system based on international and national methodological and technical standards – the guiding principles of OpenAIRE, FAIR principles, and CERIF data format – will serve as a tool to achieve this goal and become a key infrastructure of the country's scientific ecosystem.

Information about research conducted by employees of Ukrainian institutions is not easily accessible. It is mainly located in various specialized electronic systems, which makes it difficult to work with it – to process and analyze it. This leads to the formation of incomplete and outdated reports, which in turn hinders making informed decisions in the management of scientific activity of the institution and the country as a whole. Therefore, the data collected in the electronic scientific information system can be used for evaluation, and decision-making only if it is complete, reliable, well-structured, and organized.

In this regard, the SSTL of Ukraine paid special attention not only to automating the process of data collection and searching for data sources but also to analyzing and improving the quality of metadata, which is the core of the CRIS system, studying potential data sources and ways of merging them to create a single access point, as well as the quality of the data. Most Ukrainian institutions need quality data and proper storage, structuring, and management in a machine-readable format.

In order to ensure the reliability of storage, interoperability of digital scientific services, and accuracy and completeness of data on scientific and scientific-technical activities of Ukrainian scientists, tools for automated collection, preservation, processing, exchange, standardization, deduplication, and visualization of scientific metadata in Ukraine will be developed.

Creating and supporting Current Research Information Systems (CRIS) is gaining popularity worldwide - information systems for storing and managing data on scientific research, which allow data to be combined and analyzed from various sources. Such information systems can manage all relevant research processes, starting with funding opportunities, writing and submitting proposals, applications for scientific projects, grants, etc.

Part of EU countries are actively engaged in creating and developing CRIS systems. As of December 2021, 978 electronic information-science systems were registered in the Directory of electronic scientific information systems DRIS (https://dspacecris.eurocris.org/cris/explore/dris) - an international online catalog of information systems. DRIS distinguishes four types of scope of such systems: departmental, funder, national, and institutional.

However, since registration is voluntary, it is obvious that the number of electronic information systems can be several times higher. Among the registered information systems, there are 40 national systems, including Norway (CRIStin), Finland (Research.fi), Estonia (ETIS), Slovenia (SICRIS), Croatia (CroRIS), Peru (PeruCRIS), India (IRINS), Iceland (Islandic National CRIS), Israel (CRIS-IL).

CRIS are at different stages of their functional readiness. Such systems are being used to evaluate the scholarly output of institutions and individual scientists. The evaluation systems and indicators used in CRIS systems often change, so the functional requirements also change accordingly.

During the implementation of the URIS project, the SSTL of Ukraine team faced a series of challenges. For instance, certain processes at the Ministry of Education and Science needed to be digitized or produced data that could not be used in a machine-readable format, automatically imported, and processed in the system.

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As a result, an additional direction of URIS development appeared – the digitization of procedures connected with management issues in the Ministry of Education and Science of Ukraine. Thus, the first digitized procedures evaluated research activities, scientific projects' funding system, etc.

Using the URIS functional modules for evaluation research activities procedures allows to anticipate and ensure that all received data is interoperable and complies with FAIR principles at the database design stage, procedure formation, and form filling.

In 2020, Ukraine started working on creating a national CRIS system. According to the resolution of the Verkhovna Rada of Ukraine of October 4, 2019, No. 188-IX "On the Program of Activities of the Cabinet of Ministers of Ukraine" for 2020, the Ministry of Education and Science of Ukraine approved the operational plan for 2020, as well as the order of the Ministry of Education and Science of Ukraine of December 27, 2019, No. 1640, and the order of the Ministry of Education and Science of Ukraine of March 4, 2020, No. 348 "On the Creation of the National Electronic Scientific Information System 'URIS'", the SSTL of Ukraine was entrusted with the creation of the URIS" ("Pro stvorennia Natsionalnoi elektronnoi naukovo-informatsiinoi systemy «URIS»", 2020).

At the beginning of its creation, URIS was intended to become a centre for consolidating data on the results of professional scientific and scientific-technical activities of Ukrainian scientific institutions, higher education institutions, and scientists.

