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The role of digital technologies in improving library and information communication: Trends and challenges

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Abstract. The relevance of the study is driven by the rapid development of digital technologies and their significant impact on all areas of life, including the library and information field. Digital resources and online services are increasingly displacing traditional printed media, necessitating the transformation of libraries to maintain their relevance and competitiveness. The aim of the research is to examine the impact of digital technologies on the library and information field, identify their potential, and identify challenges arising during this transformative transition. Various methods were employed during the study, allowing for a deep and comprehensive understanding of the process of digital transformation in the library and information field. The application of a comprehensive methodological approach, which included literature analysis and the involvement of various sources of information, enabled a thorough investigation of the issues. Comparative analysis of approaches allowed for objective conclusions and recommendations regarding the optimal implementation of digital innovations in this field. The research results indicate promising opportunities for using digital technologies to optimize communication and expand user capabilities. Key aspects of the impact of digital technologies on the library and information field were identified, highlighting their importance in the context of the modern information landscape. Trends and challenges associated with digital innovations were analyzed, revealing significant changes in the functioning of libraries and the transformation of their role. The question of the adequacy of libraries to modern requirements and the need to develop development strategies were raised. It was clarified that the further development of the library and information field will be determined by prioritizing digital innovations and flexible adaptation to changes in the information environment. The conclusions and recommendations obtained have practical significance

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for contemporary librarians, drawing their attention to the importance of adapting to the digital environment. Considering the dynamics of the information society, the focus on preparing librarians to use advanced technologies determines their successful adaptation to new challenges

Keywords: digital tools; library and information activities; communication in the library field; the role of librarians in the digital society; modern transformations in libraries

Introduction

In the modern digital world, where technological innovations drive the development of various fields, the library and information sphere do not remain untouched by transformations. Digital technologies not only change the means of storing and disseminating information but also define new directions in interaction between libraries and users.

The development of the information society presents new challenges and trends for libraries, which become centers of access to knowledge and cultural heritage. Digital technologies accelerate and simplify the interaction between libraries and users. The transition from traditional to digital service delivery opens up unlimited opportunities for accessing information and promotes extensive knowledge exchange. Considering the wide range of studies conducted by researchers at the national and international levels, key aspects defining modern trends in this field can be identified. The growing role of digital technologies, their impact on library work, and new requirements for professional skills of librarians are the focus of researchers' attention.

V. Dobrovolska & L. Cherednyk (2023), studying global experience, note that a significant stage in the development of libraries and meeting users' information needs is the necessity of creating information and library networks, as well as actively seeking and implementing new forms of work. This will contribute to improving the efficiency of library services and meeting the needs of modern society for access to quality information. I. Rozman & A. Petrova (2023) emphasize that modern trends in the development of information technologies in library and archival affairs are focused on innovations that facilitate access, ensure effective storage, and organization of documents and archival materials.

Research conducted by D. Holcer *et al.* (2021) indicates that the challenges arising from the COVID-19 pandemic have significantly increased the level of digitization in Ukrainian libraries and led to significant changes in their activities. Libraries quickly adapted to the new conditions by providing their users with various remote services to ensure uninterrupted access to information and resources during remote work. These changes demonstrate the flexibility and high responsiveness of libraries to contemporary challenges. I. Borodai *et al.* (2022), analyzing the current activities of libraries, point out their main priorities, including the development of electronic products, improvement of search strategies, digitization of documentary resources,

and implementation of innovative methods of information security to ensure effective access. L. Wilms (2021) emphasizes the necessity for libraries not to limit themselves to traditional library functions, such as providing physical collections and supporting information literacy. The researcher believes that libraries should actively expand their activities, acting as publishers of their digital collections and providing necessary expertise for publishing this data. This leads not only to changes in the internal structure and operation of the library but also transforms relations with the scientific community. Such an approach opens up new opportunities for libraries as active participants in shaping and disseminating digital knowledge.

