



Exploring the Expanding Universe of Digital Gateways in Library and Information Science: Platforms for Knowledge Access, Scholarly Communication and Research Advancement

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The exponential growth of knowledge in the digital age necessitates more effective methods for locating and accessing information. Library and Information Science (LIS) gateways now function as central hubs for curated, reliable, and comprehensive research resources, serving scholars, practitioners, and students. These platforms facilitate discovery, contribution, and collaboration across geographic and disciplinary boundaries, thereby strengthening the global LIS community. Additionally, LIS gateways provide students and professionals with organized, quality-controlled access to the global knowledge network, which is essential for navigating the contemporary information landscape. The central thesis of this study is to critically evaluate the function and impact of major global LIS gateways, with particular emphasis on their roles in enhancing scholarly communication, the challenges encountered in their implementation, and the opportunities for their future optimization. To this end, the research systematically examines the roles, strengths, and challenges of prominent LIS gateways, focusing on factors such as resource breadth, equitable access, language barriers, content currency, and technological adaptation. Through this analysis, the study aims to offer actionable guidance for professionals, policymakers, stakeholders, and developers on improving these platforms, fostering innovation, and strengthening global information management. Furthermore, the study explores the emerging trends influencing LIS gateways, including user experience, advanced search functionalities, artificial intelligence integration, data privacy, security, and ethical and social considerations.

Keywords: Gateway, Digital Gateway, Subject Gateway, Library Gateway, Library Portal, Library and Information Science Gateway, LIS Gateway.

Introduction

The term "Gateway" about the "World of Gateways" is a notably expansive and incredibly broad term covering a wide range of technologies, concepts, and even metaphorical ideas. Its core represents a means of access and connection to provide a link, bridge, or interface or entry or exit point that connects two separate or distinct systems, spaces, or entities, because the knowledge floating among networks on web, curated information accessed by the end users or researchers, reliable and trustworthy monetary exchange, or opening doors for individuals' to experiences something new, gateways service streamline the movement and interaction between distinct dimensions. These vital gateways are essential components, providing access to diverse web resources, facilitating communication among professionals, and supporting the evolution of

information in this interconnected digital or robotic world. Whenever a gateway deals with a specific-subject like provides an organized collection of resources on a specific subject along with a retrieval mechanism i.e. structured hyper-linked directory, as followed by some of the search engine sites that offer directory services known as subject gateways. There are a number of subject gateways running in the field of Science & Technology, Engineering, Medical Science etc. In the meantime, the digital revolution has transformed libraries from physical repositories to dynamic, service-oriented ecosystems. Libraries now host diverse resources, including e-books, journals, multimedia, and datasets, which necessitate robust platforms for seamless access. So as custodians of knowledge, libraries must adapt to these changes by providing seamless access to their resources and services in the digital realm. A crucial component of

this evolution or adaptation is the development of robust and user-friendly library information science subject gateway services. These gateways act as centralized access points, integrating diverse resources and services, thereby simplifying information discovery and retrieval from the vast and chaotic world of information.

Literature Review

A literature review on the domain of LIS gateways reveals their evolving role in organizing, accessing, and disseminating information within the global LIS community. These platforms have transitioned from simple directories to sophisticated hubs offering a wide array of services. While the landscape of LIS portals is dynamic, some notable examples and concepts frequently appear in the literature.

Cullen (2001) explored the strategies for bridging the divide like increased investment in digital infrastructure, targeted training programs, and changing attitudes towards technology, with a focus on both national and international contexts¹.

According to Peterson (2005), there are five categories of user activities that make use of library space: information retrieval, leisure, teaching and learning, contemplation, and connection. The provision of space for both individual and group work facilitates the transition to college by enabling library users to learn in a new learning community or an educational center from early childhood to adulthood².

According to Raza and Eqbal (2005) findings, the LIS gateways are online portals and websites that offer searchable or browsable catalogues of particular resources from all over the world, and concentrated on a small number of academic subjects or areas. Here, resources are connected to other pertinent websites that offer more precise information on the same topic. This website's resources were selected for their authority, utility, clarity, and relevance to user demands. A LIS subject gateway launched in April 2004, known as LISgateways.com, was created by the library of Aligarh Muslim University (AMU), as a project under the University Grants Commission (UGC), New Delhi, to offer a searchable catalog of online resources available in the area of LIS. The technical aspects of this gateway are - Windows NT Server, MySQL database, ASP-based application programs for web hosting, and IIS Web server for public domain access etc. were also covered in detail by the authors³.

As per the presented case study performed by Zala and Patel (2006) about the Knowledge Exchange & Information Centre (KEIC): One Stop Search Portal, by which users can search and access KEIC resources through "LIBRARYONLINE". It has been established since 1994 with a motto to harness the huge body of information available at a global level, including all forms of communication, and for all consumers, so that it can. The MICA, an academic institution established in 1991 with the main objective to provide young individuals (either men or women) with pertinent education i.e. to help Indians to improve their professional communication abilities, because specific knowledge and skills are necessary to become proficient communicators. As part of this endeavor, the KEIC portal was launched by MICA⁴.

As per the research of Singh and Mahajan (2010), there are number of chemistry portals spread across the world. Indian Chemistry Portals were also performing well. In continuation of that, Punjab University, Chandigarh, established and launched its Chemistry portal, a single window user-centric platform, which was envisioned as a comprehensive overview of various chemistry-related resources and serves important information for scholars, as they can find all the relevant content in one place, as per their desire⁵.

As documented by Patel and Patel (2011), a subject gateway is different from search engines, especially in providing information and services. They also discussed the INFLIBNET Subject Gateway portal built for the versatile and interactive knowledge management available in the Indian society, mainly at the university level. It is designed to provide cataloguing for Indian resources, browsing, and subject classification of Indian resources in a user friendly interface⁶.

