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TIURKEDZHY N. S.
Scientific Library, Zaporizhzhia State Medical and Pharmaceutical University (Zaporizhzhia, Ukraine), e-mail: Natali_turkedjy@ukr.net, ORCID 0000-0001-6785-2900

MARINA O. YU.
Department of Digital Communications and Information Technologies, Kharkiv State Academy of Culture (Kharkiv, Ukraine), e-mail: Helenmaryina@gmail.com, ORCID: 0000-0002-7248-2147

DAVYDOVA I. O.
Department of Digital Communications and Information Technologies, Kharkiv State Academy of Culture (Kharkiv, Ukraine), e-mail: IDavydova1@ukr.net, ORCID: 0000-0003-1635-4973

MARIN S. O.
Department of Software Engineering Kharkiv National University of Radio Electronics (Kharkiv, Ukraine), e-mail: serhiy.maryin@nure.ua, ORCID 0000-0002-2012-7477

Experience of Implementing Assistive Technologies in Ukrainian and Foreign Document and Information Structures

Objective. The article examines the global experience of digital inclusion and the state of the creation of information spaces for people with special needs in leading document and information institutions of society. **Methods**. The research was conducted based on content analysis of 20 sites of US academic libraries and webometric analysis of 41 sites of Ukrainian document and information structures (libraries, archives, and museums) using the "Web Accessibility Checker" functionality. Monitoring of library sites was carried out during May 2024. **Results**. The conducted analysis proved that today digital inclusion in document and information institutions of libraries in the USA, Great Britain, and France is aimed at overcoming the lack of information resources for different groups of users, introducing computers with special software and assistive technologies for people with disabilities, and creating comfortable information space. This activity is only a desirable prospect for Ukraine's libraries, although work in this direction is unfolding. **Conclusions**. A conclusion was made regarding the importance of implementing assistive technologies in document and information structures and ensuring comfortable access to information for various categories of users, including those with special educational needs and people with disabilities. The development of digital inclusion and the creation of specialized products and services for special users is a strategic direction of the development of document and information institutions. Libraries are leaders in implementing and using assistive technologies among various document and information institutions. Compared to museums and archives, they have the greatest experience in serving users with disabilities and the most powerful potential for developing social inclusion and embodying diversity in the digital environment.

Keywords: document and information institutions; library; assistive technologies; digital space; inclusion

Introduction

Currently, Ukraine is going through a difficult stage in its history. A full-scale war is going on in the country. Every day, servicemen receive injuries of various degrees of severity, and the number of people with disabilities is rapidly increasing. Today, according to Minister of Social Policy Oksana Zholnovich, "there are 3 million people with disabilities in Ukraine. Over the past year and a half, their number has increased by approximately 300,000" (Zholnovich, 2023). Such a situation leads to the fact that libraries, as leading social and communication institutions of society, are increasingly involved in the psychological and emotional recovery of this category of information consumers. They master the experience of providing information services to users

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with special needs and study the processes of using assistive technologies by the libraries of the leading countries of the world.

Assistive technologies are extremely important in the process of ensuring the availability of information and services for different groups of users. Among these, there are people with disabilities, citizens who have found themselves in difficult life circumstances, for example, due to social deprivation and insecurity, natural disasters, military operations and armed conflicts, political unrest, social prejudices due to race and ethnicity, gender, age, socio-economic status, intellectual or mental disabilities, etc. These users mostly do not have access to timely and reliable information, education, and basic socio-cultural services. This leads to social rejection and exclusion of these people, life in conditions of social isolation, and problems in solving trivial life situations.

The implementation of assistive technologies in document and information structures should become an important component of the global concept of social inclusion, which recognizes the diversity and uniqueness of each person and calls for the creation of a society where each person has the opportunity to realize his potential and be a full participant in social, economic and cultural life.