The mentioned studies make a significant contribution to the development of the library and information field, contributing to the understanding of key aspects of digital transformation. They also highlight the need for continuous improvement of librarians' skills and adaptation of libraries to the challenges of the modern information environment. Such scholarly discourse reveals essential aspects of using information technologies in library and archival work. From the integration of new technologies to changing approaches to storing and accessing information, each study contributes to understanding how libraries adapt to contemporary demands. However, the rapid technological advancement and dynamic societal changes raise new questions that need to be addressed. It is important to remember the constant need for adaptation to new challenges. The conclusions and recommendations identified in the studies become important steps towards further research and the improvement of the contemporary library and information sphere. Considering the diversity of modern trends in the development of the library and information field, this topic requires deep and detailed examination. Analyzing current innovations and challenges associated with the use of digital technologies in the library environment is crucial for understanding the impact of these changes on information communication.

The aim of this research is to thoroughly analyze the impact of digital technologies on the library and information field, identify their potential for improving communication, and determine the main challenges arising during this transition. The task of the work is to systematize scientific sources and conduct an analysis of examples of digital technology implementation in library work. The choice of research methodology included

various methods, contributing to a deep and comprehensive understanding of the process of digital transformation in the library and information sphere. The application of a comprehensive methodological approach, including the analysis of literature and the involvement of various informational resources, allowed for a detailed study of the problem, which not only helped to generalize existing theoretical knowledge but also ensured the acquisition of new empirical data, including viewpoints and perspectives of experts from different countries and fields of activity. Comparative analysis of different approaches allowed for objective conclusions and recommendations regarding the optimal implementation of digital innovations in this field, which became an important step in improving the efficiency and competitiveness of the library and information environment.

The scientific novelty of the article lies in updating the understanding of how modern technologies define the role of libraries in the virtual space and what challenges they pose to contemporary librarians. By analyzing trends and challenges in the context of digital innovations, the article aims to uncover the prospects for further development of the library and information sphere.

Transformation of libraries in the digital age

In the context of dynamic sociocultural transformations, the role of libraries as a key factor in the accumulation and transformation of knowledge becomes increasingly relevant. These institutions have served as information repositories for centuries, providing access to knowledge and contributing to the development of individuals and society. Libraries not only preserve knowledge but also actively transform it, making it accessible to the general public. This is achieved through cataloging, digitization, information popularization, as well as through educational and cultural programs.

The Law of Ukraine No. 684 (2018) provides the following definition of an electronic library: "a universal centralized information system designed for the accumulation, ordering, accounting, processing, storage, use of electronic document collections, and their management, serving visitors and users of the library through telecommunications networks in a manner that guarantees compliance with intellectual and property rights".

S. Ivanova *et al.* (2022) note that the concept of an "electronic library" (digital library) first appeared in 1994 as part of the NSF/DARPA/NASA Digital Library Initiative. Initially, the term "virtual library" was used synonymously with a digital library. However, over time, it acquired a different meaning and now describes libraries that are virtual in a broader sense (e.g., libraries that aggregate distributed content). In the early stages of the development of digital libraries, there was a debate about the similarities and differences between the terms "digital" "virtual" and "electronic".

Leading countries worldwide have launched global initiatives to create electronic libraries, including the World Digital Library project initiated by the Library of Congress with UNESCO support. The goal of the WDL is to promote international and intercultural understanding. This resource provides access to the richness and diversity of the world's cultural heritage in an open and multilingual format. Among the content presented are manuscripts, maps, sheet music, recordings, rare and valuable books, films, photographs, drawings, and more (Library of Congress: World digital library, n.d.).

In the era of digital technologies, libraries undergo significant changes. The introduction of electronic catalogs, online libraries, artificial intelligence, and other innovations opens up new opportunities for information work. It is important to understand that the role of libraries is not limited to the storage and provision of information. They play a significant role in the development of individuals and society. Libraries become catalysts for intellectual growth, providing access to information and creating conditions for development and interaction. Their role in society will only grow, as knowledge becomes an increasingly valuable resource. To meet the challenges of the time, libraries need to constantly evolve, implement new technologies, expand the range of services, and strengthen partnerships.

Under the influence of significant factors such as globalization, digitalization, and the Russo-Ukrainian war, the systemic transformation and functions of libraries are shaped by the socio-political and socio-economic level of development of Ukrainian society. The conditions of the digital age, with the continuous growth of information volumes and documentation resources, allow libraries not only to preserve their key role in the information-communication structure of society but also open up new prospects for national revival in the fields of culture, education, and science as the basis for the country's economic development.

