

Digital Maturity and Web 2.0 Adoption Among Library and Information Science Associations in India: A National Webometric Assessment

Vaishali D. Malode Wadnerkar^a and Supriya A. Bejalwar^b

^aLibrarian, Dhanwate National College, Nagpur-440012(MH)

E-mail: vaishu.malode2014@gmail.com

^bLibrarian, Prof Ram Meghe College of Engineering & Management, Badnera, Amravati- 444701(MH)

E-mail: prmceamlibrary@gmail.com

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In recent years, professional Library and Information Science (LIS) Associations in India are becoming more and more reliant on their websites to interact with members/Library Professionals, share knowledge and stay visible in the organization. This study investigates the digital footprint of 23 Indian LIS associations by analyzing their website's availability, qualitative content quality, the extent of their implementation of Web 2.0 features, the usability of their website and connectivity via the Internet.

A descriptive and evaluative webometric design was used for 23 formally constituted LIS associations that were found from the official webometric directory of ILA, government records, and from the peer-reviewed literature. These included 18 associations with operational websites, and comprised the analytical sample. Qualitative content was analyzed using a dual-coder checklist instrument (Cohen's $\kappa = 0.87$) with six dimensions; the five Web 2.0 features were analyzed with a binary scoring protocol. Cluster analysis (Ward's linkage), heatmap and radar charts were used for the digital maturity patterns analysis using Python language. Analysis of the data collected in January–March 2025 indicates that 78.3% of associations had reasonably strong content accuracy (77.8%) and usability (83.3%) in their functional websites, but the use of interactive Web 2.0 features was very low, such as use of RSS feeds (11.1%), Keyword search (16.7%), and Membership login (22.2%) and only 22.2% linked with related professional resources, cluster analysis yielded three distinct digital maturity tiers, represented by associations like Kerala Library Association, Assam Library Association and ILA, respectively. While these findings are based on presence/absence scoring within the Indian national context, the study suggests that the following measures need to be taken in order to improve the functioning of these associations: Associations need to designate dedicated digital officers, enhance their RSS feeds, search functionality, and sitemaps; and bodies such as IFLA India and government funding agencies should develop digital standards and benchmarks in relation to association recognition. This study is the first national-level webometric analysis of Indian LIS association websites and provides a replicable typology of digital maturity in LIS associations based on both quantitative and qualitative analysis methods, which can be extended for longitudinal and cross-national research in the future.

Keywords: Webometrics, Web 2.0, Digital Maturity, LIS Professional Associations, India, Website Evaluation, Cluster Analysis, Professional Associations.

1 Introduction

The Library and Information Science (LIS) profession in India is greatly influenced by the role of professional library associations in terms of its growth, direction, and identity. Professional development, policy advocacy, networking and promotion of standards in librarianship in the country has been greatly facilitated by national bodies like Indian Library Association (ILA), Indian Association of Special Libraries and Information Centres (IASLIC) and Indian Association of Teachers of Library and Information Science (IATLIS) since the turn of the twentieth century (Satpathy, 2020). As information and communication technologies grow,

these associations are increasingly turning towards their websites as a vital tool for sharing knowledge, supporting membership, sharing organizational activities and allowing them to interact with stakeholders (Ahmadian & Deshpande, 2013). Good websites enhance the access, clarity and visibility of professional associations and help to measure their digital maturity and responsiveness to the evolving information landscape. Within this context, a webometric approach has become an important tool for the analysis of the structure, visibility and impact of web-based information resources. Webometrics is the quantitative analysis of web structures and hyperlinks (Björneborn & Ingwersen, 2004). It

