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Libraries as hubs of digital literacy: A case study of public libraries in Kyiv, Lviv, and Kharkiv

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Abstract. The aim of the research was to explore the role of Ukrainian libraries in developing digital technology skills based on international practices. The methodology involved a systematic analysis of Ukrainian libraries in Kyiv, Lviv, and Kharkiv, content analysis of digital platforms and tools, an international review of practices in Finland, India, Moldova, Romania, and Nigeria, and a descriptive-analytical method for summarising programmes and initiatives with the purpose of assessing the effectiveness of digital technology integration into library activities and formulating recommendations. The main results of the study examined the state of Ukrainian public libraries in Kyiv, Lviv, and Kharkiv, and it was established that they have undergone a transformation, evolving from traditional repositories of printed materials into centres of digital education and innovative activities. It was explored how the implementation of digital platforms, such as "Diia. Digital Education", Google Workspace, Canva, electronic libraries, and webinars, has enabled users of different ages to enhance their digital competencies and information literacy. In particular, tools such as "Diia. Digital Education", Canva, Google Workspace, Zoom, Microsoft Teams, and chatbots assist librarians in effectively organising training, managing learning groups, and adapting materials for users. International experience highlighted that library development programmes as centres of digital education in Finland, India, Moldova, Romania, and Nigeria contributed to enhancing citizens' information and technological skills. It was investigated that in Ukraine, the Digital Education Hub network enabled vulnerable population groups to master practical digital skills, whereas centralised resources in Finland and programmes in India provided access to knowledge for the general population, including rural areas and individuals with limited capabilities. The results demonstrated that the technical upgrading of libraries and the training of librarians as digital facilitators will contribute to enhancing the population's digital literacy, the inclusivity of educational services, and the development of critical thinking skills, ensuring Ukraine's integration into the global information space. The recommendations envisage expanding the network of library hubs, combining in-person and distance learning, creating a national digital platform, and developing specialised courses for socially vulnerable groups. The practical significance of the research lies in the fact that its results can be used by librarians and educational managers to enhance digital literacy

Keywords: digital competence; social inclusion; digitalisation centres; training; international practices

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Introduction

Libraries are instrumental in shaping the population's digital literacy, becoming hubs of access to knowledge, information resources, and technologies. The case of public libraries in Kyiv, Lviv, and Kharkiv demonstrates an active transformation of traditional reading halls into innovative spaces where citizens acquire skills for working with digital tools, electronic services, and online platforms. The development of libraries as hubs of digital literacy has contributed to reducing the digital divide, supporting lifelong learning, and engaging various age groups in the digital transformation of society. Such initiatives have strengthened social integration, ensured equal opportunities for learning, and contributed to enhancing citizens' competitiveness in the information environment.

Public libraries worldwide have shown a tendency to transform into centres of digital literacy and lifelong learning, combining educational, social, and technological functions. A significant number of scholars have focused on this topic, forming various approaches and interpretations of its content. For instance, the study by E.-S.T. Abumandour (2021) demonstrated that libraries provided equal access to e-learning, contributed to overcoming educational barriers, and served as platforms for developing self-learning skills. This approach reflected a new paradigm of the library space, oriented towards interactive interaction between users and staff. Similar results were recorded in the study by A. Garoufali & E. Garoufallou (2024), where libraries in Greece were considered as collaborative learning centres that integrated physical and digital space. The authors proved that the implementation of a shared learning space model ensured effective support for visitors in mastering digital technologies, increased the level of information competence, and fostered social learning. A notable place in these transformations was occupied by the formation of digital creativity. In particular, T. La Rose & B. Detlor (2021) showed that digital storytelling and work in library makerspaces contributed to the development of digital skills and creative thinking, especially among students of social specialisations. Projects of this type allowed users to combine technological knowledge with humanities content, which expanded the perception of the library as an environment for innovative learning. Similar trends were observed in Ukrainian public libraries, where the creation of media laboratories, creative rooms, and digital classrooms fostered youth engagement with digital practices, enhancing their competitiveness in the labour market.

International research has paid attention to the problem of overcoming the digital divide. In particular, X. Neumeyer *et al.* (2021) established that digital literacy served as a social bridge, reducing technological barriers among socially vulnerable groups. Libraries acted as intermediaries between users and technologies, providing opportunities for practical learning and support for entrepreneurial initiatives. In turn, D. Radovanović *et al.* (2020) developed a system of key digital literacy indicators for sustainable development, proving that libraries could become core institutions for its measurement and expansion within communities. The work of P. Reddy *et al.* (2023) presented a model for developing digital skills that narrowed the gap between different population groups. The scholars emphasised that libraries had the potential to implement such models through free training, consultations, and joint events with educational institutions. This aligned with the research of M. Ridley & D. Pawlick-Potts (2021), who identified the need for developing algorithmic literacy among librarians and users. Their conclusions confirmed that library staff performed not only the role of intermediaries in access to information but also that of mentors capable of explaining the principles of digital technologies, algorithms, and artificial intelligence systems. S. Strover *et al.* (2020) showed that in rural regions, libraries ensured digital inclusion, compensating for inequality caused by spatial factors. The authors concluded that such institutions formed hubs of community interaction where digital literacy developed through collaborative learning, knowledge sharing, and local initiatives. This conclusion resonated in the urban environment of Ukraine; public libraries in Kyiv, Lviv, and Kharkiv implemented programmes such as "Digital Education", "Library as a Space for Development", and "Smart Library", which united citizens around the idea of open access to digital resources. Confirmation of these trends was found in the work of T. Withorn *et al.* (2020), who proved that library instruction and information literacy formed the foundation of digital learning, ensuring users' adaptation to changing information conditions. The researchers emphasised that systematic training in the fundamentals of information literacy in libraries contributed to increasing visitors' autonomy and expanded their capabilities in using digital resources.