In the conditions of the COVID pandemic, the practice of library digitalization becomes especially relevant, contributing to providing the population with access to information, opportunities for self-education, and the use of advanced technological developments. This process also leads to the transformation of libraries in accordance with the requirements of different generations, forms a new focus on digitalizing library practice, and changes the nature of library activities.

S. Sujood *et al.* (2023) also note that after the lockdown resulting from the COVID-19 pandemic, libraries and information centers found themselves in a particularly challenging situation. The unexpected situation required library staff to demonstrate ingenuity and responsiveness to ensure continuous access for users to necessary information and resources while adhering to epidemic prevention measures. In response to this challenge, librarians began actively using digital technologies to provide remote access to their services. This

decision allowed libraries to remain active and accessible to users, even during periods of quarantine and social distancing. In particular, library staff began to provide electronic access to book collections, databases, scientific journals, and other resources, ensuring a continuous flow of information for study and research. This strategic step allowed libraries to establish themselves as key information resources, even in quarantine conditions. In addition, digital access expanded the audience of users, reaching not only local residents but also those at a distance. According to the authors, this approach has proven to be not only effective in preserving the activity of libraries but also opened up new opportunities for the development and improvement of electronic services in the future.

The modern Strategy for the Development of the Library Sector defines strategic directions of activity in conditions of change. These directions are aimed at achieving a number of important goals, such as consolidating society through the affirmation of common values, adhering to European standards, and integration into the European community, which promotes the exchange of ideas and cultural understanding. In addition, the strategy aims to improve the quality of life of citizens by providing access to important information resources and cultural assets, as well as ensuring equal access to information and knowledge for all segments of the population. These priorities are aimed at supporting the development of society and ensuring the harmonious integrated development of citizens (Order of the Cabinet of Ministers of Ukraine No. 219, 2016).

A significant part of the structure of library and information activities is occupied by cultural and artistic events, which include various cultural and artistic initiatives (Makarova, 2023). Among them, it is worth noting book and thematic exhibitions, art exhibitions that represent a synthesis of library and museum exhibits, revealing unique aspects of cultural heritage. Lectures, scientific conferences, and meetings contribute to the exchange of knowledge and stimulate the intellectual development of the audience. Library marathons and events of this kind create a platform for active community participation, supporting interest in reading and cultural events. All these initiatives not only enrich the cultural space but also actively contribute to the development of the library sphere as a center of cultural and educational activities in modern society.

Over the past decade, libraries have undergone significant transformations driven by the influence of information and communication technologies (ICT). These changes have had a profound impact on all aspects of library activities and have required librarians not only to possess key skills in information processing, management, and provision of information services but also active readiness for continuous learning and acquisition of new competencies, such as the use of computer and web applications. This period of transformation has

proved to be not only a challenge for librarians but also a unique opportunity for their professional growth. The implementation of innovative technologies in library activities has opened up broad prospects, allowing them to apply acquired skills in various fields of human endeavor.

I. Rozman & A. Petrova (2023) concluded that modern trends in the development of information technologies in library and archival affairs include various innovations and changes aimed at facilitating access to information, efficient storage, organization, and dissemination of documents and archival materials. Among the most important directions of development, one can highlight the introduction of modern digital technologies to ensure open and convenient access to collections, the use of intelligent systems for information organization and retrieval, as well as the application of artificial intelligence tools for automating processes of data processing and analysis. Additionally, the development of electronic archives, virtual libraries, and platforms for efficient document exchange opens up new opportunities for the rapid and flexible dissemination of knowledge and information in modern information society.

In today's information society, where the exchange and access to knowledge play a key role, libraries perform an integral function as centers of information-cultural interaction. Library-information communication, encompassing a wide range of interactions between libraries and the public, users, and professional communities, becomes a key aspect of the successful functioning of the library environment. Library-information communication is a system of interaction and information exchange between libraries, users, and other participants in the library process. This type of communication involves effective information exchange regarding access to library resources, services, events, news, and other aspects of library activities. Library-information communication includes various forms of communication, such as announcements, advertising, consultations, interaction at events, and other formats. An important aspect is the use of various communication channels, such as electronic resources, social networks, lectures, exhibitions, etc., to reach the maximum audience and increase users' awareness of library services and resources.

