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MODERN APPROACHES TO AUTOMATING LIBRARY PROCESSES IN HIGHER EDUCATION INSTITUTIONS

The purpose of this article is to analyse the current state of implementation of electronic document management in the automation of library processes in Ukraine and to determine the functional capabilities and challenges of using automated library information systems. The methodological basis of the study consists of methods of analysis and synthesis, comparative analysis, generalisation of regulatory and legal sources, and practical experience of university libraries. The study found that the automation of library processes in higher education institutions covers a range of interrelated areas, including electronic cataloguing, automated accounting and preservation of collections, management of electronic information resources, organisation of remote access to scientific materials, and digitisation of internal document flow. It was found that the introduction of automated library systems contributes to increasing the efficiency of library operations, reducing the routine workload on staff, optimising management decisions, and expanding the range of electronic services for users. The scientific novelty of the article lies in the fact that it has been proven that the level of automation efficiency directly depends on the integration of library technologies with the information infrastructure of a higher education institution and the consistency of digital solutions with its overall development strategy. It has also been established that the comprehensive implementation of automated processes increases the resilience of library activities to external challenges and ensures the continuity of information services in conditions of limited physical access. Conclusions. The study confirmed that the implementation of electronic document management and automated library information systems is a key prerequisite for the effective operation of higher education libraries in the context of digital transformation and external challenges. It has been established that comprehensive automation of library processes ensures increased efficiency in information resource management, improved quality of library and information services, and expanded opportunities for remote access to scientific content. It has been proven that the effectiveness of digital transformations in the library sector directly depends on the level of integration of electronic document management with the information infrastructure of the higher education institution, the availability of adequate human and technical resources, as well as the systematic improvement of the digital competencies of library staff.

Keywords: digital transformation, automated library information systems, information services, academic libraries, library management.

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СУЧАСНІ ПІДХОДИ ДО АВТОМАТИЗАЦІЇ БІБЛІОТЕЧНИХ ПРОЦЕСІВ У ЗАКЛАДАХ ВИЩОЇ ОСВІТИ

*Метою статті є аналіз сучасного стану впровадження електронного документообігу в автоматизацію бібліотечних процесів в Україні та визначення функціональних можливостей і проблем використання автоматизованих бібліотечних інформаційних систем. **Методологічну основу** дослідження становлять методи аналізу та синтезу, порівняльний аналіз, узагальнення нормативно-правових джерел і практичного досвіду університетських бібліотек. У результаті дослідження встановлено, що автоматизація бібліотечних процесів у закладах вищої освіти охоплює комплекс взаємопов'язаних напрямів, зокрема електронну каталогізацію, автоматизований облік і збереження фондів, управління електронними інформаційними ресурсами, організацію дистанційного доступу до наукових матеріалів та цифровізацію внутрішнього документообігу. Виявлено, що впровадження автоматизованих бібліотечних систем сприяє підвищенню оперативності бібліотечних операцій, зниженню рівня рутинного завантаження на персонал, оптимізації управлінських рішень і розширенню спектру електронних сервісів для користувачів. **Наукова новизна** статті виявляється в тому, що доведено рівень ефективності автоматизації іноді залежить від інтеграції бібліотечних технологій з інформаційною інфраструктурою закладу вищої освіти та узгодженості цифрових рішень із загальною стратегією його розвитку. Також встановлено, що комплексне впровадження автоматизованих процесів забезпечує стійкість бібліотечної діяльності до зовнішніх викликів і забезпечує безперервність інформаційного обслуговування в умовах обмеженого фізичного доступу. **Висновки.** У ході дослідження підтверджено, що впровадження електронного документообігу та автоматизованої діяльності бібліотечних інформаційних систем є ключовою передумовою ефективною бібліотеки закладів вищої освіти в умовах цифрової трансформації та зовнішніх викликів. Встановлено, що комплексна автоматизація підвищення бібліотечних процесів забезпечує оперативність управління інформаційними ресурсами, підвищення якості бібліотечно-інформаційного обслуговування та розширення можливостей віддаленого доступу до наукового контенту. Доведено, що результативність цифрових перетворень у бібліотечній сфері залежить від рівня інтеграції електронного документообігу з інформаційною інфраструктурою закладу вищої освіти, наявності належного кадрового та технічного забезпечення, а також системного підвищення цифрових компетентностей бібліотечних працівників.*

Ключові слова: цифрова трансформація, автоматизовані бібліотечні інформаційні системи, інформаційне обслуговування, наукові бібліотеки, управління бібліотечною діяльністю.