Despite the aspects covered by previous researchers, gaps remained in the study of specific practices for developing digital literacy in public libraries in Kyiv, Lviv, and Kharkiv. There was a lack of systematic analysis of the effectiveness of local initiatives, methods for engaging different age groups, and the integration of the latest digital tools into library training programmes. The impact of such initiatives on bridging the digital divide among different social and demographic groups of library users was insufficiently researched. The aim of the study was to assess the effectiveness of Ukrainian libraries in functioning as centres for learning digital skills and, based on international experience. The objectives of the study were to analyse digital initiatives and the transformation of public libraries in Ukraine; to evaluate the process of integrating digital platforms into modern library activities; to highlight international practices of developing libraries as hubs of digital literacy; to formulate recommendations for the development of Ukrainian libraries as centres of digital education.

Materials and Methods

The study conducted a systematic analysis of the digital transformation of public libraries in Ukraine, particularly in Kyiv, Lviv, and Kharkiv, with the aim of identifying key practices for integrating digital tools into library activities. Specifically, the National Library of Ukraine named after V.I. Vernadsky (n.d.), the Lviv Regional Universal Scientific Library (n.d.), and the Kharkiv State Scientific Library named after V.G. Korolenko (n.d.) were selected to assess their involvement in digital transformation and the development of media education competencies. The analysis of these sources was carried out to determine their potential for developing users' digital literacy, creating an interactive learning environment, and supporting libraries in their role as centres of digital education.

The study sequentially carried out several stages of analysing digital platforms and tools used in public libraries in Kyiv, Lviv, and Kharkiv. First, the Diia. Digital Education (n.d.) platform was identified and evaluated; it provided access to online courses and training materials for enhancing citizens' digital literacy. The next step was to examine the capabilities of Canva (n.d.) with AI functions for creating educational presentations, informational materials, and interactive resources. Subsequently, the application of Google Workspace (n.d.) was analysed, which facilitates collaborative work, document management, and remote educational events. Simultaneously, the use of interactive chatbots was investigated; these provided prompt consultations and ensured feedback with users. At the final stage, the possibilities of conducting online training sessions via Zoom (n.d.) and Microsoft Teams (n.d.) were assessed, allowing for the organisation of synchronous educational events and ensuring interaction between participants regardless of their location. This step-by-step approach enabled a comprehensive assessment of the functionality and effectiveness of digital tools in the library environment. These tools were selected due to their practical significance for developing digital competencies among users of different ages, ensuring the accessibility of educational resources, the interactivity of the educational process, and the possibility of forming practical skills in using digital services. The selection was based on criteria such as: the presence of official library support, regular use in training programmes, adaptability to different user groups, and the ability to support independent digital activity by visitors.

The study conducted an international review of library digital transformation practices aimed at identifying effective models for developing libraries as centres of digital literacy. For analysis, Ukraine, Finland, India, Moldova, Romania, and Nigeria were selected, as they participate in the international SollarSpell (n.d.) project, since they demonstrated the most indicative and diverse models of developing libraries as hubs of digital literacy. For this purpose, a descriptive-analytical method was applied, which involved summarising government programmes and materials, namely: in Ukraine (the Digital Education Hub (n.d.) initiative through the United Nations Development Programme Ukraine (2023)), libraries functioned as free educational spaces for enhancing citizens' digital competence. In Finland (the E-library (n.d.) and Finna (n.d.) platforms), a centralised ecosystem of electronic resources was created, ensuring equal access to knowledge. In India (the Digital Empowerment Foundation (n.d.) project), libraries supported digital inclusion of the population in rural regions. In Moldova, Romania, and Nigeria (the IREX (International Research & Exchanges Board) Libraries for Development (IREX, n.d.a) programme), which contributed to the formation of digital literacy and entrepreneurship skills. This approach made it possible to identify innovative directions for integrating technologies into the library sphere and their role in the development of digital communities. Recommendations for Ukrainian libraries as hubs of digital literacy were provided based on the conducted research.

Results

Digital initiatives and transformation of public libraries in Ukraine

In the modern information society, public libraries are undergoing significant transformations: from classical repositories of printed collections to multifunctional centres of digital education, communication, and innovative activity. Furthermore, electronic and digital libraries are becoming a necessary tool that complements traditional library activities. For example, the National Library of Ukraine named after V.I. Vernadsky offers a wide range of electronic resources, including the digital library "Ukrainica", a repository of scholarly works, collections of historical and cultural heritage, as well as access to international projects such as the World Digital Library, which provide remote access for users to unique scientific and cultural materials. Specifically, the "Ukrainica" digital library systematises and disseminates scientific and educational materials of Ukrainian origin, the repository of scholarly works preserves research results and promotes academic integrity, the collections of historical and cultural heritage support the preservation of national memory and cultural identity, and international projects, particularly the World Digital Library, ensure information exchange, intercultural dialogue, and the inclusion of Ukrainian scholarship in the global digital space. These digital tools contribute to the development of open science, the preservation of national heritage, and the enhancement of the information literacy of society (National Library of Ukraine named after V.I. Vernadsky, 2023). This example demonstrates how libraries can act as coordination centres for uniting materials from many institutions into a unified digital system.