Literature review. Over the past 10 years, the attention of leading specialists in the library and information field to the issues of implementing assistive technologies has significantly increased in the world. In the United States of America, active discussion and development of strategies for providing open access to scientific information resources have been ongoing for a long time. American specialists note that the concept of "open access" implies absolutely unhindered access to scientific publications, which is not limited by financial, legal, or technical barriers. Among the problems of implementation and use of assistive technologies in libraries, the following ones are identified: lack of professional education of library staff to ensure access to information and inclusion; the universality of programs addressed to people with different types of disabilities and needs; the need to develop marketing programs that would promote the dissemination of information about special library services and increase the level of attractiveness for the maximum number of users (Pasichnyk, Shestakevych, Kunanets, Rzheuskyi, & Andrunyk, 2019); lack of budget; lack of qualified personnel, especially in the technological field; lack of technology and equipment; lack of coordination between scientists, librarians and users (Abutayeh & García-Orosa, 2021).

Ukrainian scientists state that libraries in Ukraine play an important role in promoting the implementation of open access to information as a mechanism for ensuring free access to scientific knowledge and cultural values, which contributes to scientific development and innovation in the country. Conducted webometric studies of 177 sites of national libraries in different countries of the world with regard to their compliance with WCAG accessibility principles, reveal that only 19% of them fully satisfy the specified criteria (Marina & Marin, 2019).

The objective of the article is to analyze the experience of implementing assistive technologies in the document and information structures of Ukraine and the world.

Methods

Within the framework of the current study, the systematic approach made it possible to follow the trend of changing the paradigm of social integration of people with disabilities to the paradigm of social inclusion and the development of the concept of diversity in society.

To study in detail the issue of the use of assistive technologies, the monitoring of the library sites of universities in Europe and the USA was carried out, in particular, the University of British Columbia, McGill University, Cambridge, Trinity, and others. This made it possible to obtain a

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representative picture of institutions and to study their main characteristics in terms of providing an inclusive space.

The work is based on a comprehensive analysis of the physical and web accessibility of 41 libraries, museums, and archives. The Web Accessibility Checker toolkit (https://websiteaccessibilitychecker.com/) was used to conduct a webometric analysis of sites, designed to assess the compliance of sites with web accessibility requirements.

Monitoring of library sites was carried out during May 2024.

Results and Discussion

Since 2014, the Global Research Summit (GREAT), coordinated by the World Health Organization's Department of Assistive Technologies (GATE), has been dealing with issues of development, manufacturing, innovation, and education in using assistive technologies. Initiatives implemented within the framework of this summit are aimed at achieving the following goals: promotion of priority research programs; formation of appropriate scientific cooperation in related fields; determining the economic impact and costs associated with the development, production and implementation of assistive technologies; development of service delivery models and presentation of best practices for their implementation; search for new funding opportunities for research and production; implementation of an innovative educational process; coverage of innovative research in the field of assistive technologies; increasing the level of awareness of the international community and attracting its interest in research processes and the use of assistive technologies (World Health Organization, 2017). Such measures are aimed at the development and dissemination of assistive technologies, as well as at the creation of an inclusive society. However, they are not directly aimed at the implementation and use of auxiliary technologies in document and information structures.

World practice shows that assistive technologies are gradually becoming widely used in the library field. There is an active transition of the implementation of assistive technologies from the theoretical level to the practical activity that meets the requirements of modernity. Therefore, every document and information structure strives to ensure equal access to services for all categories of users, and the use of assistive technologies opens up wide opportunities for improving the quality of life through education and self-improvement for all segments of the population.

The analysis of the 20 websites of academic libraries in Europe and the USA from the Times Higher Education World University Rankings 2024 (Times Higher Education, 2024) showed that they are most actively working on the issue of overcoming the shortage of information resources for different groups of users. The main activity in this direction is the preparation of materials in an accessible format for various categories of users. In addition, it is important to adopt technologies that support the learning process, such as mobile applications and voice control technologies, in addition to the current large-scale technologies that apply to libraries, such as Integrated Library Systems (ILS), Library Service Platforms (LSP), Customer Detecting Services (CDS) and e-book rental technology. The analysis of sites of academic libraries made it possible to establish that:

1) projects of new library buildings comply with the principles of universal access or have become accessible to people with disabilities due to modernization;