Based on the study of Oyelude and Bamigbola (2012), the library acts as a gateway to provide a reading place for people with the latest information and technology. It seriously guarded accessibility issues, copyright problems, institutional repositories, security concerns, and other day-to-day hurdles. Now, libraries should be focused on collaboration, training, content, and knowledge repositories at local, regional, national, and ultimately global level. This will enable them to fulfill their existence as a knowledge gateway effectively and efficiently⁷.

As demonstrated by Maheswaran (2016), the Peradeniya University, Sri Lanka library gateway is

the oldest and largest LIS subject gateway, designed to identify the target users, subject discussion with experts, retrieve information available on the web, categorization, and organization of resources. It also included e-journals, digitized books, reports, scholarly archives, software, bibliographic databases, e-newsletters, datasets, and bibliographies. As per the author, the primary challenges in launching this type of library gateway are – how to ensure its success, keep it operational for a long time, and motivate users to use it⁸.

From the perspective of Suganth and Packiyaraj (2016), the Bharathiyar University (BU) Library Gateway contains the academic info, librarian internet index, scout report, virtual library, archives, etc., that explored by their research scholars. As per the findings, the research scholars have huge experience using internet resources, free Wi-Fi provided by BU and E- resources available on BU library in the most comfortable accessing mode, but awareness about subject gateways still required among research scholars because web resources most commonly searched by search engines and overloaded, downloading, e-waste management are the major problems faced by campus scholars⁹.

Das (2019) finds that the major elements considered in the design of any library portal or gateway are a customizable search interface, URL linking, authentication, security, and presentation of content with interactive service. He also explained objectives of the library portals are - configurable and integrated interface for the management information, search across different formats of material (like bibliographic records, full text, graphics, and multimedia files, etc.) multiple databases, metadata schemes, and other formats (MARC, Dublin Core, etc.), to provide navigation, linking, and usage statistics¹⁰.

Gajbhiye (2020) aforementioned fundamental features of a LIS subject gateway include: an online service that offers links to web documents; the development or intervention of subject specialists; the selection of resources according to quality and scope; content descriptions; and brief annotations for review, search, and browsing facilities that are maintained and updated. Additionally, he provides the names of initials subject gateways in the field of library science, including the American Library Association, Acquisitions Librarians Electronic Network (ACQNET), Digital Librarian (a librarian's selection

of the top websites on the Internet), Dewey Blog, India's Digital Library, University of Delhi website, Digital South Asia Library, Initiative of Dublin Core Metadata, IFLA (International Federation of Library Associations and Institutions) Gateway & Blogs, Infolibrarian, Internet Library (only for librarian), LIS Links, LIS Web Resources, Librarian Blogs, Library of Congress Online (LOC) Catalogue, LIS Learning, Internet Directory, National Library of India's, MARC Standards Site, INFOPORT, Open Access Resources (OAR), Cyber Library (for Social Science), UNESCO Libraries Portal, Universal Digital Library, and Subject Information Gateway in Information Technology (SIGIT) and World Digital Library¹¹.

Dongre (2021) referred that, the portal term belongs from information technology (IT), which act as entry point or homepage, including the features of library portal i.e. they are the mirror of any library, support 24*7 service, provide remote or fingertip. Web linkage access to the information through WEB-OPAC, a structured listing of the collection of a particular library¹².

Park's (2021) report indicated how the subject gateways serve as a source of vacancy information by delivering job announcements, counseling, internships, fairs, mentoring, presentations, and success stories. A group of 33 public libraries, 08 university libraries, and 07 specialized libraries have joined forces to form the Delaware Libraries. Its website provides employment and guidance to support careers that introduce valuable information resources and programs operated by the Georgetown, Wilmington, and Dover Partner Public libraries to provide subject guides, specialized employment, job-related information, and services. It also provides preparation materials for a job or interview, education, training, company search facility, including a list of relevant websites, organizations, their lectures, educational, and training materials¹³.

Sengupta and Das (2023) suggested that the past and present study outputs of social sciences are available and access on the official website of the National Institute of Social Science, New York, USA, and the Indian Council of Social Science Research (ICSSR), New Delhi, India. In this study authors discovered that nearly half of the participants knew about subject-gateways, including their synonyms such as subject information gateways, subject based gateways, subject index gateways, virtual libraries, clearing houses, subject trees, pathfinders, meta

resources, and others' name spread globally. Here, 70.8% of respondents agree that subject gateways are beneficial, 54.2% respondents appreciated the search, browse, and access facilities of the gateway, 37.5% researchers prefer subject gateways in their research, and 16.7% are likely to explore free Internet sources¹⁴.

Liabor (2023) highlighted the LIS gateway role in the empowerment of the librarian in efficient management, organization, and distribution of information within the digital landscape. Additionally, he recommended that the approach and sequential steps used in the development and integration of the digital library, from research to post-implementation innovations adaptation, such as AI (Artificial Intelligence) driven systems with personalization algorithms that could dynamically curate content, present an exciting frontier in enhancing the capabilities of digital library systems and offering customized recommendations that sustain a symbiotic relationship between technology and user engagement by harmoniously aligning with the diverse needs and preferences of library patrons. A dynamic, user-friendly, and future-ready library ecosystem will be fostered in large part by this remarkable balance¹⁵.

Dnyaneshwar (2024) accentuated on the impact of digital technologies in the domain of LIS. As per his study, the old library was considered a bare storage of knowledge, but today IT has reshaped the functions and services of libraries i.e. changed the way of accession, processing, subscription, and rotation, etc., to disseminate information in the shortest time with lower manpower. This IT age is growing presto, so library services are generated using new tools and ways to guide the right users to the right information¹⁶.