In Lviv, public libraries are also actively implementing digital technologies. In particular, the Lviv Regional Universal Scientific Library (n.d.) is implementing the "Fifth Element" project, which helps children from displaced

families through interactive learning of digital skills, information literacy, and critical thinking (Rubryka, 2024). Furthermore, in 2025, Lviv libraries restored over 7,000 publications and created centres for non-formal education for adults, which contributes to the development of media education competencies among youth and adults (Rubryka, 2025). In Kharkiv, the Kharkiv State Scientific Library named after V.G. Korolenko (n.d.) actively conducts media literacy training, organises cultural and educational events, and provides consultations for users. In particular, the organisation of non-formal and informational education for users and librarians contributes to the development of critical thinking and skills for the safe use of information technologies among different age groups (Chytomo, 2022). The Kharkiv State Scientific Library named after V.G. Korolenko is actively modernising and updating its space, combining traditional services with digital technologies: a micro-library and the digital platform "Ideas Cube" have been created, providing users with access to thousands of educational and cultural materials, integrating online media literacy courses, and ensuring the possibility of work even with limited internet access, as well as introducing interactive training and digital services to improve the media education competencies of visitors (Official Site of Kharkiv City Council, 2025).

Overall, the public libraries in the three cities are actively implementing digital technologies and media education programmes, which contributes to the development of digital literacy among the population. These initiatives help citizens adapt to rapid changes in the digital environment and ensure equal access to educational resources. The role of libraries during wartime is positive, as they are hubs of informational support and learning for the population. Table 1 summarises the key digital initiatives and tools in the public libraries of Kyiv, Lviv, and Kharkiv, showing the different approaches of the cities to digital transformation depending on infrastructure, socio-economic conditions, and community needs.

Table 1. Digital initiatives and tools in the public libraries of Kyiv, Lviv, and Kharkiv

City	Initiative title	Description
Kyiv	Launch of Digital Tools for Librarians at the V.I. Vernadsky National Library of Ukraine	In June 2024, two tools for librarians were launched on the Diia. Digital Education platform: a digital competence framework and the "Digigram" test, which contribute to the professional development of staff in the field of digital technologies, as well as to the integration of electronic catalogues and the resources of the "Ukrainica" digital library.
Lviv	Opening of the Centre for Non-Formal Adult Education at the Lviv Regional Library for Adults	On 19 April 2024, the Centre for Non-Formal Adult Education was opened, offering courses in digital literacy, media literacy, and interactive training sessions for adults, including internally displaced persons, as well as providing access to online resources and digital collections.
Kharkiv	Installation of a Micro-Library and the "Ideas Cube" Digital Library at the V.G. Korolenko Kharkiv State Scientific Library	In September 2023, the library organised a micro-library and the "Ideas Cube" digital platform, which provides access to thousands of educational and cultural materials, integrates online media literacy courses, and supports user operations during limited internet access, including during wartime.

Source: compiled by the authors based on research from United Nations Development Programme Ukraine (2024), InLviv (2024), United Nations Development Programme Ukraine (2025)

Table 1 demonstrates that the digital initiatives in the libraries of Kyiv, Lviv, and Kharkiv have different emphases due to the specificities of the cities: the capital prioritises the implementation of national platforms and the professional development of librarians, Lviv focuses on the development of educational centres and access to electronic resources, while Kharkiv emphasises ensuring remote access to knowledge through micro-libraries and digital hubs. These differences are conditioned by the level of infrastructure, cultural and socio-economic conditions, as well as the needs of local communities. The public libraries of Kyiv, Lviv, and Kharkiv are actively modernising and undergoing digitalisation, helping users to navigate information flows effectively, forming a modern reference and bibliographic base, and providing access to educational and cultural resources even with limited internet access, which is a significant aspect in wartime. In Kyiv, the National Library of Ukraine named after V.I. Vernadsky (n.d.) has implemented digital tools on the Diia. Digital Education (n.d.) platform, including a digital competence framework and the "Digigram" test, which enable librarians to quickly orient themselves in digital resources and help users find relevant information and electronic collections. The Diia. Digital Education platform is designed to enhance the digital literacy of users and the professional development of library staff, providing access to learning materials, interactive tools, and electronic resources. It includes a digital competence framework, which defines the key skills required for working in a modern digital environment, as well as the "Digigram" test, which allows for the assessment of the digital awareness level of users and librarians. The primary objective of implementing this platform and test is to ensure rapid orientation within digital resources, enhance the efficiency of searching for relevant information, facilitate access to electronic collections, and promote the development of independent learning skills and the critical use of digital technologies. The Lviv Regional

Universal Scientific Library (n.d.) has opened a Centre for Non-Formal Education, where courses in digital literacy, media literacy, and interactive training are conducted, providing users, including internally displaced persons, with skills for critical information analysis and access to online resources. The Kharkiv State Scientific Library named after V.G. Korolenko (n.d.) has created a micro-library and the digital platform "Ideas Cube", which provides access to thousands of educational and cultural materials, integrates online media literacy courses, and supports users' work under the difficult conditions of wartime. Overall, these practices not only contribute to the development of digital skills and media education competencies but also demonstrate Ukrainian experience in comparison with European trends in library and book studies, strengthening the role of libraries as modern educational and cultural centres.