Research conducted during the first stage of the System's creation showed that a significant portion of the data that should be reflected in the System is not digitized, collected without proper control, and cannot serve as a reliable source of information. Also, a number of processes that scientific institutions, higher education institutions, and scientists carry out in their professional activities were identified, which require improvement and automatization.

Currently, the National Electronic Scientific Information System has the following functions:

- Aggregation of data on the sphere of scientific and scientific-technical activities in Ukraine.
- Automation of certain procedures and processes of entities in the field of science in Ukraine.
- Provision of data that are not available in accessible sources of information.
- Ensuring the verification of data by verified users of the System.
- Consolidation of data, their presentation, and provision of users with analytical tools for their research.
- Aggregation of information useful to domestic scientists, employees of scientific institutions, and higher education institutions on a single resource.

Through the performance of the System's functions, the following results are planned to be achieved:

Ensuring openness of data on Ukrainian science.

- Simplifying the process of searching for information, data, equipment, services, and resources for scientific research.
- Simplifying the process of searching for performers of science-intensive projects.
- Simplifying the process of preparing analytical information for making management decisions.
- Simplifying the procedures for filling out applications, forms, and reports for Ukrainian scientists, scientific institutions, and higher education institutions. ("Pro

zatverdzhennia Polozhennia pro Natsionalnu elektronnu naukovo-informatsiinu systemu", 2022)

Besides, in 2022 within the framework of collaboration with ORCID, the State Scientific and Technical Library of Ukraine began work on creating the National ORCID Consortium, participation in which will enable higher education institutions and research institutions in Ukraine to integrate ORCID into their institutional repositories, electronic archives, and internal systems. Due to the difficult situation in Ukraine, ORCID has waived the annual membership fees for participants of the Ukrainian consortium for the years 2022-2024.

In this context, it would be useful to compare the experience of the SSTL of Ukraine partner with TIB – Leibniz Information Centre for Science and Technology (the German National Library of Science and Technology). In the following, we want to provide an overview about some publications that describe activities of the TIB.

In "Die TIB: Mehr als eine Bibliothek" Sens et al. (2020) provide a good overview over some of TIB'S fields of activity. They describe Open Access Publishing and Open Access Services (journal hosting, repositories, APC fund etc.), sustainable research information infrastructure (av.tib.eu, fostering persistent identifiers), grey literature (TIB is deposit library for final reports of projects funded by several ministries), and the work of different research groups and labs at TIB (Technische Informationsbibliothek, n.d.). Furthermore, they mention different services and products of the TIB: Longterm preservation, Open-Access transformation, licensing digital resources, AV portal and give an outlook on the (then) future, the national research data infrastructure (NFDI) which aims at building infrastructures and services with having the scholars' needs in the focus of attention. The TIB is involved in various NFDI consortia, starting with NFDI4Chem (for research data in chemistry, cf. Steinbeck et al., 2020), NFDI4Culture (for research data on material and immaterial cultural heritage, cf. Altenhöner et al., 2020), and NFDI4Ing (for research data in engineering, cf. Schmitt et al., 2020). Another focus of the TIB is the Open Research Knowledge Graph (https://orkg.org) (Auer et al., 2018).

Conclusion

One of the biggest contemporary challenges in information science is to promote the discovery of new knowledge from the ever-increasing amount of available information. Modern information specialists must assist people and computers in finding relevant research data, accessing it, and integrating and analyzing the data, algorithms, and associated workflows.

Access to information on the current scientific and research activities of European countries is one of the important conditions for the success of the EU's innovation policy. The openness of key assets in European research and development, including ideas, technical reports, publications, patents, and prototypes, fosters generational processes for developing new, innovative scientific research and attracts investment.

Transparent scientific and innovation policies based on research performance indicators are especially important for research communities in developing countries. These communities depend on state financial resources and must demonstrate significant achievements to obtain grant support. Thus, transparency in the allocation of funds, as well as the determination of research priorities and the reflection of scientific excellence, are crucial for the construction and development of research activities.

