

Digital Humanities in Education: Practices at Lviv Polytechnic National University*

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Abstract

The article examines the evolution of the Lviv educational and scientific school of library and information sciences, established at the department of Social Communications and Information Activities of Lviv Polytechnic National University, in the context of modernization processes within document-information and information-analytical institutions, as well as the penetration of digital technologies into administrative, socio-economic and humanitarian domains of society. The study explores the transformation of the content of the department's educational and scientific activities in 2000–2024, from a culture-centered concept of training specialists in Documentation and Information Activity – Information, Library and Archival Science (DIA–ILAS) to a digitally oriented concept, reflected in the following key identification priorities: focusing the educational and scientific process on Digital Humanities (DH) technologies; consolidating the potential of the academic community; engaging students in research activities; and developing international scientific and academic communication. The modernization policy in training specialists in ILAS requires the continuous updating of curricula, aligning them with the development of contemporary digital technologies, enhancing the quality and competitiveness of young professionals and approximating the content and quality of education to global standards. The positioning of Lviv Polytechnic as a leader in the training of young professionals in social communications and information activities is the outcome of 25 years of systematic efforts to harmonize educational and scientific directions of activity with the current demands of the education and labor markets. The evolutionary changes in the content of ILAS education at Lviv Polytechnic correspond to the major trends observed in leading universities worldwide.

Keywords

educational and scientific school, educational program, curriculum content, teaching activities, competencies, learning outcomes, digitalization, Digital Humanities, quality of education, academic mobility, scientific collaboration

1. Introduction

1.1. Relevance of the research

The integration of the documentation and information field into the digital world is under global influence and determined by several scientific, technical and technological factors: the spread of information and computer technologies across all intellectual domains of work (scientific, technical, administrative, economic and cultural); the proliferation of knowledge-intensive technologies; the application of artificial intelligence technologies; the growing importance of cybersecurity and protection of the information space.

The documentary subsystem of social communications, traditionally developed on the humanitarian methodological foundation of book studies, library science and bibliography, is undergoing new quantitative and qualitative transformations. In management, library and archival activities, the following realities of Digital Humanities (DH) are emerging: e-governance, electronic

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document management, digital archives, digitization of library and archival collections, human resource management, a higher level of unification and standardization of documents and the legal regulation of electronic documentation. The global use of digital technologies transforms documentation and information support across all spheres of social activity into a direct productive force.

1.2. Problem statement

The training of modern professionals within the context of DH is determined by objective processes of profound modernization in the activities of information-analytical structures, libraries and archives. Their role as scientific, information-analytical and educational centers is increasing, as they enable comprehensive and rapid use of information resources, conduct information retrieval through innovative technologies, systems and networks and integrate into the global scientific and educational space.

The growing importance of information in social life necessitates specialists with an information profile. Domestic educational and scientific schools, formed on different conceptual foundations, demonstrate both varied and similar understandings of the relevance of the information-analytical, information-technological and socio-communicative components in the professional profile of specialists.

2. Analysis of recent publication

Innovative research and generalizations of experience in the implementation of educational programs, the introduction of various concepts of curricula and teaching methods in Ukrainian universities, aligned with standards for different levels of higher education, constitute a priority theme of academic publications. The tasks of modernizing and harmonizing domestic educational programs with international experience have stimulated broad discussion within Ukraine's academic community on diverse theoretical, methodological and applied issues of organizing the educational process in the specialty 029 – "Information, Library and Archival Science" (ILAS). Processes of collecting, processing and preserving information on traditional paper media and in digital form, the creation of banks and databases within integrated information systems, management consulting and digital curation are becoming the technological foundation for shaping contemporary concepts of professional training [33]. The defining principle in establishing educational and scientific schools in documentation and information sciences is the unity of scientific and teaching activities within the academic and pedagogical environment of higher education. Identification parameters of such schools include the ability of the academic staff to: generate new scientific, educational and methodological knowledge in the field of training specialists in specific domains and qualification levels for systematic implementation in the educational process; create an atmosphere of scientific discourse within the professional field (e.g., organization of specialized conferences, publication of professional journals, student involvement in research); and integrate teams preparing specialists in non-traditional fields for their institution into formal and informal professional academic communication networks led by the heads of scientific-pedagogical schools [23].

Library and information education in Ukraine has undergone a long path of evolutionary development since the early 19th century, embodying the characteristic features and specificities of scientific, educational, political and industrial processes across different societal formations. Domestic educational and scientific schools are formed throughout all stages of their development: initial, organizational-structural, ideological-developmental, reorganizational, conceptual and modernization [22].

The Kharkiv State Academy of Culture, over nearly a century of its existence, has become a leading academic center, conducting innovative educational activities across diverse fields of knowledge and levels of higher education, carrying out fundamental and applied research,

disseminating scientific knowledge and playing a significant role in the introduction of modern information technologies into teaching [2]. At the Kyiv National University of Culture and Arts, library and information education has, over 50 years, undergone substantial development and transformation, strengthening past traditions while forming forward-looking concepts, methodologies and approaches to the training of library and information professionals modeled on the best global standards [32]. Educational and scientific schools implement new academic and teaching projects, start-ups and innovative, interactive forms of student engagement in a transformed educational environment, thereby enhancing high levels of professional competence.

3. Presentation of the main material

The Lviv Educational and Scientific School of Library and Information Sciences (LESS-LIS), established at the Lviv Polytechnic National University (NULP), has developed under the influence of theoretical and methodological concepts as well as practical achievements generated by the Kharkiv and Kyiv educational and scientific schools. LESS-LIS has undergone a 25-year trajectory of creative search for its identity, focus of educational programs and demand in the modern educational services market and labor market. Over the period of training young professionals in Library and Information Sciences at NULP, a number of educational, scientific, organizational, staffing and reputational achievements have been attained:

1. The creation of LESS-LIS was made possible by a creative team of scholars with substantial practical experience in libraries, research institutions, IT companies and information and administrative structures. At various stages of LESS-LIS's development, students were taught by specialists in information and technological disciplines; information and analytical disciplines. During the existence of the department of Social Communications and Information Activities (SCIA), faculty members defended two doctoral and thirteen candidate (PhD) dissertations. The vast majority of the staff possess doctoral degrees and academic titles (associate or full professor) [12].
2. The development of robust educational-methodological, staffing and material-technical support has provided the foundation for the successful implementation of a three-level system of training young professionals and scholars in the ILAS specialty: the first (bachelor's) level, the second (master's) level and the third (educational-scientific) level.
3. Comprehensive career guidance activities ensure an annual intake of applicants to the ILAS specialty through the SCIA educational program (for bachelor's level), the ILAS educational program (for master's level) and since 2023 – the ILAS educational-scientific program (for doctoral students). Over 25 years, more than 2,000 students have enrolled in Lviv Polytechnic to study LIS.
4. A complex and systematic approach to scientific research based on the approved departmental theme "Management of Social Communication Processes in the Global Information Space" provides in-depth study of the management of DH processes in the context of interdisciplinary issues spanning social communications, engineering, history, philology and physical-mathematical sciences. Within the Lviv Polytechnic ScienceLP information system, the department's research output (since 2017) includes: 71 monographs (or monograph chapters), 52 textbooks and teaching manuals and 895 scholarly articles in periodicals, including 106 indexed in Scopus and Web of Science [14].
5. The recognition and integrity of the Lviv Polytechnic brand in training ILAS specialists through existing educational programs enables the SCIA graduating department to consistently hold high-ranking positions among nearly 100 graduating departments at the university.