evaluates attributes like website size, link structure, content richness, and user-friendly attributes, enabling organizations to gain insights into their online presence and relative performance. The study of webometric instruments in LIS has been limited to university libraries, national libraries and institutional websites (Gadhavi, 2017; Haneefa & Venugopal 2010) and a few studies have been carried out on professional library association websites especially in Indian context. While India has a significant number of LIS associations at the national and state level, studies on the presence of these associations' web presence is limited. A few studies have looked at the web characteristics of selected associations in other parts of the world (Dhar & Gayan, 2022) or digital presence of associations in stand-alone fashion (Chandra, 2015). A detailed study on the digital visibility, content quality, Web 2.0 attributes and user friendliness of the Indian LIS association websites is lacking in the context of the country. This gap is especially pertinent in a world where digital platforms are increasingly used for communication, collaboration and professional outreach, and highlights the need for systematic and nationally scaled evaluation.

Theoretical Framework

Theoretically this study is based on the four-pillar webometrics framework of Björneborn and Ingwersen (2004) as an evaluative framework to structure and interpret the different aspects of the study. The four pillars are:

- 1) content analysis, looking at quality, accuracy, currency and coverage of information on a website;
- 2) link structure analysis, analyzing the internal navigation of a website and the external hyperlinks, as a measure of inter-organizational connectivity and web impact;
- 3) usage analysis, looking at how much users interact with the website, e.g. through tools such as visitor counters and analytics; and
- 4) technological evaluation, analyzing the use of Web 2.0 features such as RSS feeds, keyword search, sitemaps, and membership portals as a measure of digital infrastructure maturity. In the present study, all four pillars are used together to analyze the sample of LIS association websites of the entire country; it entails an elaborate empirical assessment and a cogent theoretical basis for recommendations at the sector level. The structure also enables the comparison of the current results with previous institutional webometric studies,

which enables the results to be put in a meaningful context within the existing literature.

Research Questions

The following research questions are being posed:

RQ1: What is the extent of maintenance of functional and publicly accessible websites by the professional LIS associations in India and how does it geographically and historically vary?

RQ2: How good is the qualitative content such as accuracy, currency, coverage and usability in websites of Indian LIS associations?

RQ3: What is the extent of Indian LIS association websites that embraced Web 2.0 and interactive digital capabilities and how does it match with the international benchmarks? RQ4: What is the pattern of digital maturity evident in the websites of Indian LIS associations and what are the structural factors that account for the digitally mature types and digitally immature types?

Objectives: The specific objectives based on the above research questions are as follows:

1. To evaluate the accessibility and availability of Indian LIS professional association's websites.
2. To analyze qualitative characteristics on these websites such as information, navigation and user support.
3. To assess the use of Web 2.0 and interactive capabilities of association websites.
4. To highlight the areas of inadequacies, constraints and opportunities for improvement of the website of LIS associations.
5. To prepare evidence-based recommendations to improve the webometric performance of Indian LIS associations to boost their digital presence.

This study will be useful in the larger effort to develop the field of LIS studies as it presents the first national level webometric analysis of the websites of professional associations in India, and provides empirical evidence based on the framework proposed by Björneborn and Ingwersen (2004). The results are intended to guide future strategies for digital enhancement, professional engagement, and communication in organizations of LIS associations in India.

2 Review of Literature

However, with the emergence of Web as a medium of information distribution, much research has been done on the ways in which libraries, universities and professional organizations present their image and

services on the Web. Almind and Ingwersen (1997) defined webometrics as the quantitative study of the structures and behaviors in the Web. Björneborn and Ingwersen (2004) further developed this framework by describing the four analytical pillars: content analysis, link structure analysis, usage analysis and technological evaluation, which serve as a theoretical foundation for the current evaluation of institutional websites that this study builds on. The literature is examined in five areas of general interest, followed by a synthesis that presents the research gap which the present study will address.