Chandola, Bag, Chakravarty and Tyagi (2025) provides special report establishing the pivotal role of the digital Indian in driving digital transformation in India during the last decade. This report also assesses the impact and potential of this initiative, with evaluation of the budgetary trends and examination of outcomes within key parameters like connectivity, digital infrastructure, digital public service delivery, capacity building, including identification of challenges and opportunities for this mission in the next phase¹⁷.

Joshi (2025) mentioned that Google Sites, WordPress, Webby, Padlet, Notion are the freely available websites for the creation of subject gateways

and listed popular gateways of other subjects such as Agrigate, Biogate, Biome, Chemdex Omni, Eevl, Psigate, Adam, Ahds, Rdn, Jstor, PubMed, Google Scholar, Edna online, Sosig¹⁸.

Research Problem

Library and Information Science (LIS) is a major interdisciplinary field encompassing information organization, knowledge management, digital libraries, information retrieval, archival science, bibliometrics, data science, and information technology. Libraries have served as sources of information from antiquity to the present digital era. Technological advancements have enabled libraries to enhance their services through subject gateways tailored to the LIS community. Accordingly, this study aims to identify and evaluate prominent LIS gateways based on criteria such as usability, accessibility, content analysis, and design, focusing on those operated by leading national and international LIS associations, institutions, and organizations. The literature review reveals a gap in assessing the requirements of LIS gateways from the perspective of users—including researchers, academicians, scientists, university students, and professionals—who utilize these platforms for efficient metadata sharing. This user-centered perspective has been largely overlooked in prior research addressing the design, development, and post-implementation stages of LIS gateways in India.

Objectives

The LIS subject gateways' primary goal is to satisfy the information needs of academics and researchers working in the LIS stream and its allied fields. Consequently, the objectives of this study are as follows -

- 1) To understand the subject-specific LIS gateway, with its main features and functions;
- 2) To identify the renowned national and international LIS gateways based on the criteria of their affiliation or linkage with prominent LIS associations or professional bodies;
- 3) To know the role of the LIS gateway as a catalyst in the research works;
- 4) To find out the major challenges in the designing, development, implementation, and maintenance of the LIS gateway; and
- 5) To explore the future prospects of the LIS gateway to measure its scope.

Methodology and Limitation

The present study was performed by navigating and exploring official websites, portals, and platforms of renowned national and international digital LIS gateways developed or established, hosted or launched, implemented or maintained by the prestigious LIS associations/institutions/organizations available worldwide, including government of developed countries like UK, US, Europe etc. The URLs of these gateways are already mentioned in this study for further reconnoitering for the researcher or other interest person. The MS-Excel sheets are used for the collection and analysis of data/information. The Google Scholar and Scopus index databases were used for searching and reviewing literature from the last 25 years i.e. from 2001 to 2025. The official reports and documents were also explored for verification of the features and functions of identified LIS gateways, as per availability. The study completely focused on LIS subject gateways, as well as the information available on public domain, are access and analysed for performing this study only.

Analysis and Findings

LIS Gateway and its Main Features

The world of the LIS gateway is a dynamic phase in the landscape of digital platforms, portals, and repositories, with the main aim to offer a more focused and reliable starting point for research, study, and professional development. These gateways were designed and implemented mainly to enhance and support in accessing of high-quality research outputs or scholarly publications, resources, databases, tools and technique among LIS communities i.e. these gateways serve as vital hubs of valuable information for professionals, researchers, and students in the field of LIS, offering a wide range of resources, news, job opportunities, and networking avenues. Therefore, we can say that a LIS gateway is a specialized online platform or portal established to provide centralized, organized, and structured access to relevant and authoritative web resources within the subject of LIS, and unlike general search engines, they retrieve a vast unfiltered array of results. The main features of LIS gateways are as follows:

a) **Selection of Intellectual Property and Quality Assurance** – LIS subject specialists and librarians manually choose and assess resources available on websites, e-journals, databases, etc., according to the quality standards like authority, validity, accuracy, and currency.

- b) **Description of Intellectual Resources** - A detailed, manually produced description i.e. metadata record, frequently containing an annotation, abstract, or review, is provided for each resource that has been chosen. This guarantees additional context and facilitates user assessment.
- c) **Organized Access to Search and Browse** - In order to facilitate systematic resource discovery, users can either search the resource database using keywords or browse the collection using a subject, which usually makes use of a recognized classification scheme like DDC, UDC.
- d) **Target Group and Defined Scope** - Gateway is subject-specific, concentrating only on LIS or a related subfield like IT. A specific target audience, including LIS students, academicians, researchers, and information professionals, is the focus of its interface.
- e) **Extensive Coverage of Resources** - LIS gateways give users access to a wide range of field-related digital resources, such as databases, e-books, e-journals, research papers, discussion groups, mailing lists, and instructional software.
- f) **Frequent Upkeep and Currency** – In order to guarantee that the linked resources are up to date and available, gateways have a well-defined collection management policy that includes maintenance procedures.

LIS Gateways Unique Functions

The LIS gateways are a one-size-fits-all solution, act as a powerful supercharger for the research flow, or central hubs for academic discovery, professional development, research dissemination, and provide organized access to scholarly resources, databases, repositories, and tools specific to the LIS domain, i.e., significantly enhancing the efficiency and effectiveness of a researcher's journey. They function as specialized tools that address the unique challenges of modern information retrieval, such as:

- a) **Targeted Access with Precision Searching** - Gateways focus exclusively on LIS-related resources or materials by minimizing irrelevant results and unrelated hits in comparison to search engines, so hits are highly relevant results in a short period of time.
- b) **Research Enhancement Built-in Tools & Utilities** - Gateways provides access to datasets, citation managers, tools, thesauri, metadata standards, classification guides, and bibliographic

databases, all in one place to support academic research works, reducing time spent hunting resources and navigating various sites.