Within the educational and scientific activities of LESS-LIS in ILAS, the following priority directions have been defined:

- focusing the educational and scientific process on DH technologies and a digital orientation of training content based on a competency-based approach;
- consolidating the potential of the scholarly community in the field of DH;
- engaging students in research activities in DH;
- fostering international academic and research communication in DH.

3.1. Direction 1. Focusing educational programs in LIS at Lviv Polytechnic on DH technologies

In the early 2000s, the rapid development of automation in documentation processes created the need for training specialists in automated library systems at specialized universities and for opening a new training program, 6.020105 “Documentation and Information Activities” (DIA). This significantly expanded the scope of young professionals trained for the information field and diversified their qualifications according to labor market needs. Training in DIA began in the context of unresolved organizational, theoretical and methodological issues, which had an objective character:

1. Lack of normative definition at the state level of the curriculum content concerning the generalized object of professional activity and requirements for graduates’ mastery of specific theoretical knowledge and practical skills.
2. Adaptation of theoretical foundations from traditional librarianship and archival science, along with established routine library and archival practices, to the realities and demands of the information society. The specialty was interpreted as a field requiring a high degree of universality of knowledge, which led to the inclusion of numerous non-specialized disciplines in curricula during the initial years of training.
3. The emergence of contradictions between culturally centered and information-technological interpretations by scholars and practitioners regarding the social mission and functions of institutions and structures within the documentation sphere, as well as their practical implementation under conditions of global informatization.
4. Weak coordination of educational activities among graduating departments in domestic and foreign universities.

Under such conditions, higher education institutions developed their own concepts of educational content in documentation and information. At Lviv Polytechnic, the evolutionary transformation of the culturally centered concept toward DH, influenced by information technologies, proceeded through several stages, defined by key criteria: organizational and material-technical changes in the educational and scientific process; and the evolution of curriculum content through changes in the balance of information-technological, information-analytical and socio-communicative disciplines relative to other educational components.

3.1.1. Stage 1. The formation of the DIA program at Lviv Polytechnic (2000–2011)

The introduction in 1994 of specialist training in DIA at the Kharkiv State Institute of Culture rapidly spread to other higher education institutions (HEIs) of Ukraine, including technical universities. In the 1998–1999 academic year, the Scientific and Methodological Commission of the Ministry of Education and Science of Ukraine granted the Lviv Polytechnic State University a state license to provide educational services in the field of DIA, which initiated the development of an educational and scientific school of document studies with a strong IT [3]. Lviv Polytechnic thus became one of the first universities in Ukraine to train specialists in this profile. The demand for a new generation of professionals in library and information sciences, along with the growing

Ukrainian information market, formed the basis of the concept of educational content for specialists in DIA [20].

At Lviv Polytechnic, training in DIA began in the 2000–2001 academic year at the graduating department of the History of Ukraine, Science and Technology and later at the department of History, Theory and Practice of Culture (Section of Documentation and Information Activities). On a parity basis, the department of Information Systems and Networks of the Institute of Computer Science and Information Technologies provided teaching of computer and information-oriented courses, which constituted a significant share of the curriculum [20].

The first stage of DIA training at Lviv Polytechnic was marked by organizational and methodological challenges, primarily due to the absence of a specialized department, namely: difficulties in improving and focusing the educational concept, building an educational and scientific school and forming an educational tradition in documentation and information support for institutional activities. The broad interpretation of educational content led to an unreasonably high share of non-specialized disciplines across all sections of the curriculum, both mandatory and elective.

At the same time, owing to the long-standing and productive experience of DIA training at the department of History, Theory and Practice of Culture, in close cooperation with the department of Information Systems and Networks, the scientific, educational and practical characteristics of the new specialty's curriculum began to take shape. Their developed concept laid the foundations for understanding DIA as an integrated type of professional activity, organically combining the documentary sphere with information and computer technologies. The educational content was aligned with the trends of information-analytical, computer and socio-communicative sciences, while also oriented toward global practices in LIS education.

During these years, a system of tiered training was developed: beginning in 2004, students who obtained a bachelor's degree in DIA had the opportunity to continue and obtain a specialist's degree. The focus on organically combining document, information and computer disciplines, the high quality of graduate preparation and Lviv Polytechnic's strong position in the educational and labor markets ensured consistently high enrollment.

Graduates of Lviv Polytechnic acquired theoretical knowledge and practical skills in applying search technologies in information resources, databases and the Internet; organizing and analyzing information; providing analytical services; creating new information products; and delivering diverse information-analytical services [20].

The implementation of Lviv Polytechnic's educational content concept ensured broad institutional diversity of graduate employment across all spheres of public life. Employers included organizations, institutions and enterprises of both state and private ownership, spanning various sectors, as well as government agencies, local self-government bodies and institutions of science, education, culture and healthcare.

The experience of training professionals and the universality of their employment confirmed that the segment of documentation and information-analytical support for management activities was in demand within the social division of labor and held strong prospects for development. The social significance of this specialty lies in the acquisition by students of competencies that open opportunities for professional and social adaptation to the diverse needs of the labor market and for meeting societal demand for highly qualified specialists in documentation, business communication and information-analytical support for managing enterprises, organizations and institutions.