I.O. Davidova & O.Y. Maryina (2018) identify five levels of digital modernization of domestic libraries. At the first level are libraries that do not implement innovations in digital technologies. Mostly these are small libraries, rural branches, school libraries, etc. The second level comprises those adapting to the digital space, but initiatives are fragmented and not aimed at interacting with users. The third level includes libraries that recognize the need for digital modernization but implement it only through individual initiatives. The fourth level consists of institutions with managed adaptive activities in the digital environment, with a clear focus on the development of digital products and interaction with the audience. At the fifth and final level are libraries that successfully

implement a strategy of digital modernization and have a wide range of innovative products. According to the authors, the majority of libraries (mostly small, rural, and school ones) are at the first three levels, where the implementation of digital technologies is fragmentary and lacks a clear strategy.

■ New challenges for librarians

M. Tolmach (2022) identifies that in the library field, both in Ukraine and abroad, updated profiles of professional activities of library specialists are being developed, taking into account the challenges of digital transformation. Moreover, new “digital” professions are introduced, such as digital transformation manager, web content and community manager, community interaction and engagement specialist, within this field.

P. Kazimi *et al.* (2023) assert that the information paradigm opens up numerous new opportunities for librarians in service delivery through the use of advanced web technologies, which automatically expand access to new areas for bridging this gap. New trends and challenges related to modern technologies create “challenges” not only for professionals in library science and information technology but also for users, visitors, researchers, and the publishing community. New technologies open up unique opportunities for librarians to facilitate and promote user-oriented services and strengthen collaboration between libraries and their users in the digital age. Authors agree with the author that adaptation to these trends and the implementation of cutting-edge web technologies will contribute to improving the status of libraries in society.

L. Butko *et al.* (2022) believe that in the socio-cultural sphere of library activities, there is a transition from the concept of “influence” to the concept of active interaction with readers, users, and clients. In this context, it is important to anticipate the emergence of a new generation of librarian-moderators who must adapt to the new intellectual environment and be prepared to react quickly to changes in the socio-cultural environment. In our opinion, libraries that can transition to the concept of active interaction with readers, users, and clients will have a successful future.

W. Horstmann (2022) considers that librarians play a key role in expanding intellectual data curation, which is an important aspect in the modern world. They play an active role in improving metadata processing by adding a human element of control to the realm of artificial intelligence. Such an approach contributes to improving the quality of information processing and helps avoid potential errors or misunderstandings. Modern libraries act not only as catalogers and knowledge repositories but also as true facilitators of scientific communication and innovation. They introduce new forms of publication and help researchers find effective tools to disseminate their research. W. Horstmann (2022) notes that librarians act as intermediaries between modern technological

data processing and people’s ability to understand and use this information. Libraries also play a significant role in contextualizing data and information. They help create connections between various sources of information, allowing researchers to integrate knowledge and explore new perspectives for research. By providing access to scientific information to society, libraries contribute not only to the development of science but also to the increase in the level of education and understanding of the importance of scientific discoveries for the general public. This integrative approach of libraries in data processing and utilization is recognized as key to modern development in science and education.

Professionalism in today’s library profession is a necessary prerequisite for successful innovative development of libraries. This aspect should not be considered only as the ability to adapt to new technologies; it should also be viewed as a value orientation that enhances the motivation of library professionals to implement innovations. In the context of digital transformations, continuous professional development of library staff is important, which involves not only updating knowledge but also changing the way of thinking and developing skills to overcome psychological barriers when mastering new technologies and implementing innovations.

■ Main directions of library digital transformation

Analysis of modern library activities has allowed I. Borodai *et al.* (2022) to conclude that one of their main priorities is the development of electronic products, improvement of information search strategies, solving tasks of digitizing documentary resources, and implementing innovative means and methods of information protection while maintaining effective access to it. Authors agree with the author that the main technological components of modern information and library services are electronic catalogs, digital libraries, informational resources, virtual exhibitions, and selective dissemination of information systems.

V. Dobrovol'ska & L. Cherednyk (2023) note that with the implementation of modern information technologies in library activities, virtual libraries are emerging – networks for general use, oriented towards information exchange between libraries. This environment brings together geographically distant libraries for integrated communication and access to information. Documents in virtual libraries are stored in machine-readable form. Users can access resources through global network search engines even without registering with the library. The application of information and communication technologies significantly improves the process of searching and obtaining the necessary publications. Virtual libraries provide practically the same services as traditional ones, including access to catalogs, organization of searches and order lists, as well as electronic versions of publications. According to the authors, the

implementation and development of virtual libraries are an important step in the development of modern library science, which will make information more accessible to people worldwide.