- c) **Organized Resources including Structured Navigation** - Gateways worked with well-categorised metadata tags and information policy to explore adjacent ones, making browsing intuitive and efficient. As well as their content being vetted by professionals or academic bodies, ensuring value and reliability.
- d) **Centralized Access to Primary & Secondary Information Resources** - Gateways serve as hubs for foundational texts and cutting-edge research by acting as an aggregator of content that comes from multiple sources, like digital libraries, peer-reviewed journals, conference proceedings, case study databases, archives, and white papers.
- e) **Knowledge Building by Updated Content** - Gateways frequently update with current trends, and LIS thought leaders, rather than relying on outdated information or broken links, also support continuing tutorials, learning, webinars, glossaries, and links associated with professional development.
- f) **Global Reach with Cross-Institutional Coverage** - Gateways reduce geographic silos and provide broader perspectives in the research, giving researchers access to global LIS literatures via aggregating resources from national or international universities, associations, and archives.

Renowned International and National LIS Gateways at Global Reach

During in-depth navigation of the official websites of world-famous professional associations, organizations, academic and research institutions, which are mainly dedicated to work in the domain of LIS, it is found that most of the international and national LIS gateways are established and managed by them. Thus, the list of popular and currently working LIS information provider gateways are mentioned below in Table- 1:

Few LIS-Focused International Gateways

In spite of these LIS gateways, some other gateways can be exclusively LIS-focused, contain highly relevant resources for staying in the field of LIS, fostering global collaboration, and accessing diverse information resources. They are following:

- a) **WorldWideScience.org** - A global science gateway enables one-stop searching of scientific databases and portals worldwide. Research on information science, technology, and LIS-related subjects is frequently included. URL - <http://worldwidescience.org/>
- b) **TechXtra** - A free service gateway focuses on engineering, mathematics, and computing. It often includes useful resources for LIS professionals working with technical support, such as information retrieval, digital libraries, and data management. URL - <https://techxtra.in/>
- c) **AERADE** - A gateway for aerospace and defense can help LIS professionals who support research in these fields. URL - <http://aerade.cranfield.ac.uk/>
- d) **SciCentral** - Aggregates breaking science research news and offers access to thousands of online resources organized by science area. URL - <http://www.scicentral.com/>
- e) **SOSIG** - A Social Science information gateway that allows researchers and practitioners to discover and access relevant high-quality networked, listed UK-based resources and services worldwide, including data archives and statistical software. URL - <https://www.socresonline.org.uk/1/3/sosig.html>

The Role of LIS Gateways in Accelerating Research

The concept of an LIS gateway as a driver for research focuses on why and how LIS gateways help, speed up, and improve scholarly research processes. The answer is that they are actively supporting the research process by providing tools, networks, open data, and scholarly content. These help researchers to do their work effectively, publish higher-quality work, and offer collaboration around the world in the following manner –

- a) **In Comprehensive Access of Resources** – Review of existing literature is an essential part of any research, and LIS gateways provide seamless access to a vast array of resources, such as - theses, dissertations, journals, conference papers, data sets, etc. via federated search tools and open access repositories. For example - a research scholar works on digital preservation techniques in India. So, it uses Shodhganga and Shodhgangotri repositories of the INFLIBNET gateway INFOPORT to review a bulk of Indian theses and synopses on the same topic,

Table 1

S No	Name	Year	Country	Objectives & Scope	URL
1	ALA (American Library Association)	1876	Chicago, Illinois, United States	It is gateway of world biggest, oldest and most influential library associations of world, offers a wide range of resources, news, publications, and information on different divisions.	https://www.ala.org
2	IFLA (International Federation of Library Associations and Institutions)	1927	The Hague, Netherlands	It is a premier global LIS body, provides access to publications, standards, policy documents, news, guidelines, and advocacy tools.	https://www.ifla.org
3	ASIS&T (Association for Information Science & Technology)	1937	Maryland, USA	This gateway of international organizations of LIS, connects information science practice with research through information science & technology, publications, and professional resources.	https://www.asist.org/
4	ICA (International Council on Archives)	1948	Paris, France	It is gateway of a non-governmental organization deals in the zone of LIS that focuses on archival science and play important role in the different parts of society.	https://www.ica.org
5	LISA (Library and Information Science Abstracts)	1969	United Kingdom (via ProQuest)	It is an international LIS tool for abstracting and indexing, first published by the Library Association. Later, Bowker-Saur took over publishing, followed by Cambridge Scientific Abstracts, and finally ProQuest. So, the LISA gateway covers periodicals from over 68 countries and in more than 20 languages, emphasizing its global scope.	https://about.proquest.com/en/products-services/lisa-set-c/
6	LIBER – Association of European Research Libraries	1971	The Hague, Netherlands	It provides online access to the 48 national libraries of Europe and top European research libraries.	https://libereurope.eu
7	Library of Congress Digital Collections	1994	Washington, D.C., United States	This gateway provides URL links of many recommended, selected, and reviewed resources by librarians like historical collections, bibliographic tools, and international MARC standards.	https://www.loc.gov
8	INFOMINE	1994	California, United States	Librarians from California State University and University of California collaborated to create and launched this gateway for scholarly internet resources in April 2000, it contained almost 20,000 scholarly and instructional online resources that had been chosen and described by librarians.	http://infomine.ucr.edu
9	DLF (Digital Library Federation)	1995	Washington, D.C., United States	It supports initiatives such as - aggregation & preservation services for digital collections, digital stewardship & curation, including managing research data, open digital library standards, software, interfaces, infrastructure, and best practices. By strengthening ties between practitioners of digital libraries and related fields, it also deals with digital humanities and opens up new avenues for research, instruction, and learning.	https://www.diglib.org
10	ERIC (Education Resources Information Center)	1966	Washington, D.C., United States	The US Department of Education initiate an extensive database of LIS and education research for accessing journal articles, technical reports, and grey literature.	https://eric.ed.gov
11	ARL (Association of Research Libraries) &	1997	Washington, D.C., United States	This is an LIS based advocacy gateway focused on open access, open data, and scholarly communication.	https://www.arl.org

(Contd.)

