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Library Service in Ensuring the Information Ecology of An Organization: A Case Study of a Research University Library

Objective. Information products and services provided by academic libraries to support the educational process and research are a component of the information ecology of educational institutions, but their list within each academic library depends on the institutional ecology. Therefore, it is useful to study the practical experience of various academic libraries in ensuring the information ecology of research universities. As an example, we consider the successful experience of G. Denysenko Scientific and Technical Library of the National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute" (KPI Library). **Methods.** A qualitative method of longitudinal research was used to obtain data and analyze the KPI Library information services. A number of primary data sources were used, such as diaries of first-hand reflection, observations, engaged in documenting and developing a narrative about the effectiveness of interaction of students, lecturers, scientists with the information environment. Analytical and review, logical, systematic methods are applied to substantiate the place of library service in information ecology. **Results.** The experience of KPI Library in ensuring the information ecology of the university was studied. Ways of organizing prompt, effective and safe (ecological) interaction with users and support of internal information products and services are analyzed. It is shown which services (tools and information resources) and areas of activity of the library form the information ecology of Igor Sikorsky Kyiv Polytechnic Institute. The role of the library in the formation of information culture and the culture of academic integrity of scientists, teachers and students of the university is shown. **Conclusions.** The considered example of KPI Library activity confirms that an academic library is directly involved in formation of the information ecology of a research university. A deeper analysis of the value of products and the effectiveness of library services for various members of the academic community as a component of the information ecology of the university may be the subject of further research.

Keywords: information ecology; information services; library service; academic libraries; KPI Library

Introduction

Despite the relative unfamiliarity of the concept of an information ecology for the scientific environment of Ukraine, Western scientific thought has quite a long experience in conceptualizing it both at the monographic level (Davenport, 1997) and at the level of individual scientific articles (Harris, 1989; O'Day, 2000; Wang et al., 2017). In particular, Bonnie Nardi and Vicki O'Day (1999) define an information ecology "as a system of people, practices, values, and technologies in a particular local environment". Dr. D. Casagrande (n.d) says that information ecology is an emerging, loosely-defined field generally concerned with modeling information processes in human systems. Information ecology is also considered as "a collocated space enriched with a multiple interlinked heterogeneous technologies. Information ecology works as an integrated cognitive system, through the lenses of distributed cognition" (Vasiliou, Ioannou, & Zaphiris, 2014).

As an example of information ecology, researchers also consider a library that contains "a surprising variety of services and resources", and librarians appear as key subjects on whom the success of the entire information ecosystem depends (Nardi & O'Day, 1999).

Despite the mention of the library in the context of information ecology (García-Marco, 2011; Wang et al., 2018), a subject study of library service in the information and environmental dimension has not yet taken place. In view of this, the proposed research aims to substantiate the complex of products and services of an academic library as a component of a university's

information ecology.

Methods and Materials

The research results were obtained through the use of a complex of scientific methods. First of all, valuable conclusions were drawn based on the use of a longitudinal case study method, in particular, planning and reporting documentation for data collection was studied. In addition, a number of primary data sources were used, such as first-hand reflection diaries, observations, which are used here to document and develop a narrative about the effectiveness of the interaction of students, lecturers, scientists with the information environment, about the risks they had to face and the services of an academic library that they discovered for themselves. The theoretical basis for the research results was provided by the use of the analytical and review method, in particular, regarding the reflection of the representation of the information ecology topic in modern scientific thought. We also used logical and systematic methods to reveal the place of library products and services in the system of information ecology.

Results and Discussion

With the development of information and communication technologies, academic libraries are in a process of constant transformation. In this regard, their roles, tasks, services are discussed in the research environment. Some researchers even talk about denying the role of a library as a provider of scientific information due to widespread access to information resources via the internet and draw attention to the violation of its role as a gateway to information by search engines, research databases and reference tools. Many library services overlap with each other and with the search tools available on the open internet. Discovery layers will continue to be a central starting point, but libraries should strive to improve them by upholding experiences that integrate more information sources and make machine learning and artificial intelligence capabilities available in a transparent manner. Many reference and indexing databases should be undone and/or integrated with the discovery layer, and libraries should look for the next generation of reference resources that can be integrated into the user flow (Dahl, 2021).