3.1.2. Stage 2. Modernization of the educational content in LIS (2011–2018)

The necessity to develop a strategy for the modernization and development of DIA educational content and later of the ILAS specialty, was driven by a complex of organizational, educational, scientific and social preconditions:

1. A powerful impetus for the development of LESS-LIS was the establishment in August 2011 at the Lviv Polytechnic National University of a specialized graduating department of Social Communications and Information Activities (SCIA). It was formed by bringing together lecturers of specialized disciplines from the department of History, Theory and Practice of Culture and the department of Information Systems and Networks. The SCIA department was headed by Professor A. Peleshchyshyn, Doctor of Technical Sciences, who was among the first scholars in Ukraine to research the positioning and functioning of WWW technologies in the global information space [1]. Based on the accumulated experience of curriculum evolution and educational practices at Lviv Polytechnic, as well as at Kharkiv State Academy of Culture, Kyiv National University of Culture and Arts and other Ukrainian universities and academies and during the period when Professor A. Peleshchyshyn chaired the Scientific and Methodological Commission on Culture and Arts (sub-commission “Information, Library and Archival Studies” of the Higher Education Council at the Ministry of Education and Science of Ukraine), Ukraine for the first time developed and approved higher education standards in specialty 029 “Information, Library and Archival Studies” at the bachelor’s, master’s and doctoral levels.
2. The normative codification in 2016 of specialty 029 “Information, Library and Archival Studies” in the field of knowledge 02 “Culture and Arts” clarified the objects of the subject area (activities of libraries, archives, documentation and information structures of institutions). Their core social functions include the creation, dissemination, accumulation, preservation, archiving and provision of access to information and knowledge in any format; as well as the study of theories, processes, technologies and standards intended to facilitate the formation, management and use of institutional information resources [6][7][8].
3. The adoption of national regulatory acts in the field of education – the state standards of higher education in specialty 029 “Information, Library and Archival Studies” in the field of knowledge 02 “Culture and Arts” – established:
 - state requirements for students’ educational attainment and guarantees of their achievement;
 - the official introduction of the competency-based approach as a system of interrelated competencies to be acquired by learners, leading to program outcomes in knowledge, skills and communication and professional qualities;
 - prerequisites for the development of diversification and specialization of educational programs;
 - growth of professional communication and collaboration between the academic and professional communities;
 - alignment of educational content and quality with international standards.
4. The need to improve the quality of graduate training to enhance the prestige of the ILAS specialty and to ensure its competitiveness relative to other specialties and cross-sectoral educational structures. This trend strengthened year by year. According to the OSVITA.UA information resource, in 2024 sixteen western universities in Ukraine announced admissions to ILAS bachelor’s [4] and master’s [5] programs (in Ivano-Frankivsk, Dubno, Lutsk, Lviv, Mukachevo, Ostroh, Rivne, Ternopil, Uzhhorod), including four universities in Lviv (Lviv Polytechnic National University, Ukrainian National Forestry University, Ivan Franko National University of Lviv and the Ukrainian Academy of Printing).

Between 2011–2018, the SCIA department implemented a strategy for modernizing and improving DIA (and later ILAS) educational content, which involved the following tasks:

- updating and focusing the curriculum on trending, creative courses in computer, information and socio-communicative technologies demanded by the labor market;
- aligning educational content with the practical information needs of the business sector;
- synchronizing educational content with the development of modern digital technologies;
- directing bachelor's and master's qualification works toward applied projects in institutional informatization;
- organizing students' educational and research activities as individual trajectories of professional formation through a mix of compulsory and elective courses.

Adhering to these educational positions provided strong momentum for the development of departmental educational activities, improving the quality and competitiveness of young specialists and aligning curricula with international standards. In 2012, NULP received a license to provide master's level training in DIA. In 2014, the specialist-level program was discontinued.

The updating of courses lay at the heart of curriculum modernization and instructional organization. A diachronic analysis of the curriculum revealed the scope of SCIA faculty's efforts to radically transform educational content: of the 70 courses included in the 2008 bachelor's curriculum, only 25 remained in the 2018 curriculum, with the rest eliminated. Thus, in implementing its modernization concept, SCIA department introduced 45 new courses (64%) and updated 25 transitional ones (see Table 1).

Table 1

Dynamics of curriculum updates in the ILAS specialty for the bachelor's degree (study plan for the 2018 intake)

Course title	Continuing courses	New courses
Mandatory Courses		
General Education Cycle	12	4
Professional Training Cycle	7	17
Elective Specialized Courses		
Block 01 "Information Activity"	3	7
Block 02 "Management of Documentation Processes"	2	8
Block 03 "Library and Archival Studies"	1	9

The student-centered principle of organizing the educational process is manifested in the opportunity for learners to design individual educational trajectories by selecting relevant, primarily new, professional courses within elective blocks: "Information Activity," "Management of Documentation Processes," "Library and Archival Studies". The completion of coursework with a practical orientation in eight core and elective disciplines is regarded as a preparatory stage for writing bachelor's and master's qualification theses.

The department is equipped with four specialized computer laboratories, where students can carry out laboratory assignments and independent work at a convenient time. The laboratories are furnished with licensed software aimed at achieving the intended learning outcomes of the educational programs. Students acquire specialized competencies in all areas of focus (information and analytical, information and technological and social and communication) through the use of a range of technologies and tools: operating environment (Windows); web technologies (HTML, Bubble); databases (MySQL, Microsoft Access); graphic tools (GIMP, Inkscape, Canva); content management systems (Drupal, WordPress, Joomla); electronic document management system (Alfresco); programming languages (VBA); cloud services (Office 365 and Google Workspace).

At this stage, the SCIA department is actively building its reputation by providing modern and competitive training for Bachelor's and Master's degree seekers, applying creative approaches to curriculum design and widely incorporating computer technologies in the learning process.

3.1.3. Stage 3. Training higher education students under the educational program “Social Communications and Information Activity” in the context of DH (2019–2024)

The diversification of the ILAS specialty at Lviv Polytechnic through the introduction of the bachelor's program “Social Communications and Information Activity” (2019), the master's program “Information, Library and Archival Studies” (2019) and the doctoral program “Information, Library and Archival Studies” (2023) within the framework of DH is driven by the recognition of the relevance, social significance and demand for young professionals in the labor market who are proficient in information and socio-communication technologies. At the same time, the importance of developing a positive image of the educational programs, their prestige and priority among students, as well as the competitiveness of Lviv Polytechnic in the educational services market of Ukraine, remains a priority.

The introduction of these programs is grounded in the fundamental principles of Lviv Polytechnic's long-standing activity in training specialists in LIS:

1. The scientific potential, educational and methodological resources and material and technical support extend beyond the domain of library and archival studies, even considering the informatization processes in these fields. Research activities, student academic and scientific work (doctoral dissertations, master's and bachelor's theses, coursework) are directly related to the creation, positioning and identification of digital information, as well as the use of infocommunication technologies.
2. Admission campaign results demonstrate the popularity and demand for an educational program model with innovative content that reflects trends in the development of information and communication processes and the universalization of communicative interaction in the global information space across all areas of social life.

The scale of transformations in scientific and educational activity testifies to the implementation of a unified educational concept that may be defined as “Education and Science in the Context of Digital Humanities”. Its purpose is to orient the content of ILAS education toward equipping students with theoretical knowledge and practical skills for the effective application of modern infocommunication technologies in traditionally humanitarian and socio-cultural domains of public life. The digitalization of the entire life cycle of documents and information (creation, collection, acquisition, storage, use, dissemination) neutralizes the perception of ILAS as a purely humanitarian field and marks the integration of library and archival studies into the domain of DH.