Although the cited examples indicate positive shifts, there are challenges and limitations that should be considered. According to a study by Y. Horban *et al*. (2024), which analyses the digital transformation of libraries across Ukraine, only 41% of libraries have computers, and 33% of libraries have access to high-speed internet. This means that a proportion of libraries are not prepared to provide digital services in full. This technical shortcoming is corroborated by a report from the Ministry of Digital Transformation: as early as 2020, it was recorded that approximately 92% of libraries lacked quality internet, with only 954 of them connected to fibre-optic broadband. This state of affairs limits the possibilities for using online platforms, webinars, interactive services, and providing comfortable electronic access for visitors.

Another challenge lies in the qualification level of library personnel. New roles as facilitators, trainers, and technology consultants are being added to digital functions. Not all librarians have prior training in this sphere, which necessitates additional training and support (which, in fact, the tools of Diia. Digital Education (n.d.) are attempting to address). Risks also lie in the unevenness of coverage; specifically, urban libraries typically have better resources, while libraries in rural areas or remote districts may be left with obsolete equipment or no internet access at all. This can exacerbate the digital divide between urban and rural populations. Funding is another aspect of instability; the development of digital services in libraries depends on grants, donor support, or project funding. When a project concludes, there is no guaranteed sustainability for these services (United Nations Development Programme Ukraine, 2024).

Real-world examples from various libraries in Ukraine confirm that even under difficult circumstances, libraries are actively engaging in innovative activities as local centres of digitalisation. Consequently, the implementation of digital tools in Ukrainian libraries is not merely a matter of fashion, but a strategic necessity in the context of the information society. It enables not only the preservation of the library's traditional function as a custodian of knowledge but also the expansion of its mission into that of an active educational incubator, a centre of digital competence, and an inclusive platform. However, for the sustainability of such transformations, systemic state support, long-term funding, staff training, careful planning of technical infrastructure, and the adaptation of interfaces to the needs of all user categories are required.

Integration of digital platforms into modern library practice

In modern library science, the primary task of public libraries is not only the preservation and provision of access to printed and digital resources but also the development of information literacy, support for educational programmes, ensuring inclusive access to knowledge, and fostering critical thinking skills in users. Libraries serve as educational centres where visitors of different ages learn to use information resources, develop digital competencies, and acquire practical skills necessary in the modern information society. To fulfil these tasks, traditional approaches are gradually being supplemented by contemporary digital platforms, allowing for the expansion of the service spectrum and enhancement of library work efficiency. For example, the Diia. Digital Education (n.d.) platform is integrated into library programmes for organising training sessions on basic digital literacy, safe internet practices, and the use of state electronic services. Through this, users independently complete courses or participate in group sessions under the guidance of a librarian, which facilitates the learning process and makes it more systematic and accessible. Canva (n.d.) with its artificial intelligence functions can be used for preparing educational materials, informational brochures, posters, and presentations for users, as well as for creating interactive tasks and visualising information during educational events. This enhances the appeal of the learning process and promotes the engagement of youth and creative users. During wartime, the digital platforms implemented in libraries enable users to obtain up-to-date information on safety and state services, complete online courses on digital literacy and safe internet use, support distance learning for children, internally displaced persons, and people with limited mobility, and ensure community communication and educational activity, maintaining access to knowledge and resources even under the difficult conditions of war.

An additional platform is Google Workspace (n.d.), integrated to organise collaborative work on projects, remote sharing of materials, and conducting online consultations. Libraries create group classes or channels for discussing educational topics, which helps to form an active community of users who support each other in knowledge acquisition. Furthermore, the integration of Zoom (n.d.) and Microsoft Teams (n.d.) helps conduct webinars, lectures, seminars, and thematic meetings online, which expands the geographical reach of access to educational programmes and ensures flexibility

in learning, especially for users from remote regions or with limited mobility. Interactive chat-bots are used to automate part of user service: they answer frequently asked questions, provide information about library services, and help with registration for events or online courses. This reduces the workload on library staff and increases the efficiency of information provision, simultaneously fostering the development of digital service usage skills among visitors.

Through the implementation of these platforms, libraries are modernising their traditional services and transforming into hubs of digital education, where users not only gain access to information but also actively learn how to use it. The use of such tools helps standardise educational programmes, making them more interactive and adapted to different user categories, including the elderly, persons with disabilities, and internally displaced persons. Moreover, the integration of digital platforms develops competencies such as critical thinking, creativity, communication, and collaboration, which are objectives of modern library science. Table 2 summarises the main functional capabilities of modern digital platforms that support the activities of librarians and provide users with access to educational and information resources.