Digital technologies play a key role in transforming information search processes, providing not only efficiency and speed but also expanding user capabilities. Electronic catalogs and databases have become the main tools for systematizing and organizing large volumes of information. They allow for easy and quick searches by keywords, topics, authors, or other parameters, simplifying navigation in the world of knowledge. Thanks to such technologies, users can not only quickly find the necessary materials but also access various formats of content, such as e-books, scientific articles, videos, and audio recordings. Expanding information search capabilities creates more opportunities for self-study, research, and education. This approach makes library information resources more democratic and accessible to different categories of users, promoting active learning and knowledge expansion. Search systems that use advanced algorithms and artificial intelligence actively adapt to individual user needs. They analyze previous queries and interactions, providing personalized recommendations and ensuring accurate and convenient access to information.

R.O. Okunlaya *et al.* (2022) define artificial intelligence (AI) as one of the latest technological trends in digital transformation that university libraries can successfully use to expand the range of educational services for their users. The ability of artificial intelligence to make intelligent decisions in the field of information acquisition and exchange in the context of learning and research can open up new perspectives for the library as an innovative knowledge center. A negative trend is the low level of implementation of artificial intelligence technology in libraries. This may be due to the absence of this direction in their strategic plans. Research in this aspect will not only contribute to the development of modern libraries but also stimulate professionals in the field of information science to use artificial intelligence as a tool to improve the quality and efficiency of library services. Authors see great potential in AI for the development of modern libraries. It is important for libraries and professionals in the field of information science to collaborate to use AI to improve the quality and efficiency of library services.

Research conducted by S. Taha *et al.* (2023) among students indicates their positive attitude towards the application of augmented technologies in the library. They are convinced that the use of augmented technology will not only be useful and user-friendly but also an effective means of providing them with access to a variety of library resources and services. As one can see, the research results confirm users' readiness to use augmented technologies in the library and their positive attitude towards this innovative approach.

M. Ashiq *et al.* (2022) classify new library functions into four main directions: "infrastructure, accessibility, and coverage", "awareness and well-being", "leadership and policy formation", and "human potential development". This aspect includes promoting the development of digital culture, transforming library services, focusing on website perestroika, and active presence on social media platforms. We agree with the author that the success of this process is determined by the presence of creative and visionary leadership that effectively develops policies in the conditions of the modern pandemic and new library realities. A key element is conscious digital leadership, which focuses on staff development and increasing the qualifications of library professionals by providing knowledge, experience, training, and education.

Considering the trends of the information society, where there is a growing need for access to information in online and digital formats, libraries should actively develop infrastructure and systems to demonstrate their presence on the Internet, expand access to services, meet the needs of remote users, and, most importantly, provide professional librarians with the necessary skills. High-speed Internet connection for users is also an important part of this process so that they can maximize the use of online content and library services. This step will make the library accessible to a wide range of users, promoting their educational development and increasing information literacy.

In the context of awareness and well-being, libraries play an important role in creating information literacy and supporting the psychological well-being of users. They can expand their functionality by providing psychological support services, organizing events to improve emotional health, and promoting cultural development and creativity. Leadership and policy formation involve active participation of libraries in public dialogue on important issues such as access to information, reader rights, preservation of cultural heritage, and others. Libraries can initiate discussions, contribute to the formation of public opinion, and influence decision-making at various levels.

Human potential development includes not only technical aspects but also cultural, educational, and social ones. Libraries can help expand educational opportunities, promote the development of creative skills, and provide space for social interaction and collaboration. All these directions require libraries to constantly update and adapt to changes in society and technology. Flexibility and readiness for innovation are important to ensure the effective role of libraries in shaping the modern information society. Digital technologies in the field of library-information communication have significantly changed the paradigm of library work and access to information. The main aspects reflecting the impact of digital technologies on improving library-information communication are:

Electronic resources and databases. Libraries actively use digital technologies to create and effectively manage electronic resources, expanding access to various materials. E-books, journals, audio, and video materials have become an integral part of digital library collections, providing users with the opportunity to interact with content in a way that is convenient for them. Thanks to a large number of databases, libraries ensure effective information retrieval. Users can quickly and easily find the necessary materials using various criteria such as author, topic, or keywords. This improves the quality of service and facilitates navigation in a vast amount of information.