Despite the fact that machines for a long time have no peers in terms of the speed of providing access to information, in some cases librarians are able to predict and meet the information needs of users better than artificial intelligence technologies. It should be remembered that the activities of companies that are represented on the market of information products and services are primarily aimed at making a profit, promoting products, etc. Accordingly, modern search algorithms, which are used on the pages of various popular websites, social networks, and online stores, are configured in such a way as to provide, first of all, the information that a particular user likes. This can be achieved thanks to the preliminary collection and analysis of users' personal data. Therefore, even in the case of simply informing users about the risks of careless handling of their personal data on the Internet, librarians are able to play an important role in network security and ethic issues (Nazarovets & Kulyk, 2017).

Information content and services provided by academic libraries must be in line with the specific needs and practices of their communities. "Their main question must be 'What is my added value for education and research?' And the answer should be a specific value proposition, not a general or standard offer" (Schöpfel, 2016, p. 123).

On the one hand, users can independently organize the research stage related to the search, evaluation, selection of information, using both informal channels of scientific communication and various databases, such as Scopus and Web of Science, arXiv, CORE, Google Scholar, etc., which

provide access to scientific information without the need to go to a scientific library. However, it is worth remembering that the modern information environment is more extensive than ever before, which makes it extremely complex. Therefore, when performing the tasks set, for example, organizing learning and teaching processes, carrying out research activities, researchers will use this environment with different efficiency. The possibilities of combining information and communication technologies in information ecology are wide, but they depend on the awareness of researchers and their level of competence.

An important advantage of the academic library is that it is in constant interaction with a multicomponent, complex external information environment (information resource providers, open access resources, digital tools and services, etc.) and an institutional environment whose information needs are constantly studied by the library. Achieving a reliable partnership between librarians and the academic community is now possible “by integrating internal and external digital resources and focusing on information search skills in information literacy courses. These competencies generally support group collaboration and empowerment of academics and can increase their efficacy of information use by opening a broader academic perspective on the digital transformation surrounding them” (Deja, Rak, & Bell., 2021).

Information products and services provided by academic libraries to support the educational process and research are a component of the information ecology of universities since these products and services are able to reduce the risks of consuming information products of dishonest publishers, outdated, pseudoscientific information content, improve the quality of the educational process, research activities. Various studies have proposed services that academic libraries can provide to support research (Bourg, Coleman, & Erway, 2009; Koltay, 2019), but their list within each academic library depends on institutional ecology.

A case study of the G. Denysenko Scientific and Technical Library of the National Technical University of Ukraine “Igor Sikorsky Kyiv Polytechnic Institute”

As an intermediary between a user and the external information resources necessary for performing certain tasks, the G. Denysenko Scientific and Technical Library of the National Technical University of Ukraine “Igor Sikorsky Kyiv Polytechnic Institute” (hereinafter – KPI Library) organizes their prompt, efficient and safe (environmental) interaction and supports internal information products and services taking into account specialized interests and needs of specific targeted audiences of the academic community.

The main task of the modern university library is information support of university education and research processes. A library proposes to the professors, students and scientists resources and tools; holds educational events, workshops and individual consultations for effective organization of studying, teaching and research. Taking into consideration trends in education, and challenges that grew during the pandemic, special attention is paid to informational and media literacy, the development of open science, integration of the university into the international educational and scientific environment (Bruil & Korian, 2021).