2) each library site has the function of adapting pages for people with visual impairments and provides information on the implemented assistive technologies and the possibilities of their use;

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3) the sites clearly and fully describe the possibilities of physical and virtual access to each of the library units, available information on navigation to workplaces specially adapted for users with disabilities, and software and technological tools that make the educational process of users comfortable;

4) Accessibility Centers or Assistive Technology Information Centers (ATIC) are organized in universities, which are equipped with computers with special software and assistive technologies; they coordinate and organize the activities of teachers and the education of students with special educational needs;

5) libraries provide their users with appropriate educational materials that can be translated into alternative formats, such as electronic text, large print, Braille, and other options, depending on the individual needs of users;

6) mutual support programs are implemented in universities, thanks to which students are given the opportunity to select mentors or partners for joint study;

7) the sites have useful links to the resources of specialized organizations that assist people with disabilities in the process of adaptation;

8) some libraries have created working groups to control the accessibility of their services for people with disabilities, the main purpose of which is to ensure compliance of the library's activities with the legal norms of a certain country, check the accessibility of services and resources for all users, as well as collect and process suggestions for improving the provision of services.

Therefore, based on the analysis of library sites, it can be concluded that great attention is paid to the introduction of assistive technologies in libraries and to ensuring comfortable access to information for users with special educational needs and people with disabilities. It is important to emphasize that research and improvement of the practical implementation of assistive technologies to ensure maximum accessibility of library services for all users continues. The development and adaptation of software and the development of methods for converting printed publications are accelerating. Methodological guidelines are being prepared regarding the specifics of the organization of service for users with disabilities and communication with them, which contributes to the creation of a broad program of state and public support.

Document and information structures that use various assistive technologies as a means of including people with special needs to a potential audience of users of their own resources have an interesting experience in the development of digital inclusion. Thus, portals of national libraries offer users the functions of scaling texts and images, audio playback, and page-by-page listening of documents. This functionality is used on the websites of digital libraries Deutsche Digitale Bibliothek (https://www.deutsche-digitale-bibliothek.de/), Biblioteca Digital Hispanica (https://www.bne.es/es/catalogos/biblioteca-digital-hispanica), Gallica (https://gallica.bnf.fr/accueil/en/content/accueil-en), etc. Some libraries offer specialized products and services for special users. For example, the National Library of Canada (https://library-archives.canada.ca/eng) has launched a project that provides adaptation of films (audio accompaniment of actions on the screen) for visually impaired users, offers digital works in DAISY format, subtitled films for people with hearing disorders; adapts news content for audiences with special needs, offers Braille code for transcription of texts in mathematics, chemistry, etc. The National Library of Brazil (https://antigo.bn.gov.br/en/explore/catalogues#) offers users an innovative system called "VLibras", which translates digital audio and video content into Brazilian Sign Language for the hearing impaired. An electronic sign language library "Viittomakielinen kirjasto" (https://viittomakielinenkirjasto.fi/) was established in Finland (Tiurkedzhy, Davydova, Marina, & Marin, 2022).

Unfortunately, in Ukraine, the specified problems in the library and information sphere have not yet been properly resolved. One of the reasons for this is the outdated legal framework,

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insufficient and unstable funding of document and information structures, which becomes the main obstacle to the adaptation of premises, formation of appropriate electronic resources, and provision of specialized services to various categories of users in the digital space. One of the priority tasks of document and information structures today is to provide free access to the Internet, various online tools, and resources that support education, employment, research, and the organization of leisure (Prykhodko, 2020). This is especially important for people with disabilities and special educational or any other needs.

One of the serious issues in Ukraine remains the physical accessibility of documents and information structures. Many of them are located in buildings that do not take into account the needs of people with disabilities. However, several important projects have been implemented recently. Sensoteka in Lviv (https://lviv.travel/en/places/attractions/sensoteka) is a benchmark among them – the first inclusive space of informal education in Ukraine (Hos, 2020). A special place has been created here, where people from different social groups meet, communicate, and communicate, united by openness and mutual respect. Sensoteka is the result of creative cooperation between the Centralized Library System for Adults of the City of Lviv and the Public Organization "Institute of Ukrainian Studies" and received the support of the Department of Culture of the Lviv City Council. This special space fosters joint growth and creates a place where people can learn, spend time usefully, communicate with interesting people and participate in exciting workshops, attend free English courses for inclusive groups, engage in art therapy, attend trainings, workshops for teachers on inclusive education, etc.