Virtual libraries and online catalogs. Digital technologies offer broad opportunities for creating virtual libraries that provide users with access to various resources anywhere in the world via the Internet. Online catalogs are extremely useful as they simplify the process of searching for and ordering books. Additionally, they provide additional information about available resources, such as reviews, ratings, annotations, and recommendations, which facilitate selection and enhance the user experience. Establishing virtual libraries allows libraries to expand their audience and provide flexible access to knowledge and information. Remote access to resources is important for users who can obtain necessary information even from remote regions or at their convenience. Such a level of digitization promotes the development of a global community of readers and researchers, making information resources more accessible and efficient.

Digital archives. Libraries actively implement digital technologies to create digital archives, which are extremely effective in preserving and accessing rare and valuable documents. This allows libraries to expand their collections and provide greater quantitative and qualitative access to cultural heritage. Additionally, digital technologies play an important role in the processes of conservation and restoration of old manuscripts and books. With specialized programs and scanning, libraries can conduct detailed research and restoration efforts to preserve these documents for future generations. This approach not only saves valuable works from wear and tear and destruction but also ensures their digital accessibility to a wide audience, contributing to the preservation of cultural heritage.

Electronic document exchange. Libraries actively use digital technologies for document and information exchange with other libraries and institutions. This opens up new opportunities for collaboration and knowledge exchange among different libraries in real-time. Thanks to digital platforms and interactive tools, libraries can easily exchange research, resources, and innovative ideas, improving the quality of service and fostering a culture of knowledge exchange in the library field. It also contributes to building a network of mutual support and interaction, expanding access to various resources and information for users.

Utilization of social media and interactive platforms. Libraries utilize social media and interactive platforms to actively engage readers. Creating virtual communities, discussing books, and announcing events on these platforms not only expand the audience but also enhance interaction between librarians and users. This open interactive space allows communities to share impressions of read works, create recommendations, and participate in joint educational activities. This is an effective way to increase public interest in library services and actively engage readers in cultural and educational initiatives.

■ Challenges and issues of digital library systems

Contemporary digital library systems, while offering numerous opportunities, face a range of significant challenges and issues. One of the main difficulties is the high level of dependency on technological infrastructures and internet connectivity. In case of technical failures or lack of network access, there may be restrictions on access to digital resources.

Another challenge is the issue of data security and confidentiality. The increase in the volume of digital information requires a high level of protection against unauthorized access, cyber-attacks, and loss of user confidentiality. Libraries dealing with a large number of digital resources and users' personal data become targets for hackers and cybercriminals. Ensuring cybersecurity involves the development and implementation of encryption measures, two-factor authentication, as well as continuous monitoring and detection of potential threats. Since libraries store user data, their reading interests, and other personal information, the issue of confidentiality is also extremely important. Implementing an effective privacy policy, including proper access management and use of data anonymity, is necessary to ensure user trust in digital library services. Additionally, the creation and management of digital collections require significant effort and resources, as well as the development of effective strategies for preserving digital archives over the long term. The expansion of digital collections is often associated with a large volume of data, which requires storage and processing capabilities.

Issues also arise in addressing copyright and licensing issues for digital resources. Many digital materials are subject to various legal restrictions, and libraries must carefully study and consider these aspects to avoid legal violations and ensure the legality of the use and distribution of digital resources. M.H. Rahman *et al.* (2023) identify the lack of necessary IT skills among users as one of the main difficulties in implementing digital libraries. It is important to consider various levels of access for different categories of users. The insufficient number of people with IT skills complicates the rapid and full use of digital resources. Additionally, the implementation of digital technologies often requires investment in equipment purchase, software, and staff

training. Problems also exist in the legal aspect, namely with intellectual property rights, which can complicate licensing, exchange, and use of digital content. Based on this, we believe that the implementation of digital libraries is a complex process that requires careful planning and coordination of efforts from various stakeholders. Through a systematic approach and collective efforts, difficulties can be overcome and successful implementation of digital libraries can benefit users and society as a whole.