Examples of information products and services offered by KPI Library include:

- for the administration – a reliable partnership in the development of the educational and scientific environment and the formation of values; analytical, statistical information as a basis for decision-making;
- for structural divisions – information support in the educational process and research activities, a modern collection of information resources, information support for the accreditation of educational programs, subject librarians services, consultations and

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educational activities on various aspects of information literacy and the culture of academic integrity;

- for researchers-comfortable, safe, accessible physical and virtual space, electronic document delivery services and inter-library subscriptions, consultations and educational events, excursions, exhibitions.

Important components of the university's information ecosystem, the functioning of which is ensured by the library, in particular, are:

- a creative, comfortable, safe environment for learning, research, development;
- website;
- electronic catalog;
- digital library;
- institutional repository;
- publishing platform.

KPI Library aims to provide research tools and information resources that are relevant to educational programs and research areas. Library search engines help save researchers time and money by offering remote access to prepaid and open access resources filtering out dishonest informational content. In particular, in KPI Library, research and teaching staff can use the replenishment service based on an electronic catalog or order the necessary book through the online form on the website. Subject librarians of KPI Library select literature for work programs (syllabuses) of academic disciplines (educational components), and for the convenience of students' access to recommended materials, together with lecturers, they support the "Course materials" service.

Every year, KPI Library conducts research to find out how satisfied users are with the information service. In January-February 2022, an online survey was conducted, which was attended by 353 respondents (students, lecturers, scientists of the Igor Sikorsky Kyiv Polytechnic Institute). A significant part of the respondents (103) to the question: "Do you use the information resources of the KPI Library (print and electronic resources)" indicated that they constantly use it, 107 researchers use it once a semester, 28 respondents find resources on the internet, 1 respondent noted that they do not use the library resources at all.

The physical space of the library can be considered a safe (ecological) learning environment, where consultants will always provide information, conduct a training consultation or an educational event on the search and use of information resources and digital tools.

As for the virtual space of the library, its website provides access to internal information resources and services, as well as redirects to external ones, which are processed and recommended by information specialists. For example, the KPI Library website provides a list of search engines and databases that correspond to the areas of educational and research activity. Also, the library constantly updates the list of open educational resources (<https://www.library.kpi.ua/open-educational-resources>), as they are recommended to be included in the syllabuses of academic disciplines.

In September 2022, KPI Library offered users the search engine "Catalog+" (<https://discovery.kpi.ua>). The search engine runs on the VuFind software. The system librarian has localized this software in Ukrainian. This is an important result, as the modified software can be distributed to other academic libraries in Ukraine.

The system allows one to simultaneously search for materials of the desired topic among the printed publications in the library catalog, in the ELAKPI institutional repository and the digital library of valuable and rare publications of the Igor Sikorsky Kyiv Polytechnic Institute, as

well as on open access platforms: arXiv, Hindawi and IntechOpen.

Some of the "Catalog+" functions are available without user authorization (search, sending selected search results entries by e-mail), while others require mandatory authorization (ordering copies, creating lists by topic and permanently saving such lists). The system offers hints in the search bar, refinement of search results using facets, etc. Electronic resources can be downloaded immediately, and printed ones can be ordered for issuance (only authorized users can perform this).

Another platform included in the information ecology of the Igor Sikorsky Kyiv Polytechnic Institute is a publishing platform (based on the Open Monograph Press software). Currently, it presents only individual publications of the library and researchers of the university, but the plans for the future are to use this platform for publishing open educational resources.

Among the most important areas of activity of the library for improving the information ecology of the university is the formation of an information culture and a culture of academic integrity. This is an important area of activity of the academic library, as research shows that students differ in their level of information literacy: some of them have some experience with research tools and information literacy skills, but are ready to continue improving, while other students have a low level of information literacy. Such a situation requires a differentiated approach during information literacy classes (Valenza et al., 2022). A lot of engineering students lack library research skills essential to be successful in academic study (Liu, 2021).