The SCIA department consolidates its scientific and creative potential to address strategic objectives for implementing the educational concept of training specialists in the context of DH and ensuring the quality of education by:

- synchronizing curriculum content with the development of digital technologies;
- aligning program competencies and learning outcomes with academic disciplines;
- orienting educational content toward creative approaches and innovative solutions in studying digital technologies;
- establishing professional communication with academic and professional communities of foreign universities (through participation in international scientific and educational projects, as well as fostering academic mobility of faculty and students);
- integrating global experience into teaching and research activities;

- utilizing computer technologies and licensed software in the educational process;
- ensuring adequate material and technical conditions and social infrastructure.

Synchronization of curriculum content with the development of digital technologies (based on the 2023 bachelor's program). The development of an educational-scientific school with a clear digital orientation is evidenced by the fact that 58% of mandatory courses and 60% of elective courses (across three blocks) in the Bachelor's program directly address information-technological and information-analytical issues. Among the mandatory courses are: "No-Code Programming," "Computer Technologies for Information Processing," "Analytics of Digital Scholarly Services," "Digital Marketing," "Corporate Computer Networks and Services," "Technologies of Electronic Libraries and Archives," "Applied Computer Technologies," "Information Management," "E-Government Services," "Database Design," "Information Support for Startups." Elective courses include: "Website Development," "Multimedia Support of Information Activity," "Social Communications on the Internet," "Project Management," "Marketing of Information Products and Services," "Electronic Document Management," "Business Strategies in Social Networks," "Web Analytics in Media Projects," "Technologies of Archiving and Information Preservation," "Analytics of Information Needs," "Electronic Cataloging," "Projects in Library and Archival Activities."

Students prepare coursework in both mandatory and elective disciplines such as "Corporate Computer Networks and Services," "Modern Software," "Applied Computer Technologies," "Information Retrieval Technologies," "Social Communications on the Internet," "Electronic Document Management."

The study of digital transformations in the curriculum of the SCIA department, based on a content analysis of bachelor's and master's theses defended during 2021–2024, highlights the prevalence of the following thematic areas: development of electronic resources using computer and information technologies – 31% and 21% respectively; examination of theoretical aspects of information technology implementation – 26% and 40%; implementation of scientific, commercial and social projects in social networks – 24% and 21%.

Alignment of competencies and academic disciplines. We interpret the alignment of curriculum content as a proportional temporal and thematic correspondence of competencies and learning outcomes with academic disciplines, interconnected according to a structural-logical scheme. The alignment of curriculum content demonstrates compliance with the declared higher education standards for the ILAS specialty and with the educational program, ensuring the consistency of competencies and learning outcomes with the disciplines through the formation of knowledge, skills, as well as communicative and professional qualities of young specialists [18].

To assess the alignment of curriculum content, we define criteria such as the correlation of the thematic structure of competencies with the thematic orientation of courses and with the quantitative distribution of disciplines (see Table 2).

Taking into account the dominant elements in the semantic structure of competencies, general competencies (responsible for shaping students' worldview, civic positions and mindset) are supported by cognitive and social sciences, philological and linguistic and legal disciplines. Specialized competencies are grouped into the following segments:

- institutional and informational competencies, supported by courses in information-analytical activity, management and library/archival studies;
- digital transformation competencies, ensured by courses in digital technologies, IT implementation and innovation activity;
- information and communication competencies, developed through courses in socio-communication activity, documentary communication and information culture and security.

Table 2

Structuring of competencies and their correlation with disciplines in the ILAS bachelor's program (educational program 2023)

Type of competencies (according to the standard) [6]	Thematic structure of competencies	Thematic structure of disciplines	Number of courses
Integral competence	General competencies	Worldview competencies	Cognitive, social sciences
			Philological and linguistic disciplines
			Legal disciplines
			Information-analytical disciplines
			Management disciplines
	Specialized competencies	Institutional and informational competencies	Library and archival studies disciplines
			Disciplines in digital technologies
			Disciplines on IT implementation
			Innovation-related disciplines
			Disciplines in socio-communication activity
		Information and communication competencies	Disciplines in documentary communication

The analysis of competency structuring, which generalizes the curriculum content of the SCIA educational program, demonstrates a balanced and multidimensional orientation, as well as an optimal quantitative distribution of mandatory and elective courses within all thematic segments of competencies. Fluctuations in quantitative indicators are determined by the significance of particular disciplines for shaping the professionalism of young specialists. In the first year, courses that foster worldview, critical thinking and civic mentality are emphasized, while in senior years, information-analytical and technological courses dominate, forming the core professional knowledge and skills.

Focus on creative approaches and innovative solutions in the study of digital technologies. The orientation of curriculum content toward creative approaches and innovative solutions in the study of digital technologies is reflected in various forms of educational and research activity at the SCIA department. The hybrid nature of program competencies and learning outcomes enables the development of a unique focus within educational programs, expands the demand and opportunities for implementing the principles of DH and promotes the introduction of interdisciplinary forms of mastering educational material [21].

An example of the continuous search for innovative educational practices and program renewal is Lviv Polytechnic's participation in the nationwide internship course "Product IT Management", developed by the IT company Genesis on an LMS platform with the support of the Ministry of Digital Transformation and the Ministry of Education and Science of Ukraine [17].

An important component of practical training under the ILAS educational program is cooperation with employers. Students have the opportunity to test their theoretical knowledge during internships related to the topics of bachelor's and master's theses directly in state and local government bodies, IT companies, enterprises of large and small businesses, libraries, archives, museums, social institutions (health care, education and science, social welfare), the Armed Forces of Ukraine and law enforcement agencies (the Ministry of Internal Affairs, the Security Service of Ukraine, courts, prosecution and legal practice).

The emphasis of the educational process on studying digital technologies ensures significant success in student recruitment for the ILAS specialty (see Figure 1).

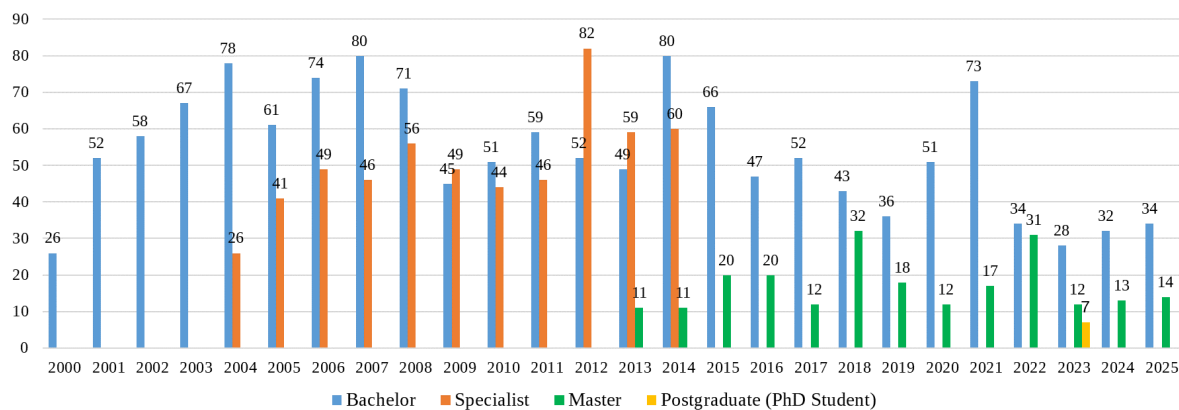


Figure 1: Number of applicants admitted to the DID-ILAS program at the levels of bachelor's, specialist and master's degrees (2000–2025).