Relevance of the research topic. In the current context of the development of the information society and the digitisation of higher education, academic libraries are undergoing significant transformations related to the need to modernise traditional forms of work and introduce digital technologies. At the global level, the automation of library processes is seen as a strategic tool for improving the efficiency of information resource management, ensuring continuous access to scientific knowledge, and expanding electronic services for the academic community. In the context of global challenges, in particular pandemic and security restrictions, digital library services have become crucial for ensuring the sustainability of

educational and scientific processes [5; 6]. At the same time, strategic approaches to the digital development of academic libraries emphasise the importance of long-term planning, institutional support, and alignment with national educational priorities.

The relevance of this study is determined by the need to summarise modern approaches to the automation of library processes in higher education institutions and to determine their role in the context of the digital transformation of the library sector. The purpose of the article is to analyse modern approaches to the automation of library processes in higher education institutions and to identify the key directions, advantages, and limitations of their implementation. To

achieve this goal, the following research tasks have been identified: to analyse the current state of automation of library activities; to summarise scientific approaches to the implementation of automated library information systems; to outline the problems and prospects for the development of automation of libraries in higher education institutions. The scientific novelty of the work lies in a comprehensive analysis of the automation of library processes as a multi-dimensional phenomenon that combines the technological, organisational, and managerial aspects of the digital development of libraries.

Analysis of research and publications. The issue of automating library processes in higher education institutions is widely represented in contemporary scientific research covering theoretical, technological, organisational, and regulatory aspects of library development in the context of digital transformation. In the works of domestic and foreign scientists, automation is considered a key tool for modernising library activities and improving the quality of information services for users.

V. Dobrovolska & L. Cherednyk [5] have made a significant contribution to the study of the digital transformation of libraries in Ukraine, focusing on the innovative activities of libraries in the context of the development of a digital society. O. Ivashkevych [6] analyses the current state of library digitization and identifies prospects for their development, taking into account global information trends. O. Kuzmenko [8] examines the transformation of library functions in the digital space, emphasising the transition of libraries from traditional information centres to multi-functional digital platforms.

A separate area of scientific research is devoted to the implementation of innovative library models and the adaptation of library services to the needs of new generations of users. Thus, T. Hrachak [4, 27] defines the guidelines for the development of libraries in the Generation Z environment, emphasising the importance of digital services and interactive forms of communication. In addition, O. Onyshchenko [12] examines the problems of adapting libraries to “digital life” and, in previous studies, analyses changes in the forms of library work in interaction with the digital generation of users.

The practical aspects of implementing automated systems in library activities are highlighted in works devoted to the experience of specific library institutions. In particular, V. Hlukhenka [3] analyses the state of implementation of the latest information technologies at the Scientific Library of Khmelnytskyi National University, and also reveals the features of the implementation of Aleph ALIS at the Vasyl Stefanyk National Scientific Library of Ukraine in Lviv [2]. The issue of choosing free and open ALIS, in

particular Koha, is discussed in the materials of the V. I. Vernadsky National Library of Ukraine [1].

Research on the use of cloud technologies in library activities is of significant importance. M. Oleksyn, N. Kunanets & R. Bilousova [11] consider cloud services to be an effective tool for storing and managing library resources, and research on cloud technologies plays an important role in improving the efficiency of electronic libraries [20].

The automation of library management processes, in particular the introduction of electronic document management, is the subject of research in both library science and document science. YU Kotsiuk & YU Danylets [7] analyse trends in the implementation of electronic document management systems in higher education institutions, while O. Pluzhnyk [13] studies the effectiveness, security, and innovative potential of electronic document management in the activities of modern libraries. The theoretical and legal foundations of the functioning of electronic document management systems are revealed in the works of V. Politanskyi [14].