Information literacy is important not only for students but also for researchers. To conduct high-quality research and help their universities rise in national and international rankings by implementing university research strategies and goals, researchers must be information-literate. As H. D. Daland and K. M. W. Hidle note, "this must be made a priority in university management, and academic libraries should work together with other departments in the university to strengthen and display their positions as an important part of research. Academic libraries must also be aware of their responsibility as a part of the support system for excellent research ... Faced with research, information handling is highly complex ... Teaching researchers how to search for, evaluate and use sources in an ethical manner is still a large part of the library's contribution" (Daland & Hidle, 2016).

Since 1961, KPI Library has been conducting a mandatory lecture on information literacy for first-year students of all structural divisions of the university – all institutes/faculties. Information literacy courses are held separately for young researchers – masters and postgraduates.

All researchers of the university can choose any topic for individual educational online counseling, or order training for a group of students. The approximate list of topics for consulting and training is as follows: digital tools of scientific communication, sources of educational and scientific information, information search, open access resources for searching scientific information, modern tools for identifying researchers in the digital scientific environment, managing research data, distributing the results of scientific research in the digital environment, bibliographic managers in research activities, text borrowing, making references and citations in educational and scientific papers, etc.

The library's specialists are involved in teaching educational disciplines on academic integrity – the university-wide selective academic discipline "Fundamentals of academic integrity", which can be chosen by second-year students, and the upgrade training course for research and teaching staff "Academic integrity" (specialty "Public management and administration") on the basis of the Institute of Postgraduate Education of the Igor Sikorsky Kyiv Polytechnic Institute.

Here are the feedbacks of researchers during the annual survey on the level of satisfaction with the KPI Library service:

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- “When she was studying, she worked a lot in the educational space "Belka" of the library. Now I mainly listen to lectures held online. I turned to the literature two or three times (and I don't think I'll turn to it more often, sorry), but I managed to find some sources that I couldn't find on the Internet” (a graduate);
- “In fact, I would live in a library:.)” (a student who constantly uses the library);
- “I am satisfied with the KPI library and its information resources” (a student who constantly uses the library);
- “Thank you for being efficient online!” (a postgraduate);
- “The library is always a place you want to go back to” (a student);
- “Good library, the most useful literature can be found” (a student);
- “It is very convenient to use the library. The electronic catalog is perfectly designed. The librarians are polite and can choose any book by topic and for your taste” (a student);
- “Thank you for the opportunity to use such a variety of books for free!” (a student);
- “There is a great lack of literature on some topics, for example biology, anatomy, chemistry” (a student);
- “Thanks to the library consultants, I have avoided a publication in a predatory journal” (a postgraduate);
- “The library saves a researcher's time and helps to quickly obtain quality sources by fair means. Consultants always inform about access to new databases, help to set up remote access” (a lecturer at the Y. O. Paton Educational and Research Institute of Materials Science and Welding of the Igor Sikorsky Kyiv Polytechnic Institute);
- “My experience of interacting with the library has demonstrated full readiness to cooperate with lecturers, in particular in updating the literature necessary for our humanitarian educational programs, so students get the opportunity to tackle up-to-date scientific sources. In addition, close communication with lecturers and spider work on organizing events (lectures, master classes, etc.) contributes to the popularization of current knowledge and the expansion of students ' educational horizons.” (a lecturer at the Publishing and Printing Institute of the Igor Sikorsky Kyiv Polytechnic Institute).

Conclusions

Based on the definition of information ecology as a system of people, practices, values and technologies, a scientific library is an example of an information-ecological system formed at the intersection of products and services of the external information environment and the internal institutional space of users' needs and practices. The role of the scientific library as a subsystem of the institutional information ecology is to adapt available information products and services to the needs of specific targeted audiences of the university.

The library supports real and virtual spaces for learning, research and development, including a website with the integrated electronic catalog and digital library, an institutional repository and a publishing platform. In the context of adapting the products and services of the Scientific Library to changes in scientific communication caused by the development of electronic technologies, KPI Library provides users with access to the "Catalog+" search engine based on the VuFind software, as well as to the services of the publishing platform for publishing open educational resources.