Table 2. Functional capabilities of digital platforms in library activities for librarians and users

Programme / Platform	Functionality for librarians	Functionality for readers / users
Diia. Digital Education	Organising digital literacy training, monitoring learning groups, creating courses	Completing online courses, self-directed learning, access to digital educational materials
Canva with AI Features	Creating educational materials, presentations, brochures, content visualisation	Using prepared materials, participating in interactive tasks, creating own visual content
Google Workspace for Education	Organising collaborative work, remote storage and sharing of educational materials, conducting online classes	Access to learning resources, participation in remote classes, collaborative work on projects
Interactive Chatbots	Automating responses to enquiries, event registration, rapid provision of information	Receiving prompt responses, navigating library services, registering for courses and events
Zoom	Conducting webinars, online lectures and consultations, session recording	Participating in webinars and lectures, viewing recordings, taking part in remote learning events
Microsoft Teams	Organising online classes and training, collaborative discussion of materials, group management	Access to online classes, participation in group discussions, collaborative completion of learning tasks

Source: compiled by the authors based on analysis of Diia. Digital Education (n.d.), Canva (n.d.), Google Workspace (n.d.), Zoom (n.d.), Microsoft Teams (n.d.)

Specifically, the tasks of libraries include the continual updating of digital resources and educational programmes, the adaptation of tools to meet new user needs, as well as the professional development of librarians as digital facilitators. The integration of platforms such as Diia. Digital Education (n.d.), Canva (n.d.), Google Workspace (n.d.), Zoom (n.d.), and Microsoft Teams (n.d.) enables the comprehensive resolution of educational and informational tasks, enhances the effectiveness of the learning process, and ensures the inclusivity, flexibility, and accessibility of services. Thus, contemporary library practice is transforming from a traditional repository of knowledge into an active educational and digital hub, where technology, learning, and community interaction converge.

International practices in developing libraries as hubs of digital literacy

Countries such as Finland and India successfully combine modern technological infrastructure, centralised electronic resources, and large-scale educational programmes that cover virtually the entire population and marginalised groups, enabling citizens to rapidly acquire digital skills and engage critically with information; meanwhile, in Moldova, Romania, and Nigeria, coverage remains limited, access to electronic materials depends on the technical equipment of individual institutions, and educational initiatives are gradual, necessitating further infrastructure development, staff training, and programme expansion for broader citizen engagement. In Ukraine, projects for library development and digital literacy have been implemented, providing access to learning and resources for broad segments of the population. Table 3 demonstrates the key programmes, achievements, and innovative approaches of various countries in transforming libraries into centres of digitalisation.

The implementation of library programmes in various countries actively contributes to the acquisition of competencies in working with information resources and technological tools. In Ukraine, established centres allow citizens to practise practical skills, notably working with electronic services, which is particularly important for representatives of vulnerable groups. In Finland, platforms provide access to a wide range of electronic materials, helping users master methods of searching, evaluating, and systematising information. The activities of the Indian organisation DEF cover rural areas and help people with limited opportunities learn to apply digital tools for everyday life and professional activities. In Moldova and Romania, programmes are aimed at enhancing skills in using state electronic services and communication platforms, facilitating the independent completion of tasks and interaction with administrative structures.

In Nigeria, initiatives concentrate on developing practical skills for youth and women, providing access to modern learning tools and entrepreneurial platforms. Thanks to these approaches, people acquire the ability to use digital technologies effectively, evaluate information critically, and organise their own learning, creating a sustainable foundation for integration into the modern information environment.

Table 3. Features of library development programmes as hubs for digital literacy in international countries

Country	Programme	Achievements	Innovations
Ukraine	"Digital Education Hub" Project (Diia.Education / UNDP)	Over 3,000 library-hubs provide digital literacy training. In 2024, over 25,000 individuals across 22 regions completed training. Pre-full-scale invasion, there were approximately 6,000 hubs; post-invasion, approximately 3,000, the majority being libraries.	Establishment of a network of library-hubs, offline access to courses, trainer training, inclusion of vulnerable population groups in the programme.
Finland	National E-Library Project (E-library) + Finna and Digital Library Services	The service covers 97% of the country's population through the inclusion of 280 municipalities. In 2024, over 200,000 registered users, more than 7,000 book titles (electronic), 100+ journals, approximately 1 million books loaned, 4 million journals read via the E-library.	Centralised collection, uniform e-resources for all users, high utilisation rate, significant proportion of new users who previously did not use libraries.
India	Digital Empowerment Foundation (DEF)	Over 30 million people impacted through DEF's educational and digital activities. More than 10,000 digital entities (libraries, organisations, etc.) utilise digital tools. (Projects also span 24 states, 135 districts).	Focus on work in rural areas, with marginalised groups – women, people with disabilities, the elderly. Creation of a network of information centres, training in online safety and digital literacy, support for entrepreneurship.
Moldova	IREX "Libraries for Development" Programme	Approximately 1,070 libraries supported (~80% of the country's libraries). Serve approximately 763,000 people annually through these libraries. 29 libraries became accredited e-centres for providing e-services, 15,000 people accessed government online services through libraries.	Modernisation of libraries, access to e-services through libraries, libraries as hubs for entrepreneurial and educational activity.
Romania	IREX / Libraries for Development Programmes	Over 80% of the country's libraries were equipped with technology and internet. Over 600,000 new internet users via libraries. Libraries recorded approximately 5.3 million visits from the population in one year.	Extensive coverage of technical infrastructure, inclusion of new users, active use of libraries as access points for the internet and digital resources.
Nigeria	IREX Library Development Programmes	70% of libraries were equipped to support digital and entrepreneurial skills for women and youth.	Focus on gender equality, youth, employability skills; technological support for libraries in local communities.