In the context of global technological innovations, foreign studies demonstrate the impact of the latest library technologies on the quality of educational processes and academic communications. Thus, Çiplak & Yildirim [21] investigate the use of the Selenium Library in the educational environment, demonstrating the possibilities of automating information resources in the academic world.

Regulatory acts governing the activities of libraries and electronic document management are of significant importance for the study of library process automation [16; 17], as well as laws in the field of electronic documents, information protection, and personal data form the legal basis for the digital transformation of libraries [18].

Thus, analysis of scientific sources indicates the complex nature of research into the automation of library processes, but at the same time reveals the need to generalise modern approaches to the automation of libraries in higher education institutions, taking into account technological, organisational, and managerial aspects, which determines the relevance of this study.

The purpose of the study is to conduct a comprehensive analysis of modern approaches to the automation of library processes in higher education institutions in Ukraine based on the implementation of electronic document management and automated library and information systems, in order to assess their functional capabilities, effectiveness of use, level of integration into the information infrastructure of universities, as well as to identify key advantages, limitations, and prospects for the further development of the digital transformation of library activities.

Presentation of the main material. The study resulted in a comprehensive analysis of the current state of implementation of electronic document management and automation of library processes in scientific libraries in Ukraine, using the examples of the Scientific Library of the National University of Ostroh Academy (NUOA) and the Scientific Library of Khmelnytskyi National University (KNU). The main focus was on the functional capabilities of automated library and information systems, the effectiveness of their use, as well as the problems and challenges that arise during the integration of innovative digital technologies into library activities.

The analysis showed that the legal framework for the application of electronic document management in Ukraine, including library activities, is sufficiently developed. However, when comparing traditional (paper) and digital document management, it was found that most processes continue to be carried out in paper format. One of the fundamental obstacles (Fig. 1) to full automation is limited funding, which complicates the purchase of licensed software, equipment upgrades, and support for modern versions of systems.

An analysis of the functioning of the ALIS showed that the use of electronic document management systems can significantly improve the efficiency of libraries. In particular, the implementation of the Koha ALIS at the NUOA and the UFD/Library at KNU automates such key processes as the registration of new acquisitions, cataloguing, inventory accounting, processing of user requests, and integration with electronic resources.

At the same time, analysis of library practices reveals significant advantages of using ALIS (Fig. 2).

At NUOA, the automation of library processes began in 2002 with the introduction of the Koha library management system. The system integrates with other university platforms, including Moodle and UM system, creating a unified information environment for students and faculty. The system interface is designed with usability in mind, providing quick and convenient access to library resources. A search for the keyword "library" yielded 540 results, the first of which provides detailed information about the publication, authors, physical location, status, and barcode.

At Khmelnytskyi National University, the automation of library processes began with the use of the automated library and information system "UFD/Library" in 1999. The system allows for centralised storage of document metadata and automated searches by various criteria, including author, title, year of publication, UDC, ISBN, document type,

language, and availability of electronic copies. As a result, a search for the keyword "library" returned 814 results, which indicates the high level of detail of the system and its effectiveness in navigating the collection.

Given the automation of library activities through the use of electronic document management, it is important to systematically and promptly inform users about new additions to the library collection and to ensure fast navigation through the online system. Within the framework of the analysis of the use of the Koha ALIS in the Scientific Library of the NUOA, the implementation of an interactive and at the same time visual presentation of new acquisitions was revealed. We note that it is presented in the form of a dynamic carousel view, which contains the cover, title, authors and publications (Fig. 3).

It should be emphasised that in order to access and use the library's collection, including all services available in its activities, a library document called a user form is required. In this regard, the section "Your personal data" of the ALIS "Koha" NUOA, which functions as an electronic user form, deserves attention, especially since this section contains key information about the reader.

It should be noted that the following data segmentation has been traced: library (library card number, expiration date, home address of the library, category); identity (personal data is indicated); primary and alternate address (detailed information about the place of residence, from the street number to the postal code); contact and alternate information (phone number, email address, and other means of communication); identity document (type of identity document, e.g., Ukrainian passport or ID card).