The competitive standing of Lviv Polytechnic determines the positive dynamics of enrollment in the ILAS program not only from the west of Ukraine but also from other regions of the country. Between 2000 and 2025, a total of 2,187 applicants were admitted to study at three levels in ILAS at Lviv Polytechnic National University.

Graduates of the department are capable of applying modern information, information-analytical and socio-communicative technologies; they possess the knowledge, skills and creative potential necessary for successful employment in institutions of the humanitarian, social and business spheres; and they are able to adapt to dynamic activities within the global information space. Training specialists with such program learning outcomes is particularly relevant for the modernization of information structures, libraries and archives, which are currently experiencing a significant crisis due to the deactualization of certain traditional functions. Comprehensive theoretical and practical preparation opens opportunities for employment in diverse sectors of the real economy, including positions such as information analyst, IT analyst, SMM manager, web community administrator, streamer, PR manager, HR manager, category manager, development manager, business analyst, web designer, web developer, copywriter, library and archive manager, electronic document management system administrator and document management specialist in public administration. The knowledge and practical skills acquired during studies enable graduates to realize their creative potential, express their civic stance and self-actualize as creative personalities in social media. The practice-oriented nature of training is a defining feature of student preparation. Professional internships in real institutions involve examining the information and documentation support of their activities and developing projects for implementation.

3.2. Direction 2. Consolidation of the scientific community's potential in the field of DH

The consolidation of the professional scientific community's potential in Ukraine and abroad in the ILAS field finds clear expression in the organization of international academic events. In line with this objective, the annual International Scientific Conference on Information, Communication, Society (ICS) has been held since 2012, organized by the SCIA department at Lviv Polytechnic National University. Since 2021, the department of Information Systems Management at Vasyl' Stus Donetsk National University has also been a co-organizer [15].

The aim of this academic event is to consolidate the potential of scholars investigating the functioning of verbal and non-verbal information in diverse systems of social communication in order to influence society at intra-personal, interpersonal, intergroup, interethnic and global levels. This strategic intention has been consistently reflected in the thematic focus of the conference, which has remained virtually unchanged from its inception to the present (see Table 3).

Table 3
Thematic focus of the ICS Conference (2012–2024)

Topics of presentations	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Technologies of social communications in the Internet and World Wide Web	+	+	+	+	+	+	+	+	+	+	+	+	
Security of the state's information space				+	+	+	+	+	+	+	+	+	
Library, archival and museum activities in the context of information society development	+	+	+	+	+	+	+	+	+	+	+	+	+
Records management and information activity in the system of modern scientific research	+	+	+	+	+	+	+	+	+	+	+	+	+
E-democracy and e-governance	+	+	+	+	+	+	+	+	+	+	+	+	+
Linguistic technologies of information activity	+	+	+	+	+	+	+	+	+	+	+	+	+
Psychological and pedagogical components of records and information activity	+	+	+	+	+	+	+	+	+	+	+	+	+
Social communications				+	+	+	+	+	+	+	+	+	+
Information management technologies and intelligent data processing	+	+	+	+	+	+	+	+	+	+	+		
Problems of marketing information products and services		+	+										
Technological aspects of information activity and social communications				+									
Information and communication technologies in online social environments													+
Artificial intelligence systems and machine learning													+
Cybersecurity and security of the state's information space													+
Information management technologies (updated focus)													+

The fundamental areas that broadly reveal the essence of ILAS and related specialties include: “Technologies of social communications in the Internet and World Wide Web” (with the updated focus on “Information and communication technologies in online social environments”), “Library, archival and museum activities in the context of information society development,” “Records management and information activity in the system of modern scientific research,” “E-democracy and e-governance,” and “Information management technologies and intelligent data processing” (with the updated focus on “Information management technologies”).

Graduates of the department professionally realize themselves in the field of mass communication, which is undergoing profound transformational changes. The multi-level and multifunctional nature of media convergence manifests itself on three levels: informational,

technological (the convergence and combination of different communication channels, the emergence of new types of media and social networks created through the integration of technological platforms of different media) and communicative (the appearance of information products whose content is transmitted through channels with different technological bases) [19]. In view of the global trend of convergence of traditional and new media, as well as the active use of special technologies with targeted application of linguistic tools for message creation, mediation, positioning, dissemination, promotion of ideas and influencing public opinion, the following conference topics have become particularly relevant: “Social communications,” “Linguistic technologies of information activity,” and “Psychological and pedagogical components of records and information activity.”

The realities of martial law and active confrontation in the information space using information technologies highlight the importance of the topics “Security of the state’s information space” (with the updated focus on “Cybersecurity and security of the state’s information space”) and “Artificial intelligence systems and machine learning.” Episodically, the following areas have also appeared: “Problems of marketing information products and services” and “Technological aspects of information activity and social communications.”

An analysis of the thematic distribution of conference presentations demonstrates significant variation in topic representation, which is determined by the varying degrees of relevance to the core issues of the ILAS specialty (see Table 4).

Table 4

Thematic distribution of papers presented at ICS conferences (2012–2024)

Thematic areas	Number of papers
Information and communication technologies in online social environments	379
Records management and information activity in the system of modern scientific research	222
Social communications	219
Information management technologies and intelligent data processing	191
Library, archival and museum activities in the context of information society development	177
E-democracy and e-governance	117
Psychological and pedagogical components of records and information activity	96
Linguistic technologies of information activity	91
Cybersecurity and security of the state’s information space	58
Problems of marketing information products and services	25
Artificial intelligence systems and machine learning	13
Technological aspects of information activity and social communications	6
Total	1,594

It is indicative that the highest levels of representativeness were achieved by those areas defined as leading within the curriculum of the educational program “Social Communications and Information Activity”: “Information and Communication Technologies in Online Social Environments” – 379 papers, “Records Management and Information Activity in the System of Modern Scientific Research” – 222 papers and “Social Communications” – 219 papers.

The temporal distribution of papers demonstrates a stable interest in the topics of the international conference, although a natural decline has recently been observed, particularly during the COVID-19 pandemic (see Figure 2).