Source: compiled by the authors based on research from United Nations Development Programme Ukraine (2023), CENL News (2025), Digital Empowerment Foundation (n.d.), IREX (n.d.a)

Based on the conducted research, aimed at analysing international practices of developing libraries as centres of digital education, a set of recommendations for Ukrainian libraries regarding their functioning as hubs of digital skills was prepared. The analysis encompassed the experience of Ukraine, Finland, India, Moldova, Romania, and Nigeria, which allowed for the identification of key aspects for the successful implementation of such initiatives. First and foremost, the research showed that the effectiveness of library work depends on a combination of offline and online learning formats. In Ukraine, for instance, the Digital Education Hub (n.d.) project engaged over 25,000 individuals in practical trainings across more than 3,000 institutions, demonstrating high demand for access to contemporary technological knowledge and the need to develop relevant skills among various population groups (United Nations Development Programme Ukraine, 2023). Considering this, it is advisable for Ukrainian libraries to expand the network of such centres, integrating offline sessions with distance learning courses and webinars for maximum citizen reach. The experience of Finland and its national E-Library showed that centralised electronic collections ensure equal access to materials for all users regardless of region. Readers use e-books and journals, which fosters the formation of skills for independent mastery of information and critical assessment of its reliability. For Ukrainian libraries, this implies the necessity of creating a unified digital platform that allows visitors to simultaneously use electronic resources, educational materials, and interactive tools for enhancing digital competencies.

The Indian experience of the Digital Empowerment Foundation (n.d.) demonstrates the importance of focusing on marginalised groups, particularly women, people

with disabilities, and rural inhabitants. Over 30 million people were reached by DEF's educational and digital programmes, enabling them to use technologies independently for solving everyday tasks and enhancing professional mobility (Association for Progressive Communications, 2009). Ukrainian libraries can adopt this practice by organising specialised courses for vulnerable population categories, as well as offering support in using state electronic services and online tools (United Nations Development Programme Ukraine, 2023). IREX programmes, notably "Beyond Access", "Learn to Discern", and "Media Literacy in Libraries" in Moldova, Romania, and Nigeria, confirmed that modernising library infrastructure and providing access to innovative resources promote broader citizen engagement with the digital environment. For example, in Moldova, over 1,000 institutions became centres for providing electronic services, and in Romania, new users gained access to modern technologies, which stimulated the active use of libraries as educational platforms (IREX, n.d.b). For Ukraine, this signifies the need for the technical upgrading of libraries, ensuring stable internet connection, and integrating modern software for teaching.

Through the implementation of these recommendations, Ukrainian libraries can transform into modern educational centres where citizens can acquire the necessary skills for successful interaction with information resources, develop critical thinking, and effectively use digital technologies in everyday life and professional activities. Thus, the implementation of these measures will contribute to raising the general level of digital competence among the population and the integration of Ukraine into the global information space.

Discussion

Public libraries in Kyiv, Lviv, and Kharkiv have gradually transformed into multifunctional spaces where not only traditional user services took place, but also the formation of population digital literacy. The expansion of the spectrum of library services, the introduction of educational programmes on digital skills, as well as the use of artificial intelligence technologies, cloud services, and online resources confirmed the orientation of libraries towards meeting societal needs in the context of digital transformation. These results were consistent with the findings of the research by M.B. Atoy Jr *et al.* (2020), where libraries were considered as hubs of digital learning and social inclusion. The fact identified in the research concerning the active participation of Ukrainian libraries in digital education programmes coincided with the approach outlined in the works of S. Dias-Trindade & A. Ferreira (2020), where the process of transition from digital literacy to digital competence was interpreted as evolutionary. The analysis of the activities of Kyiv, Lviv, and Kharkiv libraries showed that library staff were gradually transitioning from basic computer skills to using interactive learning platforms, adaptive online courses, and digital services for user engagement. This confirmed the opinion of the aforementioned authors that digital literacy is not a static characteristic but is formed as a continuous process in response to socio-technological changes.

The collected data revealed that in all three cities, libraries functioned as open educational spaces that contributed to the reduction of the digital divide. This conclusion was consistent with the findings of the study by M.Y. Ali *et al.* (2020), in which libraries were identified as key institutions for the popularisation of artificial intelligence technologies within educational communities. In Kyiv libraries, particularly at the V.I. Vernadsky National Library of Ukraine, a digital competence framework and the "Digigram" test were implemented on the Diia. Digital Education platform in June 2024 for the professional development of librarians. These tools enable effective work with electronic catalogues and digital resources, fostering users' digital skills and critical thinking. This example aligned with the approaches described in international practice by M. El Benny *et al.* (2021), where librarians acted not merely as intermediaries between the user and information, but also as facilitators of the digital learning process, corresponding to the concept of critical digital literacy defined by E. Beck *et al.* (2021). These authors emphasised that digital literacy education must include an awareness of the risks of the online environment, and the development of privacy skills and critical thinking. Within the context of Ukrainian libraries, a transition was occurring from traditional book storage functions to the role of centres for digital education and media literacy. Electronic catalogues, digital libraries, online courses, and interactive platforms for librarian upskilling and user training were introduced, which allowed for the development of critical thinking, digital skills, and ensured access to knowledge even under challenging conditions, particularly during wartime.