Digital inclusion in Ukraine is still only a desirable prospect. This is evidenced by the results of the analysis of 41 sites of Ukrainian document and information structures (libraries, archives and museums) of different subordination and status. One of the aspects of the research was measuring the level of their accessibility and the presence of assistive technologies in their functionality.

The results of the analysis of resources by the "Web Accessibility Checker" functionality indicate the presence of accessibility problems in 100% of the library websites selected for analysis. In particular, among the main problems, the following were identified (Fig. 1.):

1 problem: lack of text alternatives for any non-text content, for example, subtitles or sign language sign language or audio accompaniment, etc.);

2 problem: lack of means to make it easier for users to view and listen to content, including separating the foreground from the background;

3 problem: lack of accessibility of all functions on website pages from the keyboard;

4 problem: lack of various ways of interaction of users with website content, additional tools for moving users on pages and website and searching for content, determining one's own location on pages and the resource as a whole;

5 problem: illegibility of text content;

6 problem: lack of auxiliary functions for users in error correction, etc.

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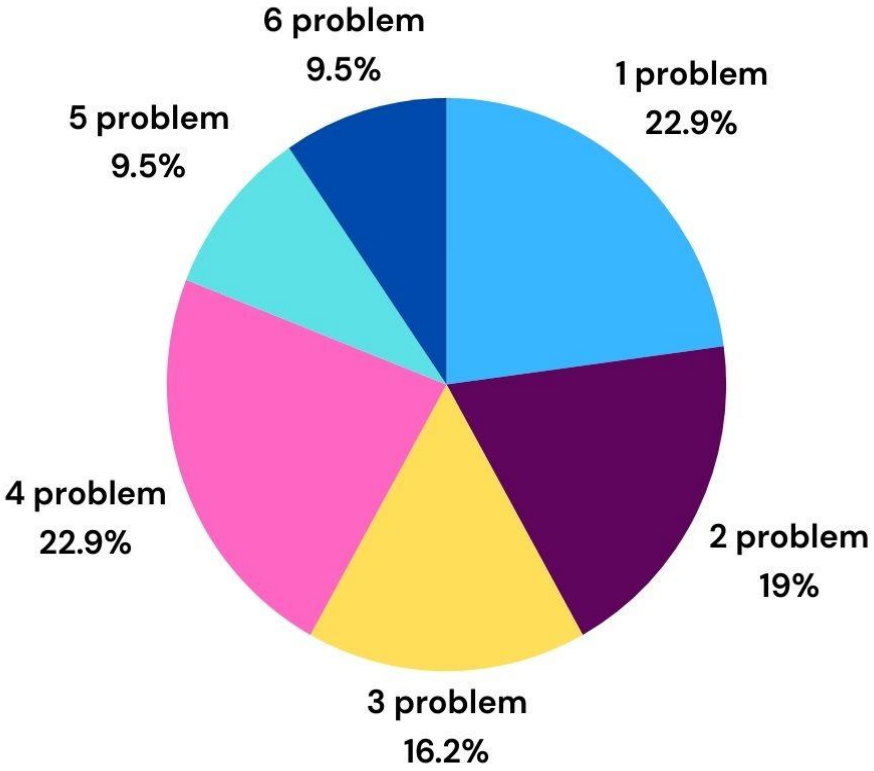

Fig. 1. Availability of accessibility problems on 41 sites of Ukrainian document and information structures

These problems make it difficult, and in some cases even completely impossible, to use information from library websites by certain categories of users, for example, people with visual disabilities.