Additionally, we would like to note that the Scientific Library of Khmelnytskyi National University has not updated its software in recent years. Therefore, version 2.5.18 is currently in use. This is directly related to the fact that the library does not have the financial means to purchase a new version.

In the context of library activities, we considered key aspects that allowed for comprehensive automation of library processes. These include centralised metadata storage and search systems. This is because documents are registered in a single system database using the systematisation and classification of information about a specific document. Incidentally, there are two search options: abbreviated and expanded. Note that the abbreviated list of fields is filtered by the following criteria: author, document title, year of publication, language, document type, subject, classifiers, and availability of an electronic copy (Fig. 4).

Key obstacles to the implementation of electronic document management in the automation of library processes

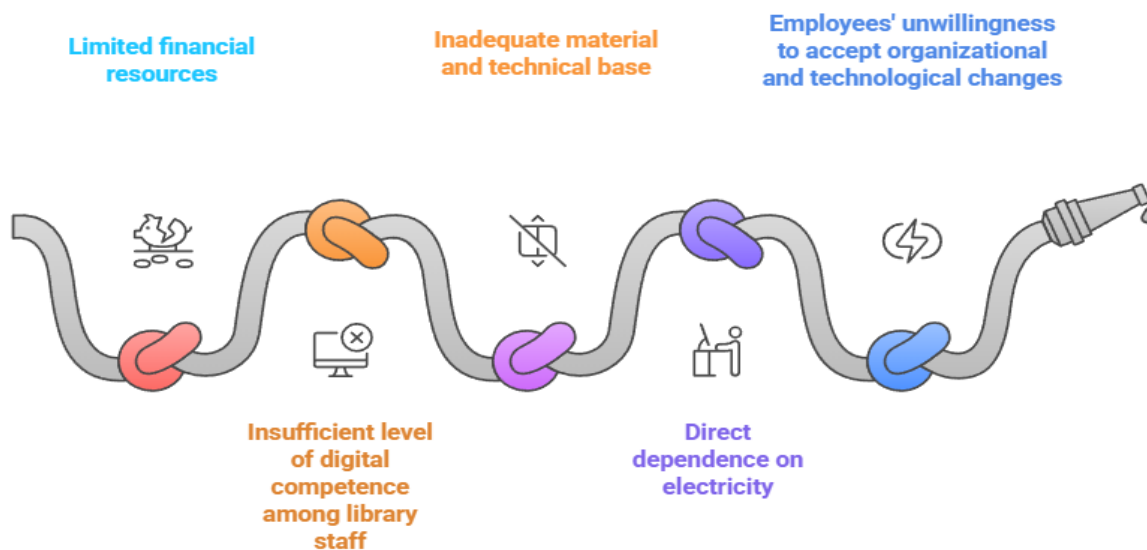


Figure 1. Key obstacles to the implementation of electronic document management in the automation of library process

Source: developed by the author

Advantages of using ALIS in library institutions by automating library processes through electronic document management