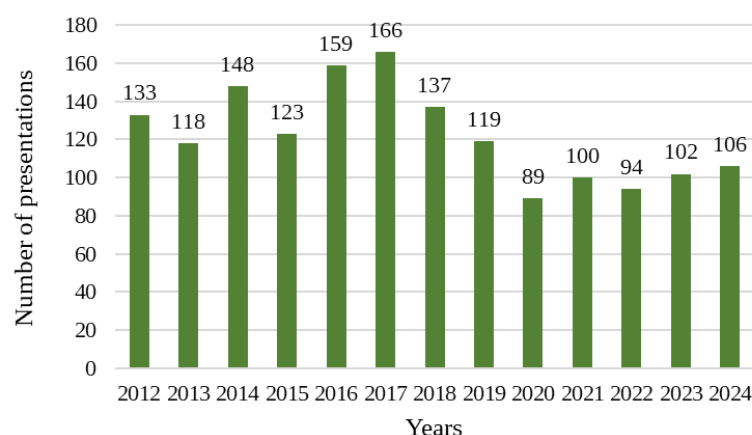


Figure 2: Temporal distribution of presentations delivered at the ICS Conference.

A notable feature of the ICS Conference is the preparation of several papers by authors in co-authorship with faculty members and students. Therefore, relevant aspects of evaluating the effectiveness of the international conference include:

- the number of conference participants (regardless of the number of papers submitted);
- the productivity of participants' institutional affiliations;
- the institutional structure of authors' affiliations.

The international event consolidates a wide range of the scholarly and professional community, as evidenced by the relatively stable body of conference participants—researchers in library and information sciences. Between 2012 and 2024, 2,084 domestic and foreign researchers, professionals and students took part in the ICS Conference (see Table 5).

Table 5

Temporal distribution of authorship at the ICS Conference (regardless of the number of submitted papers)

Year	LPNU faculty (excluding SCIA department)	SCIA department faculty	SCIA department students	Faculty of other HEIs	Foreign faculty	Total
2012	38	18	42	77	2	177
2013	34	18	57	42	10	161
2014	55	20	51	73	2	201
2015	23	15	57	60	2	157
2016	34	21	88	69	2	214
2017	45	20	69	77	7	218
2018	27	20	66	63	4	180
2019	20	17	56	65	1	159
2020	19	18	43	40	3	123
2021	21	15	25	38	2	101
2022	12	18	56	28	6	120
2023	10	25	55	36	5	131
2024	14	21	57	45	5	142
Total	352	246	722	713	51	2084

Among the participants, the main categories include faculty members and students of Lviv Polytechnic, faculty of other universities, professionals from research institutions, governmental and local authorities, as well as business representatives, and foreign participants (see Figure 3).

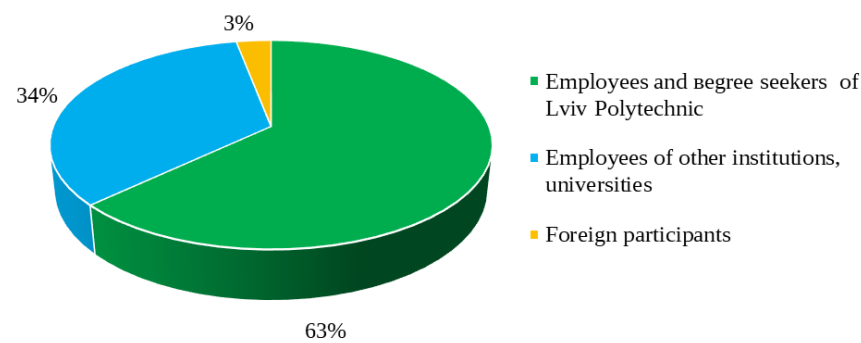


Figure 3: Structure of participants of the ICS Conference (2012–2024).

Researchers who submitted two or more co-authored papers to the conference are predominantly affiliated with Lviv Polytechnic. The productivity of participants’ institutional affiliations is reflected in the overall number of individuals who prepared papers, both single-authored and co-authored. The differentiation of Lviv Polytechnic contributors into such categories as Lviv Polytechnic faculty (excluding the SCIA department), SCIA department faculty and SCIA department students demonstrates a nearly consistent temporal distribution of author affiliations with the university across all categories (with minor deviations of an objective nature) (see Table 6).

Table 6
Temporal dynamics of author affiliations with the ICS Conference, faculty and students of Lviv Polytechnic (including number of submitted papers)

Year	LPNU faculty (excluding SCIA department)	SCIA department faculty	SCIA department students	Total
2012	41	43	47	131
2013	39	57	58	154
2014	70	56	55	181
2015	26	63	57	146
2016	35	91	89	215
2017	53	87	71	211
2018	29	77	66	172
2019	23	62	58	143
2020	19	53	43	115
2021	30	37	25	92
2022	16	60	56	132
2023	12	47	57	116
2024	18	61	57	136
Total	411	794	739	1944

The structure of author affiliations reflects the broad societal functions, sectoral diversity and geographical scope of institutions involved in this scientific collaboration (see Figure 4).

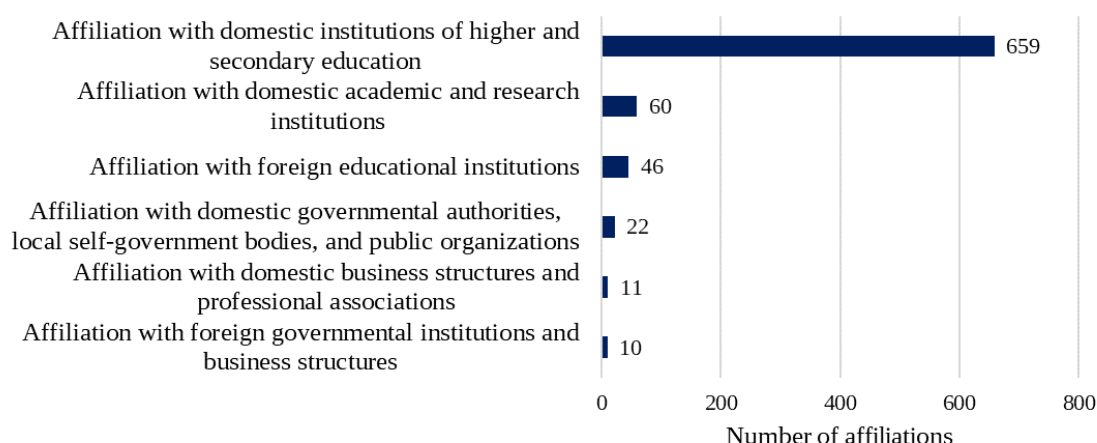


Figure 4: Institutional structure of author affiliations (including number of submitted papers).

The regional distribution of institutions represented at the ICS Conference underscores the event's strong consolidating potential, uniting academic schools and facilitating a broad dialogue among professionals (see Figure 5).