2.1 Webometric Studies on Academic and Research Institutions

Initial research being carried out was mainly on academic libraries and University websites. Following these studies, Still (2001) and Qiu et al. (2004) showed that the hyperlink structure and citation frequency could be used as measures of institutional visibility and influence. Later, Parmar and Mandalia (2016) and Madhusudhan and Prakash (2013) examined the websites of Indian universities and IITs, observing significant variation in the content richness, internal linking, Web Impact Factor (WIF) and visibility indicators of the websites. The results confirm the numerous studies that have been conducted on the issue of the digital maturity of Indian academic websites, and the web maintenance practices, in particular the tight interdependence of the two aspects, (Hadagali et al., 2021; Ramalingam, 2013; Brahma & Verma, 2018; Thanuskodi, 2012) which were found to be unevenly distributed across different institutions. These studies, in terms of their methodological approach, are relevant to the present study because they focus on academic institutions despite being conducted on other types of institutions, they aid in establishing the importance of evaluating the structure, visibility and usability of the websites through a computational and analytical approach. Nevertheless, they have an institutional bias and there is a lack of discussion on professional LIS associations which this study addresses.

2.2 Webometrics in Public and National Library Contexts

This course aims to understand how to apply webometrics in the context of public and national libraries. At the international level, Talipova et al. (2024) introduced an integrated fuzzy-logic and web-analytic model that incorporates multi-dimensional web quality aspects, demonstrating a methodological shift toward multi-criteria evaluation that takes

qualitative as well as quantitative aspects into account when evaluating the web quality of public library websites. In South Asia, Verma and Brahma's (2017a) study on iconic Indian public and national libraries found that library websites could be rich on information but lacked external link visibility and also SEO practices were not being used in the libraries. The effects of these results are clear well-established libraries still struggle to become visible online, and voluntary professional associations which are likely to be less well resourced, and without a dedicated digital professional, may find the digital divide even wider. This line of thinking directly supports the need for the present research. One of the studies by Ramanayaka et al. (2018) on Sri Lankan university library websites revealed that the evolution of digital environments is uneven because of resource imbalances, lack of uniformity in digital knowledge, and the lack of a common university web development framework in South Asian institutional environments. The structural factors are especially relevant in the context of associational structure in India as explored in the present study.

2.3 Web Visibility, SEO, and User-Centric Evaluation

Over the last few years, there has been a lot of research on the significance of search engine optimization (SEO) and user-centric design in the discoverability and professional outreach of institutional websites. Even the academic libraries, whose reputation is global, have low SEO visibility, as reported by Vázquez and Ventura (2020) due to the lack of uniformity in metadata and structure of backlinks. Clark and Rossmann (2017), and Yalçın and Köse (2010) also highlighted the importance of the structured metadata, responsive design and user experience in improving the digital reach and keeping stakeholders engaged. The relatively low use of SEO features reported in Indian LIS institutions by Walia & Gupta (2015) and Joicy & Varghese (2019) suggests that the lack of visibility on the Internet is a structural obstacle to the visibility of Indian LIS institutions in professional circles. The present study directly addresses these concerns by analyzing the availability of sitemap, the review of external linking practices and the analysis of navigational features of Indian LIS association websites within the body of research of SEO and usability analysis.

2.4 Digital Presence of Library Associations: A Sparse Area

Studies specifically on library associations are very limited and few in number, as compared to academic

libraries or public libraries. Dhar and Gayan (2022) did an international analysis of selected library associations based on MOZ-based parameters – Domain Authority (DA) and Page Authority (PA) and concluded the weak link structures, limited services, and low digital engagement of most library associations. Similarly, a small sample of library associations' websites were examined by Ahmadian and Deshpande (2013) who found that the majority of library associations had not progressed beyond informational static web pages. The literature on library associations in India is very limited and disjointed. Chandra (2015) identified low scores for WIF, limited interlinking and the obsolescent content on the websites of a few selected Indian library associations, without conducting a country-wide study and limited to a select set of associations. Most importantly, there are no studies at home or abroad that combine qualitative content evaluation, Web 2.0 feature analysis and digital maturity clustering in a single methodology. It is this gap in methodological approaches that the current research addresses specifically.