Table 1 (Contd.)

S No	Name	Year	Country	Objectives & Scope	URL
12	SPARC (Scholarly Publishing and Academic Resources Coalition)	1998	Washington, D.C., United States	It is an international alliance of academic research libraries, currently includes 800 institutions in Japan, China, Europe, Australia and North America, which is developed and initiated by the Association of Research Libraries, to act as a catalyst in open access of information task and in the reduction of barriers.	https://sparcopen.org/
13	LIBRIS	1997	Stockholm, Sweden	It is a national infrastructure and union catalogue of Swedish academic libraries. It supports international authority to link metadata and managed by the National Library of Sweden. It was initially developed by the Royal Library in Sweden to provide a unified search interface for different Swedish library collections.	https://libris.kb.se
14	SciELO (Scientific Electronic Library Online)	1997	São Paulo, Brazil	Originally headquartered in Brazil, it is a network of 16 nations in Latin America, Caribbean, and Iberian Peninsula. The SciELO program and its journal collections are distributed across these participating countries.	https://www.scielo.org.za/
15	OCLC (Online Computer Library Center) WorldCat	1998	Ohio, USA	The Global Library Cooperative offers the world's largest online union catalogue and database known as WorldCat. This gateway connects users to various kind of resources like books, journals, articles, and media from libraries at worldwide. It also provides tools & technology for research and community programs for bibliographic & metadata services.	https://www.oclc.org
16	LibrarySpot.com	1998	Evanston, Illinois, United States	A convenient starting point for various library-related resources.	http://www.libraryspot.com/
17	Infolibrarian	1999	United States	Provides a selection of resources for the librarians.	https://www.infolibrarian.com/lander
18	CILIP – The Library and Information Association	2002	London, England	It is gateway of UK-based LIS professional organization offers professional development, ethics, news, and standards with global resource.	https://www.cilip.org.uk
19	DLIST (Digital Library of Information Science and Technology)	2002	Tucson, Arizona, United States	It is a repository cum gateway for LIS-related research hosted by the University of Arizona (formerly), now archived at IDEALS.	https://www.ideals.illinois.edu/handle/
20	Redalyc	2002	Toluca, Mexico	It is used for open-access scientific journals with many LIS publications.	https://www.redalyc.org/
21	E-LIS	2003	Milan, Italy	The world's largest and first open-access LIS archive cum gateway for LIS scholarly papers for research. It works to promote open scholarly communication, especially from under represented regions. It also provides access to theses, papers, grey-literature, research papers, pre-prints, and conference presentations. Its scope is multilingual and international.	http://eprints.rclis.org/
22	DOAJ (Directory of Open Access Journals)	2003	Roskilde, Denmark	There are numerous open-access journals of LIS and its related fields are hosted by this gateway.	https://www.doaj.org
23	BASE (Bielefeld Academic Search Engine)	2004	Germany (Bielefeld University)	It is one of the world's most voluminous open-access academic search engines, useful for LIS research and professionals.	https://www.base-search.net
24	OpenDOAR (Directory of Open Access Repositories)	2005	UK (SHERPA Services)	It is provide a curated list of institutional and subject-based repositories related to LIS.	https://opendoar.ac.uk/

(Contd.)

Table 1 (Contd.)					
S No	Name	Year	Country	Objectives & Scope	URL
25	Aligarh Muslim University LIS Learning Gateway	2005	India (not verified)	It is an effective gateway targeted to LIS academicians and students, implemented to streamline the process of finding information and to access high-quality online LIS resources. It functions as a carefully curated portal with links of databases, e-journals, bibliographies, and other pertinent resources.	http://lislearning.in/
26	Intute (Archived)	2006	United Kingdom	It was a joint project involving seven UK universities. Mimas at the University of Manchester served as the host partner. Unfortunately, funding stopped in 2011, which led to the closure of the Intute site. However, a partial archive is now available at XtLearn.net.	http://www.intute.ac.uk/
27	Europeana	2008	The Hague, Netherlands	This gateway helps to explore millions of artworks, artifacts, digitized books, documents, videos, and sounds from European libraries, museums, and archives.	https://www.europeana.eu
28	HathiTrust Digital Library cum a gateway	2008	Ann Arbor, Michigan, USA	This gateway developed by the combined effort of 25 research libraries for preservation and further access of their digitized collections. The name "HathiTrust" comes from the Hindi word for elephant, "hathi," which represents the digital library aim to keep digitized books for the long term. Its main office is at the Hatcher Graduate Library, University of Michigan. The Indiana University and University of Illinois at Urbana Champaign, are home to the HathiTrust Research Center.	http://hathitrust.org
29	LIS Links	2008	India	This is the first and largest popular academic forum for social network of LIS professionals in India, featuring open access materials, discussions, job postings, events, groups, academic news, information, and group interactions.	http://lislinks.ning.com/
30	INFOPORT	2012	India	A subject gateway operated by INFLIBNET that focuses on collection and preservation of Indian electronic resources and promotes open access to scholarly content.	https://infoport.inflibnet.ac.in/
31	UNESCO Library & Open Access Portal	2013	Paris, France (Nottingham University)	A multitude of UNESCO resources are accessible through this global information gateway, which is running for the librarians and library patrons. It includes educational, scientific, and cultural materials, along with bulk of LIS content that focuses on open access of knowledge and information literacy.	https://www.unesco.org/en/archives
32	AFLIA (African Library and Information Associations & Institutions)	2013	Accra, Ghana	According to Ghanaian law, it is a global non-profitable organization that is registered as an NGO. The reliable voice of Africa's library and information community is represented by AFLIA, a Gateway for LIS development, policies, and training across African nations.	https://web.aflia.net/

(Contd.)