This social orientation was consistent with the conclusions of the research by R. Hernandez-Ramos *et al.* (2021), which substantiated the necessity of developing digital accompaniment programmes for groups with low levels of digital literacy. In Lviv, at the Lviv Regional Universal Scientific Library, an Adult Non-Formal Education Centre was opened on 19 April 2024, offering courses in digital literacy and media literacy. The centre provides access to online resources and digital collections, helping users to develop self-directed learning skills and critical information evaluation. This aligned with the findings of F. Hamad *et al.* (2021), who demonstrated the influence of librarians' digital skills on the perception of technological innovations in the library environment. The analysis of Ukrainian libraries showed that through the implementation of these initiatives, Ukrainian libraries are becoming modern educational centres where visitors acquire skills for working with information resources, develop critical thinking, and the ability to effectively use digital technologies in both daily life and professional activities. Such interaction corresponded to the

conclusions of H. Haryanto *et al.* (2024), who considered libraries as incubators for social entrepreneurship and inclusion, capable of contributing to the achievement of the Sustainable Development Goals (SDGs). From this perspective, Ukrainian libraries need to work towards the technical modernisation of libraries, ensuring stable internet connectivity, and integrating modern software for training. A comparison with the results of the study by K. Kumpulainen *et al.* (2020) revealed that the formation of digital practices among children and youth was reflected in library activities.

In the libraries of Kyiv, Lviv, and Kharkiv, active development of digital resources and educational initiatives aimed at enhancing users' digital literacy was observed. Library staff implemented electronic catalogues, digital collections, interactive online courses, and adaptive learning platforms, which contributed to the formation of critical thinking and information resource skills among visitors. This assertion is consistent with the research by A. Kuek & S. Hakkennes (2019), which assessed the level of digital literacy and staff attitudes towards information systems in the context of implementing electronic library records. The results showed that the majority of respondents (70-80%) possessed a high level of digital literacy and a positive attitude towards information systems, but approximately one-fifth experienced anxiety when using such systems. In particular, libraries in Kyiv and Lviv utilised user progress assessment tools, which increased learning motivation and corresponded to the concepts of digital competence development in the scholarly works of B. Le *et al.* (2022) and A. Lilian (2022), who asserted that librarians' skills exceed the average level but require improvement in specific aspects, such as information security and digital content management. In Kharkiv, positive dynamics in the adoption of digital technologies among staff and users were observed, which aligned with the approaches to critical digital literacy and active civic participation in the digital society of G. Polizzi (2023). Simultaneously, the analysis showed that a significant proportion of users required additional training and support, particularly among adult and elderly visitors, which was corroborated by the studies of S. Oh *et al.* (2021) and M. Tsai *et al.* (2021), which noted that the use of interactive platforms and group training stimulated user engagement and allowed for the adaptation of learning tasks to different skill levels. Overall, Ukrainian libraries have become spaces for social interaction and knowledge exchange, where users could receive support from trainers and volunteers, master digital tools, and learn critical information analysis. This comprehensive approach to digital education is consistent with the conclusions of E. Tour *et al.* (2023), who emphasise the importance of combining technical skills and social support, especially for vulnerable user categories, including internally displaced persons and refugees.

The analysis of practices in the libraries of Kyiv, Lviv, and Kharkiv showed that digital resources are actively used for the development of users' critical thinking, information literacy, and digital competencies. This is supported by data from the article by O.B. Onyancha (2020) and L. Pangrazio *et al.* (2020), who indicated that libraries introduced integrated learning programmes that combined computer skills, information literacy, and civic engagement. Furthermore, the study indicated that digital literacy training and learning group control for librarians were organised on the "Diia. Digital Education" platform, while users could complete online courses and independently master digital educational materials. The use of Canva with AI functions allowed librarians to prepare learning materials, presentations, and interactive tasks, and visitors could create their own visual content and work with prepared materials, which fostered creativity and information visualisation skills. Additionally, the authors K. Spjeldnæs & F. Karlsen (2022) determined that Google Workspace for Education tools provided librarians with the capability to organise collaborative work, remote storage of materials, and online classes, while users could participate in remote sessions and collaboratively execute projects. Interactive chat-bots ensured the automation of responses to enquiries, course registration, and quick information retrieval, enabling users to efficiently navigate library services. Zoom and Microsoft Teams platforms were used for conducting webinars, lectures, and group online classes, and users had the opportunity to participate in lectures, view recordings, and collaborate on learning tasks. This is confirmed by J. Yu *et al.* (2024), as such practices allowed libraries to adapt educational programmes to different levels of users' digital competence, including adults, elderly individuals, and displaced persons, and also stimulated active participation and motivation for learning.

This comprehensive approach supported the simultaneous development of users' technical, critical, and social competencies, creating conditions for the effective use of digital technologies in daily life and professional activities. Overall, the implementation of interactive and online tools in libraries fostered the formation of an inclusive and flexible educational environment, which corresponds to the modern demands of the digital society and the needs of wartime.