2.5 Emerging Trends and Methodological Directions in Webometrics

Recent studies show a growing variety of webometric approaches, as digital environments grow more complex for institutions. In addition, Ali (2023) introduced webometric tools to the global scholarly access platforms, including Sci-Hub and LibGen, demonstrating the scalability and versatility of webometrics, which goes beyond the institution-centric studies. An evaluative review of the literature on webometric published by Mukunde and Prakash (2023) revealed that the literature was moving from simple WIFs to more complex hybrid methods that involved rich file analysis, SEO metrics, user-centric metrics, and automated analytics, which aligns with the multi-method approach used in the present study. Recently, Talipova et al. (2024) confirmed that web analytics can be used in library settings for more nuanced quality assessment, while also modelling the effectiveness of fuzzy logic, which further bolsters the argument for the use of a multitude of evaluative lenses. In a similar vein, there is an increase in literature in 2023-2024 that advocates for the use of cluster-based typologies, visualization tools, such as heatmaps and dendrograms, as a means of communicating digital maturity patterns more effectively to both researchers and practitioners

(Mukunde & Prakash, 2023). The focus on this methodological evolution directly translates to the design of the present study, which is based on both quantitative (feature scoring, sitemap checks, login verification) and qualitative (content accuracy, scope, usability) methods, with the addition of Python-based cluster visualization, which allows the assessment of digital maturity patterns across the sector.

Synthesize and identify research gap: The literature reviewed in five domains listed above presents several patterns that are consistent and convergent and motivate the present study. In the literature, inconsistencies in content, inadequate external linking and lack of web 2.0 features in the websites are reported as common weakness across the websites of universities, IIT's and national libraries (Brahma & Verma, 2018; Hadagali et al., 2021; Verma & Brahma, 2017a). Evaluation frameworks have become increasingly sophisticated, shifting from one metric WIF assessments to multi-metric assessments including quantitative analysis of webometrics alongside qualitative analysis of the content and cluster-based visualization techniques (Mukunde & Prakash, 2023; Talipova et al., 2024). Authorities from South Asian contexts such as Sri Lanka (Ramanayaka et al., 2018) and India (Walia & Gupta, 2015; Joicy & Varghese, 2019) have always blamed the underperformance of the digital world on structural issues as opposed to technological ones, such as resource constraints, lack of compulsory standards, and uneven institutional capacity. However, there is a large body of evidence yet to be explored, especially in the Indian context, as far as the professional LIS associations are concerned. The only recently relevant domestic study (Chandra, 2015) has been performed in a decade ago, includes a small sample of associations and lacks a multi-dimensional evaluation framework. International studies (Dhar & Gayan, 2022; Ahmadian & Deshpande, 2013) offer some helpful benchmarks, but they are not specifically geared to the national context in India, and fail to integrate the concept of cluster-based maturity analysis. This is addressed by the present study, which involves a webometric evaluation of the 23 professional LIS associations in India with theoretical support from the four-pillars framework of the LIS proposed by Björneborn and Ingwersen (2004). It explores the accessibility of their websites, the type and quality of information they offer on the web, and how interactive and user friendly they are.

The study represents a methodological improvement of previous research and offers the first national level baseline to serve as a reference for future longitudinal and comparative LIS association studies.

3 Methodology

3.1 Research Design and Sample

The descriptive and evaluative research design was used following the trend in the institutional webometric research (Dhar & Gayan, 2022; Haneefa & Venugopal, 2010) to explore the digital presence and webometric aspects of professional associations of LIS in India. The sampling frame was developed using the triangulation method of three sources which included ILA official directory, government-registered society records and peer-reviewed literature. Inclusion criteria included (a) formal constitutional registration as a LIS professional body; (b) verified active operational status at the time of data collection; and (c) corroboration of the active operational status by at least two independent sources. Twenty-three associations were identified as the national population. From these, 18 associations (78.3%) had functional websites during the data collection period (January – March 2025) and were used in the analysis. The other five were kept for availability statistics. If a website had one or more of the following issues it was deemed defunct: HTTP 4xx or 5xx error on three independent access attempts, DNS Resolution failure or no Wayback Machine archive since January 2023. Of the five non-functional cases, two cases (Medical Library Association of India; Young Librarians Association) had no registered web presence and three cases fell under the above defunct criteria.