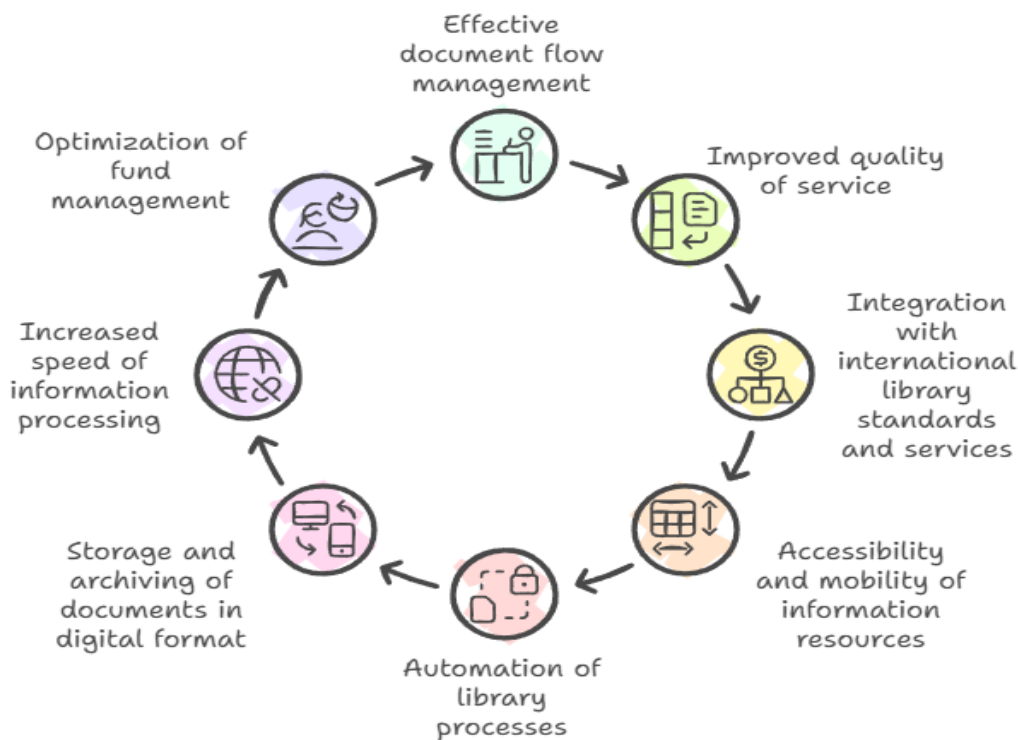


Figure 2. Advantages of using ALIS in library institutions by automating library processes through electronic document management

Source: developed by the author

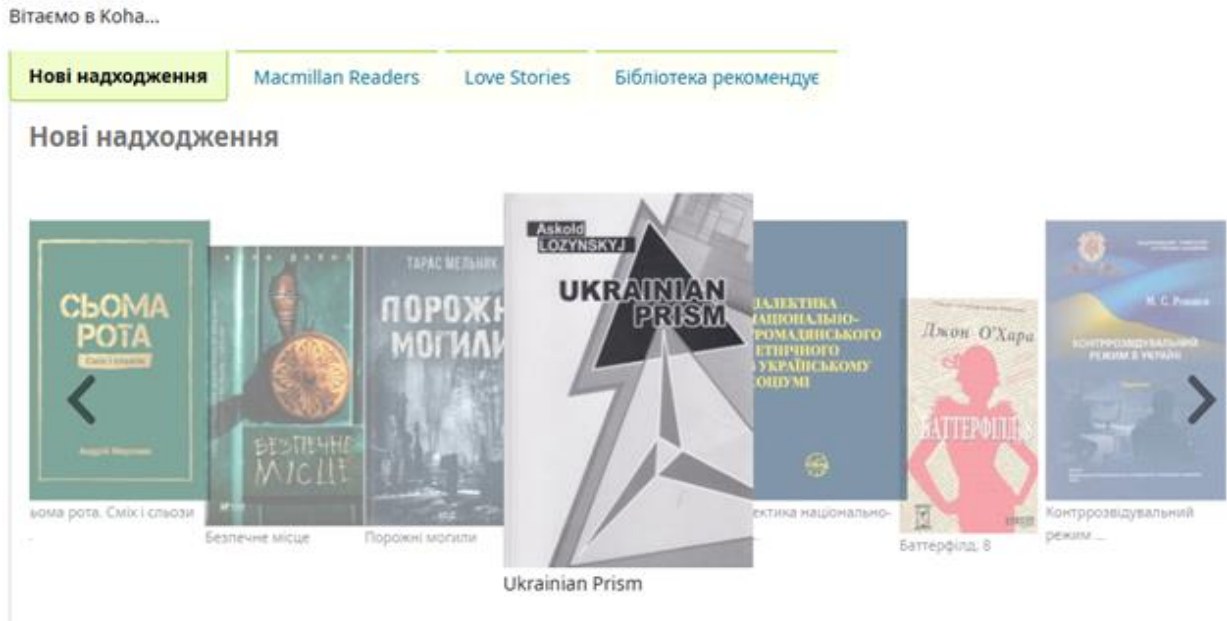


Figure 3. Presentation of new acquisitions in Koha at the Scientific Library of the National University of Ostroh Academy

Source: [9]