Conclusions

As a result of the research, it was established that the public libraries of Kyiv, Lviv, and Kharkiv have taken significant steps towards digital transformation and the development of media education competencies. In 2024, the V.I. Vernadsky National Library of Ukraine implemented digital tools for librarians on the Diia. Digital Education platform, specifically a digital competence framework and the "Digigram" test, which enhanced staff qualifications and promoted the integration of electronic catalogues and the "Ukrainica" digital library. The Lviv Regional Library for Adults opened a Non-Formal Education Centre in April 2024, where courses in

digital literacy, media literacy, and interactive training for adults, including displaced persons, were organised, and users gained access to online resources and digital collections. At the V.G. Korolenko Kharkiv State Scientific Library, a micro-library and the "Ideas Cube" digital platform were created, providing access to thousands of educational and cultural materials, integrating online media literacy courses, and supporting users' work even with limited internet access, which was particularly important during wartime. Overall, these initiatives contributed to the formation of critical thinking, the development of digital skills and information literacy among various age groups, ensured access to quality educational resources and interactive platforms, and strengthened the role of libraries as modern educational and cultural centres in complex socio-economic conditions and during military conflict.

The study demonstrated that the integration of digital platforms into the work of Ukrainian libraries has transformed the format of educational service provision, enabling users of different ages to master skills for working with information resources, create their own content, and participate in remote learning events. Specifically, tools such as Diia. Digital Education, Canva, Google Workspace, Zoom, and Microsoft Teams enable librarians to effectively organise training sessions, manage learning groups, and adapt materials to the needs of visitors, while simultaneously enhancing their digital competencies and critical thinking. The analysis of international practices revealed that library development programmes functioning as digital education centres in various countries have contributed to enhancing citizens' competencies in the sphere of information and technological skills. In Ukraine, the Digital Education Hub network provided users with the opportunity to practise practical skills in using electronic services and platforms, which proved particularly beneficial for vulnerable population groups. In Finland, centralised electronic resources enabled citizens to effectively master the search, evaluation, and structuring of information, while in India, the activities of DEF extended digital learning to rural areas and supported people with disabilities in applying technologies for their daily and professional lives. Moldova and Romania implemented programmes that developed skills in using state electronic services and communication platforms, thereby facilitating interaction with administrative structures. In Nigeria, initiatives were aimed at teaching youth and women practical digital skills and entrepreneurial abilities. Thanks to such approaches, users acquired the capacity to effectively apply technologies, critically evaluate information, and organise their own learning, which established a stable foundation for integration into the modern information environment. Prospects for further research may include an algorithm for using artificial intelligence to personalise educational programmes in libraries, an analysis of the effectiveness of adaptive platforms for different age and social groups, and the modelling of scenarios for expanding access to online resources in small towns and rural communities.

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Бібліотеки як хаби цифрової грамотності на прикладі публічних бібліотек Києва, Львова та Харкова

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Анотація. Метою дослідження було вивчення ролі українських бібліотек у розвитку навичок використання цифрових технологій на основі міжнародного досвіду. Методологія дослідження включала системний аналіз діяльності українських бібліотек у Києві, Львові та Харкові, контент-аналіз цифрових платформ і інструментів, огляд міжнародних практик у Фінляндії, Індії, Молдові, Румунії та Нігерії, а також описово-аналітичний метод узагальнення програм і ініціатив з метою оцінювання ефективності інтеграції цифрових технологій у бібліотечну діяльність і формулювання рекомендацій. Основні результати дослідження засвідчили сучасний стан українських публічних бібліотек у Києві, Львові та Харкові та дали змогу встановити, що вони зазнали трансформації, еволюціонувавши від традиційних сховищ друкованих матеріалів до центрів цифрової освіти та інноваційної діяльності. Досліджено, що впровадження цифрових платформ, зокрема «Дія. Цифрова освіта», Google Workspace, Canva, електронних бібліотек і вебінарів, дало змогу користувачам різного віку підвищити рівень цифрових компетентностей та інформаційної грамотності. Зокрема, такі інструменти, як «Дія. Цифрова освіта», Canva, Google Workspace, Zoom, Microsoft Teams і чат-боти, допомагають бібліотекарям ефективно організовувати навчання, керувати навчальними групами та адаптувати матеріали для користувачів. Міжнародний досвід засвідчив, що програми розвитку бібліотек як центрів цифрової освіти у Фінляндії, Індії, Молдові, Румунії та Нігерії сприяли підвищенню рівня інформаційних і технологічних навичок громадян. Установлено, що в Україні мережа хабів цифрової освіти дала змогу вразливим групам населення опанувати практичні цифрові навички, тоді як централізовані ресурси у Фінляндії та програми в Індії забезпечили доступ до знань для широких верств населення, зокрема мешканців сільських територій та осіб з обмеженими можливостями. Отримані результати доводять, що технічне оновлення бібліотек і підготовка бібліотекарів як цифрових фасилітаторів сприятимуть підвищенню цифрової грамотності населення, інклюзивності освітніх послуг та розвитку навичок критичного мислення, забезпечуючи інтеграцію України у глобальний інформаційний простір. Рекомендації передбачають розширення мережі бібліотечних хабів, поєднання очного та дистанційного навчання, створення національної цифрової платформи та розроблення спеціалізованих курсів для соціально вразливих груп населення. Практичне значення дослідження полягає в тому, що його результати можуть бути використані бібліотекарями та менеджерами у сфері освіти для підвищення рівня цифрової грамотності

Ключові слова: цифрова компетентність; соціальна інклюзія; центри цифровізації; навчання; міжнародний досвід