S.A. Khan & R. Bhatti (2017) conclude that skills in digital technologies for the development and effective management of digital libraries can be divided into three main categories. The first category includes digital competencies necessary for the development of digital libraries. The second category encompasses digital skills related to effective management of electronic libraries. Finally, the third category defines digital competencies important for ensuring the security of digital content. Authors agree that such a division into categories offers several advantages: it helps to clearly define the necessary skills for different positions and tasks; it promotes the development and training of staff in the target direction; and it ensures more effective management of digital libraries.

G.O. Oyovwe-Tinuoye *et al.* (2021) argue that modern technologies demand librarians' continuous readiness and updating of their skills due to rapid changes in the digital environment. Understanding and utilizing ICT enable librarians to function effectively not only within the library but also to actively interact with other fields, thereby expanding their capabilities and enhancing their professional status. Given the dynamic nature of the contemporary environment in which the library operates, it is important to pay due attention to preparing librarians for the use of advanced technologies to optimally perform their duties. Authors support the authors' view that effective librarian training policy implementation requires library management's decisiveness and adequate attention to this issue.

B. Zaka (2022) emphasizes that a significant problem requiring a comprehensive approach to resolution is data analytics, as a large volume of information requires effective processing and analysis methods to derive useful insights. Additionally, system compatibility is another issue since various library components often operate on different technical platforms, requiring integration to optimize workflow processes. Access control to digital resources is yet another significant issue. Ensuring information security and data confidentiality demands reliable authentication and authorization mechanisms. The problems highlighted by the author are indeed pertinent and require a comprehensive approach to their resolution. Specifically, it is necessary to develop and implement effective data analysis methods, ensure system compatibility to optimize workflow processes, as well as ensure information security and control access to digital resources. These measures will help enhance

the efficiency and reliability of data management in the modern information environment.

Author underscores several advantages provided by electronic libraries. The main advantages of this format over traditional libraries include rapid database updates with improved quality control, enhanced search functions, and simplified access to retrieved information, thus increasing user efficiency and reducing bureaucracy. Additionally, there are other potential benefits to consider. Firstly, an electronic library becomes accessible anywhere a personal computer connected to the network is present, providing access both at the workplace and at home. Information resources of electronic libraries are available to users around the clock, providing flexibility in individual knowledge access. In the virtual environment of electronic libraries, convenient access to information resources in various formats necessary for users is provided. This includes video and audio formats unavailable in traditional print publications. Such diverse access allows for more effectively meeting users' diverse knowledge and information needs. According to the authors, electronic libraries also contribute to the dissemination of knowledge and information, reduce costs associated with storing and servicing information resources, and promote environmental sustainability.

I. Yarema (2021) notes that the creation of electronic libraries and online catalogs, as well as document delivery services, have become the most popular applications of internet technologies in the library field. Important directions include remote user registration, ordering and renewing subscriptions remotely, as well as access to electronic forms. Some libraries maintain blogs to inform about cultural, artistic, and educational events. To facilitate information search and communication with remote users, librarians create virtual reference desks, use multimedia services to create virtual tours, galleries, educational video courses, and organize video conferences. Additionally, they implement innovative work forms such as library flash mobs, flashbooks, web quests, virtual exhibitions, book trailers, bibliofreshes, bibliomixes, and so on. Thus, modern libraries can provide a wide range of services using internet technologies. Digital technologies significantly expand library capabilities, providing greater access to information, improving document exchange, and communication between libraries and users. Thanks to digital resources, libraries can provide electronic access to books, journals, documents, and other resources, facilitating more efficient information use.

Moreover, digital technologies enable the creation of interactive platforms for collaborative work, exchanging ideas, and feedback between users and library staff. This contributes to the creation of virtual communities where people can discuss books, share recommendations, and actively interact with each other. With the help of digital tools, libraries can more effectively manage

and archive their collections, as well as provide access to these resources online, making educational and scientific materials more accessible to a wider range of users. Digital technologies also help libraries improve their services, adapting to modern requirements and improving the quality of service.