Webometric research of sites was also carried out according to the following parameters: content analysis and audit of the site for the availability of assistive technologies and accessibility tools, analysis of the range of products and services of document and information structures for users with disabilities. The results of the analysis indicate that (Fig. 2):

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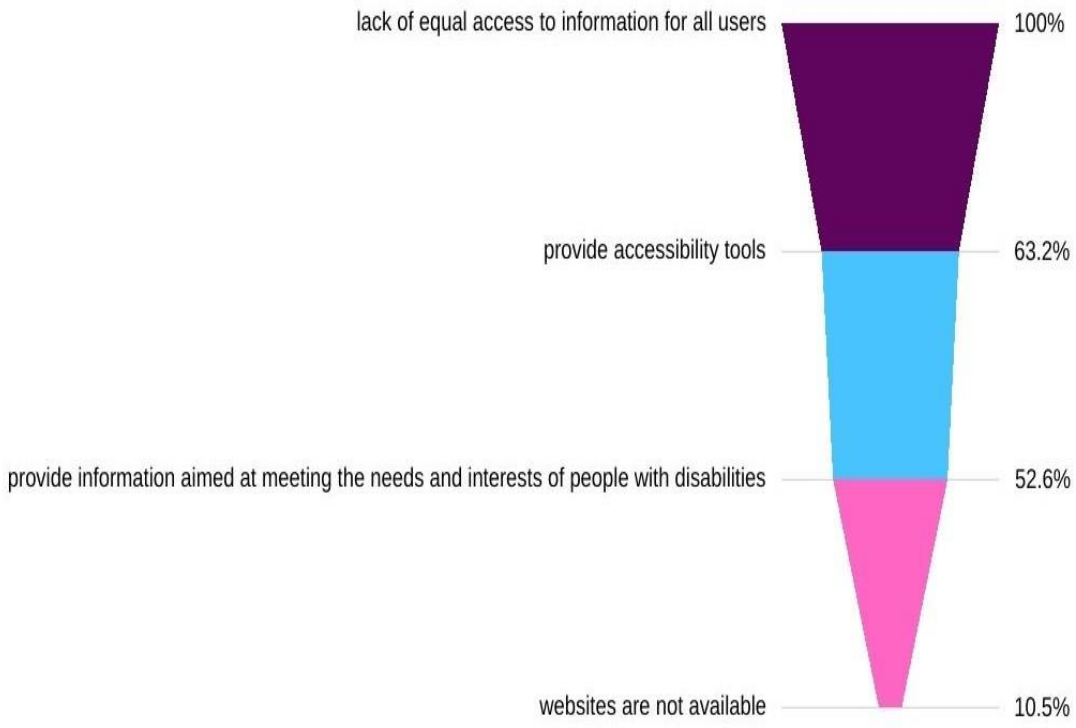

Fig. 2. Availability of assistive accessibility technologies on websites of Ukrainian document and information structures for users

1) 19 out of 41 sites do not provide equal access to information for all users, including people with disabilities: the resources lack adequate design solutions and technical means for access by people with various types of disabilities, there is no possibility to use a mouse, etc.;

2) 12 out of 41 sites have accessibility tools: resources have implemented tools for changing font sizes, alternative texts for images, console versions for using speech synthesizers, etc.,

3) 10 out of 41 sites provide information aimed at meeting the needs and interests of people with disabilities and providing them with adequate service.

4) 2 sites failed to open, which may be due to technical issues or poor technical support.

In the research process, it was found that in recent years, Ukrainian documents and information structures began to pay attention to the importance of creating accessible web resources to ensure inclusive access to historical and cultural heritage and information about art. This demonstrates an understanding of the importance of assistive technologies and their potential to expand cultural opportunities for a wide range of audiences. The results of the content analysis emphasize the need for the development and implementation of assistive technologies in the field of archival documentation and access to archival resources to ensure equal opportunities and inclusion.

Therefore, the specified results of the analysis emphasize the urgent need to improve the infrastructure of digital resources, a total revision of the concept of technical support, and an audit of resources to ensure stable access to them. The vast majority of the investigated sites have

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deficiencies in accordance with the principles of accessibility for persons with visual, auditory, motor, or cognitive limitations.