3.2 Web 2.0 Feature Scoring

These five Web 2.0 features were tested: RSS feeds, XML sitemaps, internal keyword search, membership login portals, and visitor counters. The selection is based on the criteria established by Dhar and Gayan (2022), Mukunde and Prakashe (2023), and Ahmadian and Deshpande (2013), who have determined that these are the key elements of interactive online functionality on the websites of professional associations. To ensure the feature set could be directly compared to the previous benchmarking conducted by the LIS association in India and internationally by Dhar and Gayan (2022), it was decided to limit the feature set to these five indicators. There are many additional indicators

considered in post-2020 studies such as social media integration, mobile responsiveness, HTTPS security (Talipova et al., 2024) but these are recommended as priorities for future research and are not included here as they are likely to be absent across a population with predominantly voluntary governance structures. The features were scored as binary protocol (1 - Available, 0 - Not Available, if broken or partially implemented). There were three phases of detection: (1) direct browser access of all major pages in Chrome 120, (2) "site: domain" + google filetype:xml, and (3) manual sub-level access to check absence prior to a zero score. The composite Web 2.0 score (0–5) was calculated per association by adding up binary scores for all of the indicators.

3.3 Qualitative Content Checklist

A qualitative content evaluation checklist was created based on the study conducted by Haneefa and Venugopal (2010) and Gadhavi (2017) with six dimensions namely accuracy and relevance, currency, coverage and mission alignment, subject scope, terminology familiarity and usability. To minimize interpretive ambiguity, each dimension was operationally defined before coding. For the complete instrument, including operational definitions, and a standardized data entry sheet, see Appendix A, which is available from the corresponding author. Throughout, a binary Yes/No rubric (Yes = 1; No = 0) was used as shown in Table A.

3.4 Inter-Rater Reliability

All 18 websites were coded by both authors independently on all 11 evaluated dimensions (6 of qualitative content dimensions, 5 of Web 2.0 indicators), resulting in 198 coded cells. The Cohen's

Table A — Qualitative Checklist - Dimensions and Scoring Rubric

Dimension	Operational Definition (Yes = 1 / No = 0)
Accuracy & Relevance	Content is factually verifiable and pertains directly to the association's stated mission
Currency	At least one section updated within 12 months of observation (January–March 2025)
Coverage / Alignment	Content addresses the objectives articulated in the association's constitution or 'About' page
Subject Scope	Covers core LIS sub-domains with sufficient depth to serve practitioner information needs
Terminology	Consistent with standard LIS professional vocabulary; no disambiguation required for a practitioner audience
Usability	Main navigation menu accessible from all pages; text legible at default browser zoom; no load errors in Chrome 120

Kappa (κ) was calculated in Python 3.11, using the function `sklearn.metrics.cohen_kappa_score`. In all categories the agreements were high ($\kappa = 0.81 - 0.94$), which is "Almost Perfect" according to Landis and Koch (1977). Eleven cells (5.6%) showed disagreements, all of which were resolved through a structured discussion that was facilitated by predetermined operational definitions outlined by Lombard et al. (2002). Final scores are consensus values based on post-discussion. The results are summarized in Table B. The results of inter-rater reliability can be seen in Table B.