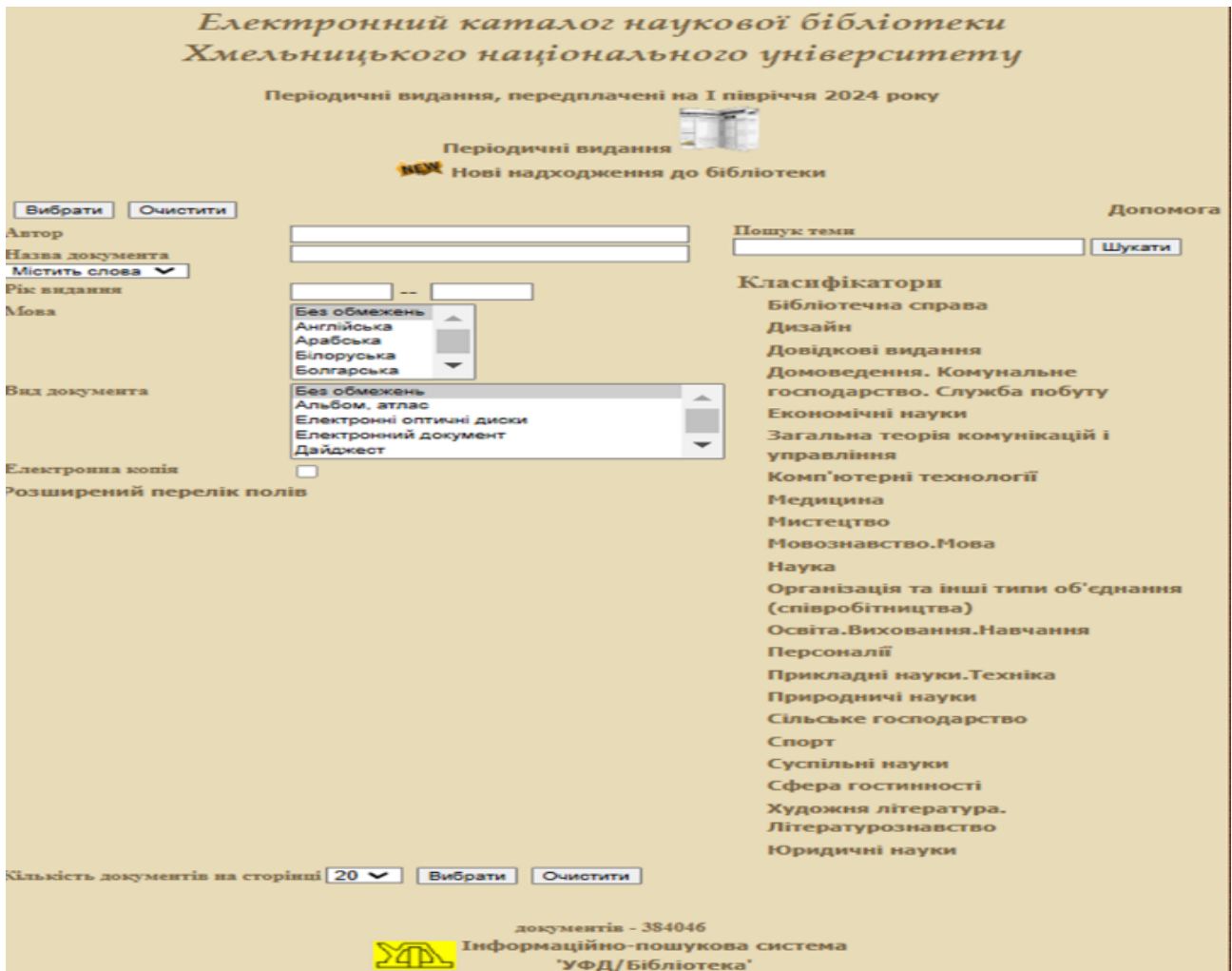


Figure 4. Abbreviated list of fields in the ALIS "UFD/Library" of the Scientific Library of Khmelnytskyi National University

Source: [19]