Conclusions

Thus, it can be argued that document and information institutions of society now play an important role as social actors in the introduction and dissemination of assistive technologies. In this context, it is possible to emphasize their significant impact on the development of social inclusion and support of the concept of diversity in society. The inclusive space of document and information institutions, built based on the implementation of assistive technologies, is now a key factor in ensuring barrier-free access to information and services for various categories of users – people with disabilities, socially vulnerable categories, victims of wars, armed and political conflicts, natural disasters, social prejudices, etc.

The study of foreign experience in the use of assistive technologies in document and information structures is a necessary prerequisite for the development of prospects for the introduction of assistive technologies in Ukrainian document and information structures.

In Ukraine, libraries are leaders in implementing and using assistive technologies among various document and information institutions. Compared to museums and archives, they have the greatest experience in serving users with disabilities and the most powerful potential for developing social inclusion and embodying diversity in the digital environment. This is made possible due to the creation and development of high-quality, adapted to the needs of various audiences of users of digital resources, and specialized digital projects. The basis for their creation and adaptation can be the results of the conducted webometric research. They provide valuable information about the state of accessibility of web resources and in the future can serve as a basis for further development and implementation of inclusive web design strategies. Understanding and addressing accessibility issues will improve interaction and meeting of user's needs, ensuring equal access to web resources and information.

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TIURKEDZHY N. S.
Наукова бібліотека, Запорізький державний медико-фармацевтичний університет (Запоріжжя, Україна), e-mail: Natali_turkedjy@ukr.net, ORCID 0000-0001-6785-2900

MARINA O. YU.
Кафедра цифрових комунікацій та інформаційних технологій, Харківська державна академія культури (Харків, Україна), e-mail: Helenmaryina@gmail.com, ORCID: 0000-0002-7248-2147

DAVYDOVA I. O.
Кафедра цифрових комунікацій та інформаційних технологій, Харківська державна академія культури (Харків, Україна), e-mail: IDavydova1@ukr.net, ORCID: 0000-0001-6015-2477

MARIN S. O.
Кафедра програмної інженерії Харківського національного університету радіоелектроніки (Харків, Україна), e-mail: serhiy.maryin@nure.ua, ORCID 0000-0002-2012-7477

Досвід упровадження асистивних технологій в українських та зарубіжних документно-інформаційних структурах

Мета. У статті розглядається світовий досвід цифрової інклюзії та стан створення інформаційних просторів для людей з особливими потребами в провідних документно-інформаційних установах суспільства. **Методика.** Дослідження проведено на основі контент-аналізу 20 сайтів академічних бібліотек США та вебометричного аналізу 41 сайту українських документно-інформаційних структур (бібліотеки, архіви та музеї) з допомогою функціоналу «Web Accessibility Checker». Моніторинг бібліотечних сайтів проводився протягом травня 2024 року. **Результати.** Проведений аналіз засвідчив, що на сьогодні цифрова інклюзія в

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документно-інформаційних установах бібліотек США, Великої Британії, Франції спрямована на подолання дефіциту інформаційних ресурсів для різних груп користувачів, запровадження комп'ютерів зі спеціальним програмним забезпеченням і допоміжними технологіями для людей з інвалідністю та на створення комфортного інформаційного простору. Для бібліотек України ця діяльність є лише бажаною перспективою, хоча робота в цьому напрямі розгортається. **Висновки.** Зроблено висновок щодо важливості впровадження асистивних технологій в документно-інформаційних структурах та забезпечення комфортного доступу до інформації для різних категорій користувачів, зокрема з особливими освітніми потребами та людей з інвалідністю. Розвиток цифрової інклюзії, створення спеціалізованих продуктів та послуг для особливих користувачів є стратегічним напрямом розвитку документно-інформаційних установ. Лідерами впровадження та використання асистивних технологій серед різних документно-інформаційних установ є бібліотеки. У порівнянні з музеями та архівами вони мають найбільший досвід в обслуговуванні користувачів з інвалідністю та найпотужніший потенціал розвитку соціальної інклюзії та втілення ідеї різноманітності у цифровому середовищі.

Ключові слова: документно-інформаційні установи; бібліотека; асистивні технологі; цифровий простір; інклюзія

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