Table 1 (Contd.)

S No	Name	Year	Country	Objectives & Scope	URL
33	Mizoram University Library Science Professionals Portal	2018	India	The primary objective of the library science professional portal of the Mizoram University library is to equip students with the necessary knowledge and abilities to efficiently handle and utilize information, particularly in the current digital environment. It also equips them for careers in a variety of fields, including research, academia, and public libraries. By facilitating information access and promoting lifelong learning, the portal also seeks to establish a knowledge-based society.	https://www.libraryscienceprofessionals.com/p/subject-gateways.html
34	LIS Portal	2019	India	The aims this gateway to provide comprehensive resource in the field of LIS, offering a wealth of information, articles, news, job listings (including international ones), quizzes, and study materials for LIS students and professionals.	https://lisportal.com/
35	INFOLIT Global Gateway	2022	European Union in virtual mode	UNESCO and IFLA collaborated to create the INFOLIT Global Gateway. It emphasizes lifelong learning and information literacy. Promoting information literacy as a necessary ability for people and societies is its aim.	https://infolitglobal.org/en/

Table 2

S. No.	Main Purpose	LIS Gateways
1	Professional Development and Community	ICA, IFLA, ALA, ASIS&T, CILIP, LIBRIS, AFLIA, Infolibrarian, LibrarySpot.com
2	Academic Research and Subject Specific Resources	LISTA, BASE, ARXIV, ERIC, INFOPORT, Mizoram University LIS portal, SPARC, LIS Learning (AMU)
3	General and Historical Quality-Controlled Gateways	DLF, INFOMINE, UNESCO Library Portal, INFOLIT
4	LIS Job Portals and Career Resources	LIS Link, LIS Portal
5	Digital Libraries and Repositories	OCLC WorldCat, HathiTrust Digital Library, Europeana, SciELO, DLIST
6	Open Access LIS Journals & Repositories	E-LIS, DOAJ, OpenDOAJ, DLIST, LIBER, ARL, Redalyc
7	Technical Standards & Guidelines	OCLC, LOC

shaping a strong literature review and avoiding redundancy.

- b) **In Research Visibility and Citations** – LIS gateways host published research outputs for scholar visibility and communication i.e. making them discoverable globally via uploading theses/dissertations in repositories, which ensures their indexing and citation. For example - a researcher uploads their research output to E-LIS, leading to increased downloads and citations by other researchers in Asia and Africa.
- c) **Encouraging Academic Integrity** - Integration with plagiarism software and transparent access to prior work helps researchers to avoid duplication and promotes ethical research. For Example - a PhD student uses LIS gateway tools to cross-check for similar studies and avoid content overlap in other LIS gateways.
- d) **Facilitating Interdisciplinary Research** – LIS gateways aggregate materials from multiple

subjects, which are required in modern research that often crosses disciplinary boundaries. For Example - WorldWideScience gateway offers a single point of access to national and international scientific databases and portals, to researcher like to retrieve resources.

- e) **Training and Research Support Tools** - Gateways mostly provide tutorials, workshops, citation and referencing tools for research data management etc. A number of researcher has lack of formal training in research data or citation management. For example - a PhD student uses the LIS portal gateway to know about upcoming events like conferences, seminars, symposiums, workshops, and trainings scheduled in the LIS domain.

Therefore, according to the distinct purpose of research, the categories of LIS gateways are mentioned below in Table - 2:

Workflow Algorithm of LIS Gateway as a Catalyst in Research

Figure 1 illustrates the algorithmic model of the workflow or mechanism followed by the researcher during the research process and shows how the LIS gateway interacts and provide quality control at each step to enhance the research process as a catalyst:

Step 1: Formulation of Research Topic - Researcher tried to identify the area of interest or research problem. Here, the LIS gateway acts like a launchpad, scholars use the subject-specific browse and search facility of this platform to find out high-quality information or resources that help his/her to imagine the overview of the field. The research questions will be further explored here by exposing concepts, current trends, and foundational papers. The gateway saves time, reduces unfiltered internet data with guidance, and provides expert-curated

```

BEGIN
  // Step 1: User Authentication for Secure Access
  IF User.HasInstitutionalAccess OR User.IsGuest THEN
    GrantAccess_To_LISGateway ()
  ELSE
    Deny_Access ()
  EXIT
  END IF

  // Step 2: For Defining Research Topic
  UserInput ← Get_Research_Topic ()
  Keywords ← Extract_Keywords (UserInput)

  // Step 3: Literature Search for Review
  SearchResults ← LISGateway.SearchRepositories (Keywords)

  IF SearchResults.IsEmpty THEN
    Display ("No match/result found. Refine your keywords")
  EXIT
  END IF
  Display(SearchResults)

  // Step 4: Filter or Fetch Resources
  FilteredResults ← Apply_Filters (SearchResults, filters = [Date, Type, Peer-reviewed])
  SelectedResources ← User.Select_RelevantResources (FilteredResults)

  // Step 5: Analysis of Literatures
  FOR EACH resource IN SelectedResources DO
    AnnotatedNotes ← Extract_Insights(resource)
    Bibliography ← AddTo_CitationManager(resource)
  END FOR

  // Step 6: Reduce Redundancy and Plagiarism
  PlagiarismReport ← Run_PlagiarismCheck (UserDraft, SelectedResources)
  IF PlagiarismReport.HasIssues THEN
    Display ("Plagiarism detected. Revise content.")
  EXIT
  END IF

  // Step 7: Drafting of Research
  ResearchDraft ← User.ComposeDraft(AnnotatedNotes, Bibliography)

  // Step 8: Research Support Services
  IF User.NeedsHelp THEN
    Offer_Services ("Reference Management", "Ethics Training", "Data Management")
  END IF

  // Step 9: Submit Research
  IF User.IsReadyToSubmit THEN
    UploadToInstitutionalRepository(ResearchDraft)
    GenerateDOI(ResearchDraft)
    Display ("Research successfully submitted and archived.")
  END IF
END

```

Fig. 1 — Pseudocode/Algorithm for a supercharged research progress by the LIS gateway.

exploration, ensuring a well-defined and feasible research topic.