3.5 Analytical Tools and Cluster Threshold

All data processing and visualization were carried out in Python 3.11, with the libraries listed in Table C. HCA was performed with the 18×5 binary feature matrix of Web 2.0, using Ward's minimum variance linkage (`scipy.cluster.hierarchy.linkage`, `method = 'ward'`). Ward's linkage was chosen because it is the most suitable method for small binary datasets (Murtagh & Legendre, 2014). The cluster threshold set was the cophenetic distance of 1.5, which was found to be stable within a range of 1.2–1.8 and always produced three distinct clusters of coherent clusters. This is as the mean indexed pages (< 45) and mean external backlinks (< 12) were below Thelwall's (2009, p. 47) minimum threshold for validity, similar to Dhar and Gayan (2022). Analysis scripts are available from the corresponding author on request.

Table B — Inter-Rater Reliability Results

Category	No. of Dimensions	Cohen's κ	Interpretation†
Qualitative content dimensions	6	0.81-0.93	Almost Perfect
Web 2.0 feature indicators	5	0.94	Almost Perfect
Overall pooled (94.4% agreement)	11	0.87	Almost Perfect

†Landis & Koch (1977): $\kappa 0.81-1.00 = \text{Almost Perfect}$.

Table C — Python Libraries Used

Library	Version	Function
pandas	2.1	Data structuring and binary matrix construction
numpy	1.26	Array operations and score normalization
scipy	1.11	Hierarchical clustering (Ward's linkage) and dendrogram generation
seaborn	0.13	Binary feature heatmap visualizations
matplotlib	3.8	Radar charts, bar charts, and composite figure output
sklearn	1.3	Cohen's κ inter-rater reliability computation

4 Data Analysis and Interpretation

This section combines the findings in both webometric and qualitative analysis and is elaborately discussed with interpretative comments, which are correlated with the four research questions and five study objectives. Seven subsections present the results from basic availability information to qualitative content assessment and the adoption of Web 2.0 features, content coverage, linking patterns, usability, and lastly the clustering of digital maturity. The findings provide a glimpse at the current state, strengths, and gaps of professional LIS association websites in India and also show the maturity levels of the websites.

To facilitate readability across Tables 3–8, all association names are abbreviated. The following consolidated key should be consulted when interpreting tabular data throughout this section (Table 0).

4.1 Website Availability, Establishment Trends, and Geographical Distribution of LIS Associations in India

The three sources triangulation protocol led to the identification of a total of 23 Library and Information Science (LIS) associations in India. Table 1 shows

Table 0 — Abbreviation Key for LIS Association Names Used in Tables 3–8

Abbreviation	Full Association Name
ALA	All Bengal School Librarians' Association
BLA	Bengal Library Association
BSLA	Bombay Science Librarians' Association
CGLA	Central Government Library Association
DLA	Delhi Library Association
GLA	Gujarat Library Association
IALA	Indian Academic Library Association
IASLIC	Indian Association of Special Libraries and Information Centres
IATLIS	Indian Association of Teachers of Library and Information Science
ILA	Indian Library Association
KSLA	Karnataka State Library Association
KLA	Kerala Library Association
MLA	Madras Library Association
PLA	Punjab Library Association
RRRLF	Raja Rammohun Roy Library Foundation
SALIS	Society for Advancement of Library & Information Science
SIS	Society for Information Science
UPLA	Uttar Pradesh Library Association

Functional = publicly accessible and responsive during January–March 2025; Defunct = URL met one or more of the operational criteria for non-functionality defined in §3.1; No Website = no URL registered or identifiable through any source.