Scholars from 85 domestic universities, academies and colleges across all regions of Ukraine have participated in discussions on the full spectrum of issues relevant to the ILAS specialty, as well as related disciplines.

Among the institutions demonstrating the highest number of affiliations are the National Aviation University (86 affiliations), Ivano-Frankivsk National Technical University of Oil and Gas, Khmelnytskyi National University (36 each), Taras Shevchenko National University of Kyiv (34), Ukrainian Academy of Printing (32), Ivan Franko National University of Lviv (31), Cherkasy State Technological University (23), National Academy of Managerial Staff of Culture and Arts (22), Central Ukrainian National Technical University (20), Vasyl' Stus Donetsk National University, National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute" (19 each), Odesa Polytechnic National University (18) and Kyiv National University of Culture and Arts (14).



Figure 5: Regional distribution of institutions – participants of the the ICS Conference.

The integration of theoretical and practical perspectives is reflected in the conference contributions of researchers representing leading national libraries: the Vernadsky National

Library of Ukraine and the Yaroslav Mudryi National Library of Ukraine (11 affiliations each), the Stefanyk Lviv National Scientific Library of Ukraine (4), the Lviv Scientific and Practical Center for Vocational Education of the National Academy of Pedagogical Sciences of Ukraine (3) and the Scientific Library of the Petro Vasylenko National Technical University of Agriculture (2).

Academic and research institutions also contribute to shaping the brand not only of the ILAS specialty but also of the conference itself. Among them are the Ukrainian Research Institute of Archival Affairs and Records Management (3 affiliations), the Institute of Software Systems of the National Academy of Sciences of Ukraine (14), the Rylsky Institute of Art Studies, Folklore and Ethnology (6), the National Center for Space Control and Testing, the Ukrainian State Research Institute “Resurs,” the Koretsky Institute of State and Law, the Institute of the Gifted Child of the National Academy of Pedagogical Sciences of Ukraine, the Institute of Condensed Matter Physics and the Skovoroda Institute of Philosophy of the NAS of Ukraine (1 each).

3.3. Direction 3. Involving students in DH research

The engagement of undergraduate, master’s and doctoral students of the ILAS specialty at the SCIA department in research activities is an important manifestation of the student-centered policy adopted at Lviv Polytechnic. In addition to various forms of student research activity provided for in the educational programs and curricula of the ILAS specialty, participation in the ICS Conference serves as an additional source and means for students to gain experience in scholarly inquiry and public presentation. More than 40% of papers at the ICS Conference are prepared by SCIA department students (see Figure 6).

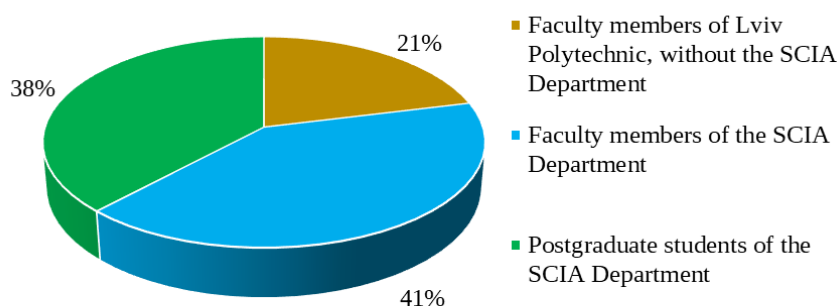


Figure 6: Distribution of publication activity of Lviv Polytechnic staff and students at the ICS Conference (including number of submitted papers).

By generalizing the best outcomes of their scholarly explorations, obtained during the preparation of term papers, bachelor’s and master’s theses, students acquire experience in overcoming informational, psychological and emotional barriers, which subsequently find application and development in various spheres of their professional activity.

3.4. Direction 4. International scientific and academic communication in DH

A defining requirement of a modern research school is the development of extensive international scientific and academic communication. The Lviv Educational and Scientific School of Library and Information Sciences (LESS-LIS) realizes its potential for international cooperation in several directions:

- ensuring academic mobility of faculty and students;
- engaging foreign partners in international scientific events organized by the SCIA department;

- participation in international educational and research programs.

An essential component of international academic mobility is student participation in ERASMUS programs, faculty internships at foreign educational and research institutions, as well as involvement in visiting professor and guest lecturer programs.

In accordance with established cooperation agreements, a prominent foreign partner is Maria Curie-Skłodowska University in Lublin (Poland). Faculty of the SCIA department undertake internships there, participate reciprocally in visiting professor and guest lecturer programs and contribute to international scientific conferences and the publication of scholarly monographs.

At Lviv Polytechnic, completion of an international internship program is a mandatory prerequisite for participation in competitions for academic positions. For several consecutive years, students pursuing the ILAS specialty at the SCIA department have studied at the University of Salamanca (Spain) within the framework of the ERASMUS program.

The SCIA department actively utilizes the conference platform of the International ICS Conference to foster scientific and academic ties with researchers from foreign educational, research and professional institutions, among them: the University of Tehran (Iran), University of Zagreb (Croatia), Pontifical University of John Paul II in Kraków (Poland), University of Łódź (Poland), University of Warsaw (Poland), Academy of Economic Studies in Bucharest (Romania), University of Bordeaux (France), Shaqra University, Quwiyah College (Saudi Arabia), Peter Schnabl School for Continuing and Further Education Munich (Germany), MacEwan University, Edmonton (Canada), Østfold University College, Halden (Norway), Albert-Ludwigs University of Freiburg (Germany) and the State Archives of North Rhine-Westphalia (Germany). Of particular note are colleagues from Maria Curie-Skłodowska University in Lublin, who presented papers with 27 affiliations to their institution.

Between 2022 and 2024, in the context of studying and applying DH technologies, the SCIA department organized three international workshops on Social Communication and Information Activity in DH (SCIA) [9], the most recent of which was held jointly with Polish colleagues from the department of Informatology, Bibliology and Media Education at Maria Curie-Skłodowska University in Lublin [11]. The proceedings of all SCIA workshops are indexed in the Scopus citation database and the dblp computer science bibliography [16].

This international event opens pathways for strengthening and expanding international research collaboration, applying best practices of scholarly cooperation and fostering interdisciplinary dialogue on DH and social communication.

The experience of SCIA-2022 and SCIA-2023 made it possible to conceptualize the thematic landscape of research in DH [26][27]. Within SCIA-2024, research efforts focused on six key directions: digitization of historical and cultural objects; applied linguistics in DH practices; data visualization, image processing and media design; social media and information behavior; open science, open data and scholarly digital resources; digital pedagogy and media education [28]. The workshop adopted a hybrid format, enabling both in-person presentations at Lviv Polytechnic and online participation from other regions and countries. Live interactions facilitated informal exchange of ideas and practical experience, as well as open discussions among participants.