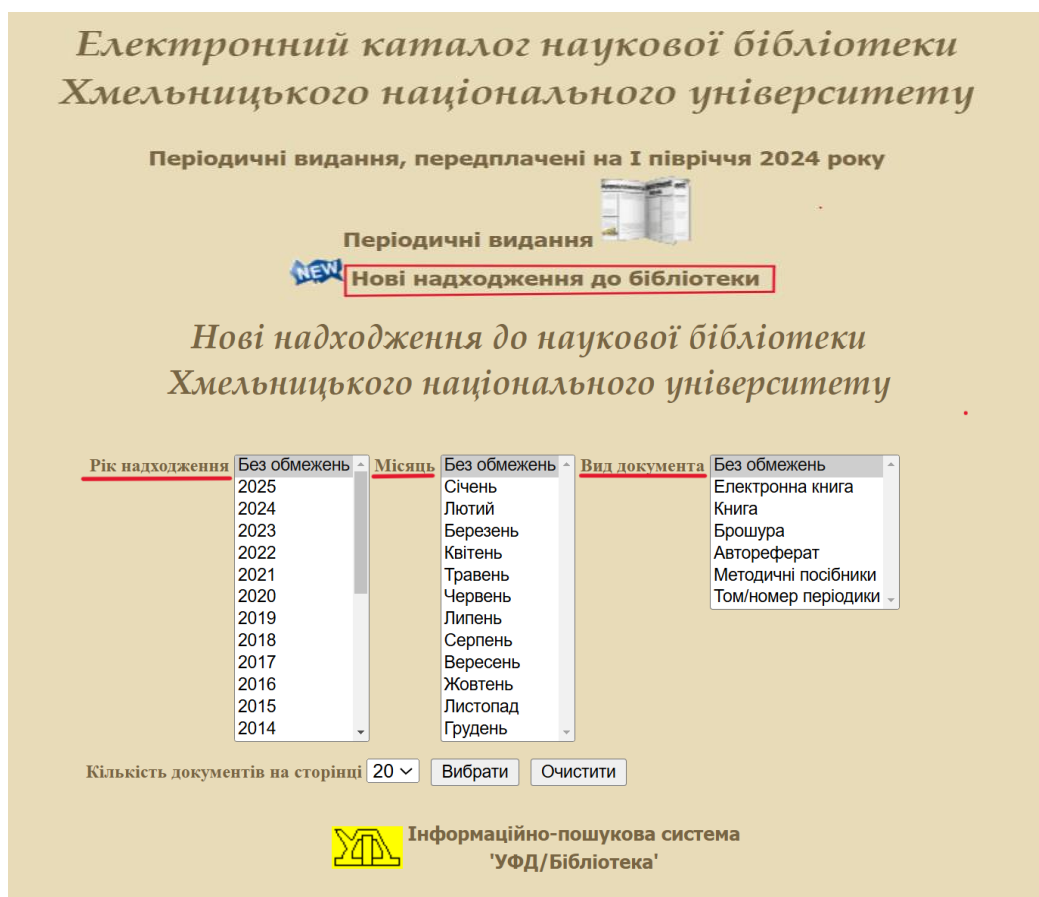


Figure 5. Display of new acquisitions to the Scientific Library of Khmelnytskyi National University in the ALIS “UFD/Library”

Source: [19]

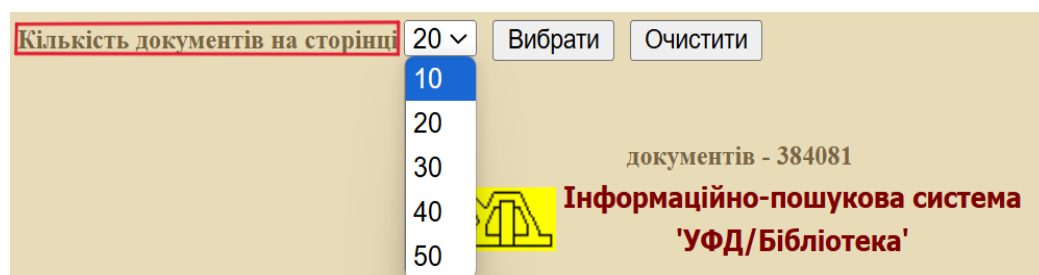


Figure 6. Flexibility of search results display settings in the UFD/Library ALIS of the Scientific Library of Khmelnytskyi National University

Source: [19]

Another important aspect of the library collection is the ability to track new arrivals, as the library of the National University of Ostroh Academy does not have this functionality. However, the formats differ, so the information is filtered by year of arrival, month, and type of document. This ultimately allows for the rapid identification of documents and ensures that users have access to up-to-date information (Fig. 5).