Step 2: Information or Resource Retrieval - Researcher tried to find out and assess relevant, reliable, and verified sources of articles, e-books, and datasets in few minutes. Here, LIS gateways serve as a quality-controlled hub to search academically sound, pre-vetted resources or databases detailed with metadata and annotations rather than normal search results.

Step 3: Information Analysis and Extraction - Researcher reads, analyses and synthesis theories, and arguments from full-text documents Here, LIS gateways indirectly provide easy and diverse type of resource across the world, linked resources, identify research gaps in existing literatures helping for comprehensive understanding of the topic and rather than information management a researcher to focus on his/her intellectual work.

Step 4: Findings Management - Tedious part of any research is to organize findings, citations, and notes. Here, LIS gateways are able to integrate with citation management tools, as well as with consistent metadata. So, the researchers are accurately and easily managing and exporting bibliography and citation data, including plagiarism error detection.

Step 5: Dissemination of Facts - Researcher communicates and publishes their findings or facts of research, Here. The LIS gateway itself provides a dissemination platform having global visibility and outreach to the academic LIS community, especially for open-access materials and institutional repositories to widen the impact of the research, make it accessible to the targeted and relevant audience, and complete the final stage of the research cycle.

LIS Gateway Implementation Challenges

Whenever the LIS gateways adapt to the quickly changing landscape of technological advancements, they must deal with a complex array of challenges, like integrating big data and AI. These are technical, ethical, financial, and human resource domains, demanding strategic and proactive responses. There is a requirement for a multi-pronged approach involving strategic planning, collaborative efforts among institutions in both areas - investment in technology and human capital to address the major issues, and a strong commitment to ethical principles in the deployment of AI and big data, which is also essential within the LIS domain.

a) **Technical and Infrastructure Challenges** –

- **Data Volume, Velocity, and Variety (Big Data Concept):**
 - Volume - Gateways are always dealing with storing, processing, and making sense of massive datasets of digitized collections, end user interactions, research or academic outputs, and some external sources, which require robust, scalable infrastructure, e.g., cloud computing, distributed storage, data centre, etc.
 - Velocity – Real-time data streaming for rapid ingestion and analysis of information, like mentioned social media resources, search trends etc. is a major problem for traditional LIS gateways.
 - Variety - Diverse formats of information, such as unstructured data includes things like images, audio, video, social media posts, XML-based semi-structured and full-text documents, and structured bibliographic records. This heterogeneous data integration and interoperability for AI tools is a monumental task i.e. AI models are only as good as the data they're trained on.
 - **Data Quality and Curation:**
 - Metadata Inconsistency - Varying cataloguing standards and legacy among international organizations, and the absence of standardized ontologies, increase the difficulty in data harmonization and harvesting.
 - Data Silos - Generally, information resides in multiple systems within an institution or partner institutions, which creates difficulty in unified data collection and large-scale AI analysis.
 - Bias Result - Development practices of historical collection or societal biases reflected in existing data can lead to AI algorithms perpetuating and amplifying biased results, recommendations, or organization-specific content.
 - **Interoperability and Integration:** LIS portals are mostly created on a complex stack of existing library management systems, discovery layers, repositories, and archival systems. The new AI and big data capabilities seamlessly integrate into this existing infrastructure without disrupting their operations.
 - **Scalability and Performance:** Portals must be able to scale efficiently to handle increased processing demands and provide fast, reliable service due to sophisticated AI features and IoT.
 - **Lack of Turnkey Solutions:** AI applications are designed for specialized subject indexing, detailed reference chat-bots, ready-made solutions, and the substantial customization needs of the LIS community.
 - **Bias and Fairness:** Latest AI models can lead to inherent, unfair, or discriminatory outcomes or biases in information access, resource discovery, or even collection development suggestions, potentially exacerbating the existing digital divide.
 - **Privacy and Security:** Ensuring compliance with international data protection laws is challenging. This includes GDPR (General Data Protection Regulation) and local privacy rules for collecting and analysing large amounts of data, such as search queries, reading habits, and user interactions. Data breaches, unauthorized access, and using AI for personalization create significant concerns.
 - **Transparency:** Trust and intellectual freedom are paramount, the inability to explain AI-driven search recommendations can erode user confidence.
 - **Intellectual Property Rights:** Use of large data sets in generative AI models raises fundamental questions about copyright, fair use, and attribution for the actual content of the creators and inventors. Thus, gateways as custodians of intellectual property have a responsibility to be careful about these legal complexities.
 - **Misinformation:** Trusted sources of information, identifying and mitigating the spread of content, especially when AI-driven tools might be used for the creation or aggregation of content, because they can be used to create highly manipulated content and convincing fake news.
- b) Financial and Resource Challenges –**
- **Designing, Development, and Implementation Costs:** Developing, integrating, and maintaining gateways with advanced interfaces and features requires significant financial investment in hardware, software licenses, user-friendly GUI platforms, and expert and skilled staff, which seems to be impossible in low and limited costs.
 - **Up-keeping and Ongoing Maintenance:** Regular monitoring, retraining, and effective updates are ongoing operational costs for dedicated resources.
 - **Scarcity-Funding:** Innovation and high-risk AI integration can be challenging, especially when the immediate return is not very clear.