With the participation of an academic library, the ethical basis for the functioning of the information ecology of an organization is formed – the culture of academic integrity.

REFERENCES

- Bourg, C., Coleman R., & Erway R. (2009, November). *Support for the Research Process: An Academic Library Manifesto*. Retrieved from <https://www.oclc.org/content/dam/research/publications/library/2009/2009-07.pdf> (in English)
- Bruil, O., & Korian, Y. (comp.). (2021). *KPI Library Strategy: 2021–2025*. Kyiv, Ukraine: Lira-K. Retrieved from <https://ela.kpi.ua/handle/123456789/43216> (in English)
- Casagrande, D. (n.d). *Information ecology*. Lehigh University. Retrieved from <https://www.lehigh.edu/~dac511/pages/research/infoecol.html> (in English)
- Dahl, M. (2021). The evolving role of library collections in the broader information ecosystem. In D. Baker & L. Ellis (Eds.). *Future directions in digital information: Predictions, practice, participation* (pp. 161-174). Chandos Publishing. doi: <https://doi.org/10.1016/B978-0-12-822144-0.00010-0> (in English)
- Daland, H. D., & Hidle, K. M. W. (2016). Information Literacy Skills in the Research Process. In *New Roles for Research Librarians: Meeting the Expectations for Research Support* (pp. 7-15). Chandos Publishing. doi: <https://doi.org/10.1016/b978-0-08-100566-8.00002-4> (in English)
- Davenport, T. H. (1997). *Information Ecology: Mastering the Information and Knowledge Environment*. Oxford, United Kingdom: Oxford University Press. (in English)
- Deja, M., Rak, D., & Bell, B. (2021). Digital transformation readiness: perspectives on academia and library outcomes in information literacy. *The Journal of Academic Librarianship*, 47(5). 102403. doi: <https://doi.org/10.1016/j.acalib.2021.102403> (in English)
- García- Marco, F. (2011). Libraries in the digital ecology: reflections and trends. *The Electronic Library*, 29(1), 105-120. doi: <https://doi.org/10.1108/02640471111111460> (in English)
- Harris, K. (1989). Information ecology. *International Journal of Information Management*, 9(4), 289-290. doi: [https://doi.org/10.1016/0268-4012\(89\)90052-2](https://doi.org/10.1016/0268-4012(89)90052-2) (in English)
- Koltay, T. (2019). Accepted and emerging roles of academic libraries in supporting research 2.0. *Journal of Academic Librarianship*, 45(2), 75-80. doi: <https://doi.org/10.1016/j.acalib.2019.01.001> (in English)
- Liu, G. (2021). Information literacy instruction for international graduate engineering students: A case study at University of Windsor. *Journal of Academic Librarianship*, 47(5). 102415. doi: <https://doi.org/10.1016/j.acalib.2021.102415> (in English)
- Nardi, B. A., & O'Day V. (1999). *Information Ecologies: Using Technology with Heart*. MIT Press. doi: <https://doi.org/10.7551/mitpress/3767.001.0001> (in English)
- Nazarovets, S., & Kulyk, E. (2017). Biblioteka 4.0: tekhnolohii ta servisy maibutnoho [Library 4.0: next generation services and technologies]. *Biblioteknyi visnyk*, 5(241), 3-14. Retrieved from http://eprints.rclis.org/31968/1/bv_2017_5_3.pdf (in Ukrainian)
- O'Day, V. L. (2000). Information Ecologies. *The Serials Librarian. From the Printed Page to the Digital Age*, 38(1-2), 31-40. doi: https://doi.org/10.1300/J123v38n01_05 (in English)
- Schöpfel, J. (2016). Six Futures of Academic Libraries. In D. Baker & W. Evans (Eds.). *The End of Wisdom? The Future of Libraries in a Digital Age* (pp. 123-128). Chandos Publishing. doi: <https://doi.org/10.1016/B978-0-08-100142-4.00013-0> (in English)
- Valenza, J. K., Dalal, H., Mohamad, G., Boyer, B., Berg, C., Charles, L. H., Bushby, R., Dempsey, M., Dalrymple, J., & Dziedzic-Elliott, E. (2022). First years' information literacy backpacks: What's already packed or not packed? *The Journal of Academic Librarianship*, 48(4). 102566. doi: <https://doi.org/10.1016/j.acalib.2022.102566> (in English)