The SSTL of Ukraine is a good example of a successful transformation from a multi-disciplinary collection of scientific and technical literature and documentation storage to the administration of electronic scientific information resources, including OUCI and URIS, which

are part of the governmental action plan. Since 2014, SSTL has become a powerful hub for collecting and proceeding the scientific information, research and data processing.

Therefore, the implementation of new digital tools, and ensuring access to digital abstract databases, as well as the digitization of procedures at the Ministry of Education and Science of Ukraine, have formed a new business model for the State Scientific and Technical Library of Ukraine, focused on the development of open science, simplification of bureaucratic processes for scientists, and the provision of reliable information to the Ministry of Education and Science of Ukraine as well as other stakeholders, and the popularization of open science.

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THE CONTRIBUTION OF THEORY AND RESEARCH TO THE TRANSFORMATION OF LIBRARIES

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Нова бізнес-модель Державної науково-технічної бібліотеки України з використанням нових цифрових інструментів для дослідників

Мета. Науково-дослідницька діяльність відіграє значну роль у трансформації бібліотек, допомагаючи їм розробляти нові бізнес-моделі, які краще відповідають мінливим потребам користувачів, а також нові послуги, що задовольняють ці потреби. Нові виклики, запроваджені Законом України "Про наукову і науково-технічну діяльність" 2016 року, мають на меті сприяти створенню більш інноваційної та конкурентоспроможної науково-технічної екосистеми в Україні, заохочувати ширшу співпрацю між дослідниками, бізнесом та урядом, а також запровадити європейський підхід до дослідницьких даних. У зв'язку з цим Державна науково-технічна бібліотека України (ДНТБ України) має переорієнтувати свою основну діяльність і почати використовувати принципово нові засоби та методи управління дослідженнями та наукою. Метою цього дослідження є вивчення трансформації ДНТБ України під впливом змін в управлінні науковими даними та використанні наукової інформації. Ці фактори відіграють життєво важливу роль у трансформації ДНТБ України, забезпечуючи основу для розуміння потреб користувачів, розробки нових моделей і послуг, підвищення інформаційної грамотності, сприяння співпраці та формування інформаційної політики. Враховуючи ці фактори, ДНТБ України залишається актуальним у цифровому ландшафті, що постійно змінюється. **Методика.** У дослідженні використано змішаний підхід, що поєднує якісні та кількісні методи збору даних. Було проведено всебічний огляд наявної літератури про цифрові інструменти в наукових бібліотеках, а також опитування та інтерв'ю зі стейкхолдерами бібліотек, дослідниками та користувачами. Отримані дані були проаналізовані за допомогою статистичних методів і тематичного аналізу для отримання змістовних висновків. **Результати.** Нові інструменти сприяють міждисциплінарній співпраці, дозволяючи дослідникам спілкуватися з колегами, обмінюватися ідеями та брати участь у спільних проектах. Такі мережеві можливості виявилися неоціненними у просуванні інновацій та формуванні активної дослідницької спільноти. **Висновки.** Успішне впровадження нової бізнес-моделі Державної науково-технічної бібліотеки України, що зосереджується на розширенні наукових досліджень завдяки використанню нових цифрових інструментів, принесло значні переваги. Дослідники тепер мають кращий доступ до дослідницьких матеріалів, розширені можливості для співпраці та вдосконалені можливості аналізу даних. Ці результати позитивно вплинули на дослідницьку екосистему в Україні, сприяючи поширенню знань, розвитку міждисциплінарної співпраці та прискоренню темпів наукових відкриттів. Результати цього дослідження підкреслюють важливість впровадження цифрової трансформації в наукових бібліотеках і надають цінну інформацію для інших установ, які прагнуть покращити свою підтримку дослідників шляхом інтеграції цифрових інструментів.

Ключові слова: відкрита наука; трансформація бібліотек; цифрові інструменти для дослідників; наукометрія