The thematic distribution of contributions shows that research on social networks and information behavior is the most popular, comprising 39% of submitted papers. Sustained interest is also observed in applied linguistics in DH practices (22%), digitization of historical and cultural objects (11%) and open science, open data and scholarly digital resources (11%) [29].

The prevalence of terms related to social media, online media, institutions of social memory and discourse analysis underscores the role of social media in shaping collective memory and influencing cultural discourses. Discussions on media culture highlight the complex interconnections between information technologies and social change. The prominence of keywords linked to 3D modeling, virtual reality, photogrammetry and machine learning points to contemporary approaches in studying and preserving cultural artifacts. These technologies enable

the creation of new interactive resources that enhance user awareness and engagement with cultural heritage.

The appearance of terms such as Ukrainian diaspora, Ukrainian Canadians, cultural heritage preservation and national and cultural achievements indicates a growing interest in Ukrainian culture and its representation abroad. This underscores the importance of virtual exhibitions and interactive maps that showcase the achievements of Ukrainian studies. Keywords such as elections, e-voting and democracy highlight the relevance of issues related to electoral processes and the critical importance of information security in the face of threats such as cyberattacks and DDoS attacks.

The increasing number of keywords associated with technical universities, gamification, user needs and mentoring support reflects trends in the development of educational technologies for training future specialists in the information field. The presence of terms related to the needs of people with disabilities, user awareness and motivation emphasizes the importance of adapting information resources to the needs of diverse population groups, which is a key aspect of the modern information society [29].

The SCIA-2024 workshop brought together researchers from Ukraine, Poland, Georgia, Germany, the Netherlands, Kazakhstan, Canada, France, Slovakia and Norway, underscoring its role in fostering international dialogue in the field of DH.

Analysis of foreign authors' participation over the last three years reveals noticeable trends. In SCIA-2022, the share of foreign authors was 14%, which decreased to 13% in SCIA-2023, indicating challenges in maintaining international collaboration. However, in SCIA-2024, there was a significant increase, with foreign authors' participation rising to 27%, despite a reduction in the number of accepted papers and authors compared to previous years. This demonstrates an improvement in content quality, international attractiveness and collaboration, highlighting key priorities for the development of the scientific event. The institutional coverage of SCIA-2024 participants emphasizes the diversity of scientific centers and includes 30 original affiliations [29].

Since 2021 and continuing through 2025, faculty members of the SCIA department have actively participated in implementing six international scientific and educational projects under the Erasmus+ program to foster capacity building and cooperation in higher education, school education and youth partnership initiatives.

A significant aspect of the SCIA department's activities in the context of DH is the implementation of several international scientific and educational projects:

- OPTIMA – Open Practices, Transparency and Integrity for Modern Academia [24];
- Open4UA – Open Science for the Ukrainian Higher Education System [25];
- AGILE – Higher Education Resilience in Refugee Crises: Forging Social Inclusion through Capacity Building, Civic Engagement and Skills Recognition [13];
- Baltics4UA – Supporting Ukraine through Citizen Engagement at Baltic Universities [10];
- Welcome! – Preparatory Online School for Children with Migration Background [30];
- WELLTEENS – Promoting the Well-being of Adolescents Fleeing from War [31].

The international project partners include approximately 30 universities, civic and professional organizations from Austria, Belgium, Bulgaria, Greece, Estonia, Spain, Italy, Latvia, Lithuania, the Netherlands, Germany, Poland, Slovenia, France and the Czech Republic (see Figure 7).



Figure 7: Partners of international scientific and educational projects under Erasmus+.

All faculty members participate in the development and implementation of these international projects. Grant funds obtained through successful project implementation constitute a significant part of the financial support for the development of Lviv Polytechnic.

4. Conclusions

The formation of the Lviv Educational and Scientific School (LESS-LIS) of Library and Information Sciences (LIS) at Lviv Polytechnic University occurs within the context of fundamental modernization processes of documentary-information and information-analytical institutions under the influence of digital technologies penetrating management, socio-economic and humanitarian spheres, as well as the development of the Ukrainian information market. The introduction of networked information technologies creates scientific and technical prerequisites for integrating information-analytical centers, libraries and archives into the global information space and the international scientific and educational context.

The LESS-LIS focuses its scientific and creative resources on priority directions, including: focusing the educational and scientific process on DH technologies, aligning the curriculum content for LIS specialists with a competency-based approach, consolidating the potential of the scientific community in LIS, involving students in research and establishing international scientific and academic communication.

The training of highly qualified bachelors and masters in LIS has undergone a long evolutionary path, from a culture-centered approach to a hybrid concept of “Education and Practice in the Context of DH,” based on the requirements of Ukrainian national standards. This concept aims to prepare information specialists, analysts, librarians and archivists to acquire both theoretical knowledge and practical skills in using modern computer and information technologies for:

- utilizing information resources, networks and systems;
- creating creative text, graphic and video content;
- developing internet projects, websites and their promotion;

- managing human resources;
- defining digital transformation strategies for services;
- determining business strategies in social networks;
- using internet technologies to achieve financial success.

Digital transformation of the curriculum is ensured through: the system of program competencies and student learning outcomes forming a conceptual model of future specialists' abilities; the system of educational components implementing the practical realization of this model; and academic disciplines that provide both theoretical knowledge and practical skills. Focusing the curriculum on mastering theoretical and practical aspects of information-analytical, information-technological and social-communication activities ensures the formation of a competitive specialist for documentation and information support in business, government and administration.

Training specialists in LIS at Lviv Polytechnic is adapted to contemporary needs for forming a new generation of information professionals capable of efficiently using information resources, conducting information searches with modern IT systems and leveraging networks.

The international dimension of LESS-LIS activities in DH opens pathways for establishing and developing international scientific collaboration, fostering interdisciplinary dialogue on DH and social communication and applying best practices of scientific cooperation. Successful implementation of international projects is a significant component of Lviv Polytechnic's financial development.

The modernization policy for LIS specialist training at Lviv Polytechnic's LESS-LIS involves continuous updating of the curriculum, synchronizing it with modern digital technologies, enhancing quality and competitiveness of young specialists and aligning education content and standards with global benchmarks. The positioning of LESS-LIS as a leader in preparing young professionals in social communication and information activities is the result of 25 years of systematic work in harmonizing educational and scientific directions to meet the current needs of the education and labor markets. Evolutionary changes in LIS curriculum content at Lviv Polytechnic correspond to global trends in leading universities.

Declaration on Generative AI

The author used ChatGPT (GPT-5.1 model, OpenAI) to assist with language editing and wording suggestions during the preparation of this manuscript. All decisions regarding research content, data interpretation, and conclusions were made solely by the author. The final manuscript was fully reviewed and approved by the author.

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