- Vasiliou, C., Ioannou, A., & Zaphiris, P. (2014). Understanding collaborative learning activities in an information ecology: A distributed cognition account. *Computers in Human Behavior*, 41, 544-553. doi: <https://doi.org/10.1016/j.chb.2014.09.057> (in English)
- Wang, X., Guo, Y., Yang, M., Chen, Y., & Zhang, W. (2017). Information ecology research: past, present, and future. *Information Technology and Management*, 18, 27-39. doi: <https://doi.org/10.1007/s10799-015-0219-3> (in English)
- Wang, X., Yang, M., Li, J., & Wang, N. (2018). Factors of mobile library user behavioral intention from the perspective of information ecology. *Electronic Library*, 36(4), 705-720. doi: <https://doi.org/10.1108/EL-03-2017-0046> (in English)

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Науково-технічна бібліотека ім. Г. І. Денисенка, Національний технічний університет України "Київський політехнічний інститут імені Ігоря Сікорського" (Київ, Україна), e-mail: e.kulyk@library.kpi.ua, ORCID 0000-0003-4050-4054

Бібліотечне обслуговування в забезпеченні інформаційної екології організації: на прикладі бібліотеки дослідницького університету

Мета. Інформаційні продукти та послуги, що надаються науковими бібліотеками для підтримки навчального процесу та наукових досліджень, є складовою інформаційної екології навчальних закладів, але їх перелік у межах кожної наукової бібліотеки залежить від інституційної екології. Тому корисним є вивчення практичного досвіду різних академічних бібліотек у забезпеченні інформаційної екології дослідницьких університетів. Як приклад розглянемо успішний досвід Науково-технічної бібліотеки ім. Г. І. Денисенка Національного технічного університету України "Київський політехнічний інститут імені Ігоря Сікорського" (Бібліотека КПІ). **Методика.** Для отримання даних та аналізу інформаційних послуг Бібліотеки КПІ використано якісний метод лонгitudного дослідження. Використано низку первинних джерел даних, таких як щоденники безпосередньої рефлексії, спостереження, що включали документування та розробку нарративу про ефективність взаємодії студентів, викладачів, науковців з інформаційним середовищем. Застосовано аналітико-оглядовий, логічний, системний методи для обґрунтування місця бібліотечного обслуговування в інформаційній екології. **Результати.** Вивчено досвід роботи Бібліотеки КПІ ім. Ігоря Сікорського щодо забезпечення інформаційної екології університету. Проаналізовано шляхи організації оперативної, ефективної та безпечної (екологічної) взаємодії з користувачами та підтримки внутрішніх інформаційних продуктів і сервісів. Показано, які послуги (інструменти та інформаційні ресурси) та напрями діяльності бібліотеки формують інформаційну екологію КПІ ім. Ігоря Сікорського. Показано роль бібліотеки у формуванні інформаційної культури та культури академічної доброчесності науковців, викладачів і студентів університету. **Висновки.** Розглянутий приклад діяльності Бібліотеки КПІ підтверджує, що академічна бібліотека бере безпосередню участь у формуванні інформаційної екології дослідницького університету. Більш глибокий аналіз цінності продуктів та ефективності бібліотечних послуг для різних членів академічної спільноти як складової інформаційної екології університету може бути предметом подальших досліджень.

Ключові слова: інформаційна екологія; інформаційні послуги; бібліотечне обслуговування; наукові бібліотеки; Бібліотека КПІ ім. Ігоря Сікорського

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