■ Conclusions

This study thoroughly analyzed key aspects of the impact of digital technologies on the library and information sphere, considering their importance in the context of the modern information landscape. The analysis of trends and challenges in light of digital innovations revealed not only significant changes in the functioning of libraries but also a substantial transformation of their role, posing questions to the field regarding compliance with modern requirements and the development of strategies.

Studying specific examples of implementing digital technologies in library work allowed the identification of effective practices aimed at improving communication with users and expanding their capabilities. An important aspect is not only technological integration but also the creation of innovative services and resources that meet the changed needs of modern users. This research highlights the urgent need for libraries to adapt to the requirements of the digital age, not only to provide access to knowledge and information but also to actively participate in creating an innovative information environment. The expansion of the role of libraries in the digital society entails not only technological transformations but also the development of strategies that allow libraries to fulfill their mission as key centers of knowledge and cultural heritage in contemporary society.

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The implementation of digital technologies in the library and information sphere brings not only undeniable advantages but also a number of challenges that require attention and competent solutions. One of the important challenges is ensuring the security and preservation of digital archives, as this determines the reliability and integrity of digital information. Considering issues of confidentiality and developing effective strategies for preserving digital resources become priority tasks for libraries to ensure not only the availability of information but also its security. Modern technologies also require constant readiness and updating of librarians' skills due to rapid and constant changes in the digital environment. This means that it is important to provide library staff with proper training to use advanced technologies and consider their readiness to adapt to new tools and approaches.

The further development of the library and information sphere will be determined by prioritizing digital innovations and flexible adaptation to changes in the information environment. Special attention should be paid to the development and implementation of advanced technologies that will contribute to the optimal performance of library tasks and improve the quality and accessibility of provided information services. The lack of sustained readiness for digital transformations may hinder libraries' ability to respond to the challenges of the modern information society and provide necessary user support.

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■ Conflict of Interest

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Роль цифрових технологій у вдосконаленні бібліотечно-інформаційної комунікації: тенденції та виклики

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Анотація. Актуальність роботи зумовлена стрімким розвитком цифрових технологій та їхнім значним впливом на всі сфери життя, включаючи бібліотечно-інформаційну сферу. Цифрові ресурси та онлайн-сервіси дедалі більше витісняють традиційні друковані носії, що зумовлює необхідність трансформації бібліотек для збереження їхньої актуальності та конкурентоспроможності. Мета дослідження полягає у вивченні впливу цифрових технологій на бібліотечно-інформаційну сферу, виявленні їхнього потенціалу та ідентифікації викликів, що виникають у процесі цього трансформаційного переходу. У ході дослідження було застосовано різноманітні методи, що дозволило отримати глибоке та всебічне розуміння процесу цифрової трансформації в бібліотечно-інформаційній сфері. Застосування комплексного методологічного підходу, що включав аналіз літератури та залучення різноманітних джерел інформації, дало змогу здійснити всебічне дослідження проблематики. Порівняльний аналіз підходів дозволив зробити об'єктивні висновки та рекомендації щодо оптимального впровадження цифрових інновацій у цій галузі. Результати дослідження вказують на перспективні можливості використання цифрових технологій для оптимізації комунікації та розширення можливостей користувачів. У ході дослідження було визначено ключові аспекти впливу цифрових технологій на бібліотечно-інформаційну сферу. Встановлено їхню важливість у контексті сучасного інформаційного ландшафту. Проаналізовано тенденції та виклики, пов'язані з цифровими інноваціями. Виявлено суттєві зміни у функціонуванні бібліотек та значне перетворення їхньої ролі. Піднято питання про відповідність бібліотек сучасним вимогам та необхідність побудови стратегій розвитку. З'ясовано, що подальший розвиток бібліотечно-інформаційної сфери буде визначатися наданням пріоритету цифровим інноваціям та гнучкою адаптацією до змін в інформаційному середовищі. Отримані висновки та рекомендації несуть практичне значення для сучасних бібліотекарів, привертаючи їхню увагу до важливості адаптації до цифрового середовища. Враховуючи динаміку інформаційного суспільства, акцент на підготовці бібліотекарів до використання передових технологій визначає їхню успішну адаптацію до нових викликів

Ключові слова: цифрові інструменти; бібліотечно-інформаційна діяльність; комунікація в галузі бібліотечної сфери; роль бібліотекарів у цифровому суспільстві; сучасні трансформації в бібліотеках