Table 1 — List of LIS Associations, Website Availability, and Functional Status

Sr. No.	Name of Library Association	Headquarters	Year of Establishment	URL
1	All Bengal School Librarians' Association	Kolkata	1990	absla.org.in
2	All Librarians Development Welfare Association	NA	NA	alamp.in
3	Assam Library Association	Guwahati	1938	assamlibraryassociation.org
4	Bengal Library Association	Kolkata	1925	blacal.org
5	Bombay Science Librarian's Association	Mumbai	1977	bosla.in
6	Central Government Library Association	Dehradun	2004	cgla.org.in
7	Delhi Library Association	New Delhi	1939	dlaindia.in
8	Gujarat Library Association	Vallabh Vidyanagar	1939	glavvn.wordpress.com
9	Indian Academic Library Association	Thrissur	1996	alaindia.org
10	Indian Association of Special Libraries and Information Centres	Kolkata	1955	iaslic1955.org.in
11	Indian Association of Teachers of Library and Information Science	Patiala	1969	iatlis.org
12	Indian Library Association	Delhi	1933	ilaindia.co.in
13	Indian Theological Library Association	Bengaluru	NA	https://www.oocities.org/itla_in/home.
14	Karnataka State Library Association	Bengaluru	1965	kalaonline.com
15	Kerala Library Association	Thiruvananthapuram	1972	keralalibraryassociation.com
16	Madras Library Association	Chennai	1928	madraslibraryassociation.com
17	Medical Library Association of India	New Delhi	1980	NA
18	Punjab Library Association	Patiala	1929	punjabla.org
19	Raja Rammohun Roy Library Foundation	Kolkata	1972	rrrlf.nic.in
20	Society for Advancement of Library & Information Science	Chennai	2002	salis.in
21	Society for Information Science	New Delhi	1976	sis.org.in
22	Uttar Pradesh Library Association	Lucknow	1935	tagorelibrary.tripod.com
23	Young Librarians Association	Bhopal	2008	NA

Status classification: Functional = publicly accessible and responsive during January–March 2025; Defunct = URL met one or more of the operational criteria for non-functionality defined in §3.1; No Website = no URL registered or identifiable through any source.

that there were 18 associations (78.2%) with functioning and publicly available websites at the time of data collection (January – March 2025), three associations with dysfunctional websites (13.04%) and two associations (8.6%) did not have a website at all. The four non-functional cases were without a registered website (All Bengal School Librarians' Association, All Librarians Development Welfare Association, Indian Theological Library Association & Uttar Pradesh Library Association) or had a URL that was classified as defunct because: (1) the HTTP error received on repeated access attempts was 404; (2) the DNS resolution failed; or (3) the Wayback Machine archive was not dated after January 2023. While Medical Library Association of India and Young Librarians Association do not have website at all. As shown in Figure 1, there is a wide, though not uniform, adoption of digital media in the Indian LIS Association sector.

Figure 2 depicts year wise establishment of LIS associations. The period of 1925 – 1935 saw the peak of association building, i.e. 5 associations were formed during this period which reflects the early

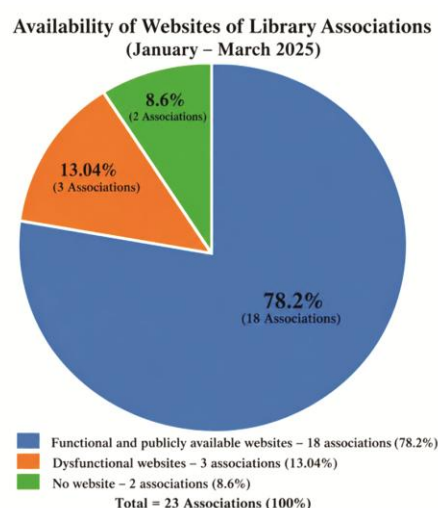


Figure 1 — Availability of Library Association Websites

stages of the library movement in India. Moderate growth was observed during 1935–1945, 1965–1975, 1975–1985, and 1995–2005, with three associations established in each period. Fewer associations were established in the other periods: in 1945–1965, 1985–1995 and 2005–2015, with only one association being