Of particular importance is the flexibility of search results display settings, which allow users to specify the number of documents per page according to their individual needs. This allows for the management of information flows. In turn, this allows the system to be adaptive in its use, taking into account the variety of devices such as smartphones, tablets, and

computers (Fig. 6).

An analysis of the functional capabilities of both ALIS systems shows that both systems support: integration of the electronic catalogue and physical collection; automatic processing of user requests; tracking of new arrivals; segmentation of user data for effective service; generation of statistical and analytical reports for evaluating library activities.

A comparative analysis of the two libraries shows that the key factor in the effectiveness of an ALIS is the level of adaptation of the system to the needs of a particular library and its users. At the National University of Ostroh Academy, integration with the university's educational platforms has been implemented, providing students with continuous

access to library resources even in a remote format. At Khmelnytskyi National University, despite funding constraints and outdated software, the UFD/Library system provides centralised data storage, automated search, and library collection management capabilities.

It should be noted that in both cases, the implementation of ALIS led to:

- increased efficiency in library resource management;
- reduced time for processing user requests;
- easier access to electronic resources;
- integration with international standards and data exchange protocols.

Compared to studies of other Ukrainian and foreign libraries, the results of our analysis confirm that automation of processes based on electronic document management significantly improves information resource management, reduces the time spent on data processing, and increases user satisfaction [15]. It is also important to note that the integration of ALIS into the work of libraries creates the conditions for further digitisation, including the introduction of artificial intelligence tools, electronic resource management (ERM) systems, and chatbots for automatic request processing.

Thus, the study demonstrates that the automation of library processes in Ukraine is undergoing a gradual transformation. Despite the existing obstacles, current trends point to the need for further integration of digital technologies, which will improve the efficiency of user services, optimise fund management, and ensure the preservation of cultural heritage.

The scientific novelty of the study lies in a comprehensive understanding of the automation of library processes in higher education institutions as an integrated socio-technical system that combines electronic document management, automated library information systems, and the university's digital infrastructure. The work is the first to conduct a systematic comparative analysis of the functioning of the Koha and UFD/Library automated library information systems from the perspective of their role in ensuring electronic document management, library collection management, and the organisation of remote access to information resources in the context of digital transformation.

The understanding of the functional

capabilities of automated library systems has been clarified and expanded by identifying key criteria for assessing the effectiveness of automation, in particular the level of integration with university information platforms, the adaptability of the interface to user needs, the flexibility of metadata management, and the provision of information security.

Conclusions. The study allowed for a comprehensive assessment of the implementation of electronic document management and automation of library processes in scientific libraries in Ukraine, using the examples of the Scientific Library of the National University of Ostroh Academy and the Scientific Library of Khmelnytskyi National University. An analysis of the functional capabilities of automated library and information systems demonstrated their high efficiency in meeting the information needs of users and optimising the work of libraries.

The study found that the use of ALIS significantly reduces the time required to process library requests, improves the accuracy of searches and collection management, provides remote access to electronic resources, and ensures integration with international cataloguing standards (MARC, UNIMARC, ISBD). A comparative analysis of the Koha (National University of Ostroh Academy) and UFD/Library (Khmelnytskyi National University) systems showed that adapting ALIS to the specifics of a particular library and integrating it with educational platforms significantly improves the efficiency of user service and collection management.

The study also identified the main problems in implementing electronic document management: outdated equipment, limited funding, insufficient digital literacy among staff, and technical failures. The results show that the digitisation of libraries is not only a means of improving their efficiency, but also an important factor in ensuring the accessibility of scientific information, preserving cultural heritage, and integrating Ukrainian scientific institutions into the international information environment.

Thus, the study confirmed the relevance of library digitisation as a component of the strategic development of higher education institutions and opens up new directions for further scientific work in the field of information and analytical technologies and electronic document management.

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