c) **Human Resources and Skill Gaps Challenges –**

- **Technical Skills:** Professionals are required to have advanced skills in data science, machine learning, AI ethics, and cloud computing for handling, effectively implementing, and continuously maintaining AI and big data technologies.
- **Training and Reskilling:** Substantial investment in training of existing staff or recruiting new talent with specialized expertise can be a lengthy and expensive process necessary for bridging this skill gap.
- **Culture Shift:** Decision-making and continuous experimentation can be resistant to change in traditionally conservative institutions, which requires an organizational cultural shift.
- **Job Displacement Fear:** NPL (Natural Programming Language) and AI as an augmentation tool will automate the role of professionals, leading to resistance or reluctance in adopting new tools and technologies due to job displacement fear, but replacement is crucial.

d) **Governance and Policy Challenges -**

- **Standard and Clear Guidelines:** Acceptable national and international standards, ethical and best practices guidelines, for accountable use, and essential.
- **Policy Development:** Need to develop robust internal institutions' policies regarding ethical, data governance, privacy, intellectual property, and AI use, which can be a time-consuming process.
- **Jurisdictional Issues:** Navigating different legal frameworks and regulations across the world or various countries adds another layer of complexity, mostly for international gateways.

LIS Gateways Future Prospects

The trend for LIS gateways is moving toward becoming smart, open, collaborative, and inclusive platforms. These platforms support knowledge discovery and also drive innovation in scholarly communication. Their development shows the wider changes in digital scholarship, information ethics, and global research ecosystems. The foresight view about the future of LIS gateways is as follows:

a) **Tech Driven Transformation –**

- **AI and Natural Processing Language (NPL):** Powered discovery tools such as 24*7 chatbot, semantic search, citation analysis, interoperability

among repositories, catalogues, and learning & research management systems.

- **IoT (Internet of Things), Blockchain & VR/AR Technology:** Emerging trend implemented smart shelving, space utilization, automated check-in/check-out systems, enhanced routine operations, enhanced transparency, digital rights management, real-time resource tracking, and augmentation. Virtual reality will be capable of providing virtual library tours and interactive learning.
- **Middleware Integration:** An advanced middleware application facilitates the connection between Learning Management Systems (LMS) and Student Information Systems (SIS).
- **Library 5.0:** Virtual machines and cloud platforms concept introduced for lifelong learning with the help of robotics and smart kiosks, testing and development tool for implementing LIS v2.0 will be introduced freeing staff services in the library, interconnect bibliographic metadata will be observed at global level, advance user engagement features such as customizable alerts, recommendation engines, and research profiles introduced for user interest and desired results, open-source software is reducing costs, fostering customization and collaborations.

b) **Evolution in LIS Skills and Curriculum –**

- **Fourth Industrial Revolution (4IR):** Aligned courses are designed to bridge the gap of modern demand and focus on training LIS professionals about digital content, literacy & preservation, digital humanities, data management, AI, cloud-based systems, and business analytics etc.
- **LIS Professionals' Roles:** They will evolve and serve as critical evaluators and data or digital curators, big data analytics digital archivists, cataloguers, knowledge managers, and data-driven decisions & policy maker librarians.

c) **Strategic Shifts & Sustainable Services –**

- **Green Libraries:** Eco-friendly library infrastructure will be the main priority in the upcoming time.
- **Research Support Formats:** Platforms like GitHub, Zenodo, and data journals, will be integrated, and interactive datasets, multimedia research outputs, and live annotations, dynamic contents will be generated and disseminated.
- **Evidence-based Practice:** Quantitative research and data-driven evidence will be the basis of the

Table 3

The Expected Trajectory Path of LIS Gateway From the Mid-2020 to 2030-onwards

Time-Span	Major Developments in Future
2025 - 2028	The wide scale deployment of Block-chain, IoT and AI integrated digital libraries and repositories increased.
2028 - 2032	The adoption and acceptance of Library 5.0 models, with immersive VR and AR technology and evidence-based services.
2032 - Onward	The global linked data ecosystems will be also spread via AI based decentralized and distributed library management system emerged.

research and decision-making at the institutional level.

- **Open Science and Open Access:** Educational resources are freely accessible, and data sharing and integration of open-access repositories have increased.
- **Diversity & Outreach:** Digital and social media platforms are used to gather and provide indigenous and regional knowledge.

Overall, the continuous and increasing involvement of digital gateways to support research, learning, and collaboration in the sector of LIS and its future lies in its ability to adapt global research needs to user-centric design via emerging technologies. On the basis of the present study, the estimated progression in the development of LIS gateways is expected here in Table - 3:

Conclusion

The results emphasize how important international associations and collaboration are to bolstering the global LIS community. They also improve the visibility and usefulness of digital library services worldwide. This study identifies key national and international LIS portals along with their main features and functions. These gateways provide - (1) Information dissemination by offering access to databases, journals, reports, and open access resources; (2) Professional networking through blogs, forums, directories, and event listings that connect practitioners, researchers, and students in LIS; (3) Professional development with training materials, certificate programs, webinars, and job opportunities; and (4) Advocacy and standardization to promote best practices and tackle global information challenges. The future of LIS gateways as a digital knowledge ecosystem is collaborative, smart, open, and inclusive. These platforms are not just sources of information; they actively support research discovery, encourage global partnerships, and empower lifelong learning in the digital information age. In summary, LIS gateways serve as an essential link between the vast, unfiltered, and valuable information available online

and the needs of academic research. They help ensure that researchers can build their work on verified and authoritative sources, reduce cognitive overload, and speed up the search and browsing process.

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