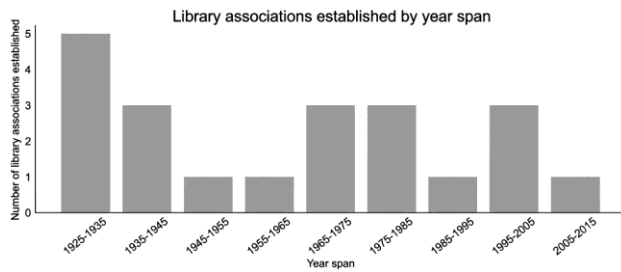


Figure 2 — Year-wise Establishment of LIS Associations

Table 2 — Distribution of LIS Associations across 12 Indian States

Sr. No.	Name of the State	No. of Library Associations
1	Assam	1
2	Delhi	4
3	Gujarat	1
4	Karnataka	2
5	Kerala	2
6	Madhya Pradesh	2
7	Maharashtra	1
8	Punjab	2
9	Tamil Nadu	2
10	Uttar Pradesh	1
11	Uttarakhand	1
12	West Bengal	4
	Total	23

established in each period. Overall, the trend is the result of varying growth in the number of library associations over the years, due to historical, educational and technological factors.

Table 2 and Figure 3 shows the geographical distribution of LIS associations in the 12 states of India. Delhi and West Bengal have the maximum number of these (4 each), followed by Karnataka, Kerala, Tamilnadu, Madhya Pradesh and Punjab (2 each). The uneven regional development and concentration of LIS activity in established academic centres are reflected in the fact that several states have just one association (Assam, Gujarat, Maharashtra, Uttar Pradesh and Uttarakhand).

The general trends show a strong website availability followed by variable growth over the last few years and a non-uniform distribution of LIS associations across the country. The majority of associations are digital and are located in regions where educational levels are higher, but there are still areas that need to be strengthened in the LIS network, both regionally and in terms of digital infrastructure.

Overall, the tables and figures reveal strong website availability, fluctuating historical growth, and uneven geographic distribution of LIS associations in

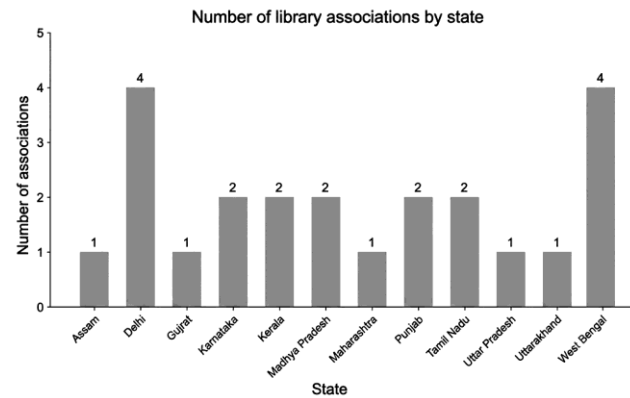


Figure 3 — Distribution of LIS Associations Across Indian States

Table 3 — Availability of Basic Organizational Information

Sr. No.	Name of Library Association	Homepage	Executive Body	Contact Us
1	ALA	AV	AV	AV
2	BLA	AV	AV	AV
3	BSLA	AV	NA	AV
4	CGLA	AV	AV	AV
5	DLA	AV	AV	AV
6	GLA	AV	NA	AV
7	IALA	AV	AV	AV
8	IASLIC	AV	AV	AV
9	IATLIS	AV	AV	AV
10	ILA	AV	AV	AV
11	KSLA	AV	AV	AV
12	KLA	AV	AV	AV
13	MLA	AV	AV	AV
14	PLA	AV	AV	AV
15	RRRLF	AV	AV	AV
16	SALIS	AV	NA	AV
17	SIS	AV	AV	NA
18	UPLA	AV	NA	NA

NA – Not Available; AV – Available

India. While most associations have a digital presence and are concentrated in educationally advanced regions, gaps persist in both regional representation and digital infrastructure, indicating areas for future strengthening within the LIS network.

4.2 Qualitative Information Features

The qualitative analysis of the 18 active LIS association websites shows significant differences in the content of the key organizational information (Table 3). A functional homepage was available on all 18 websites (100%), indicating that all websites have at least the minimum commitment to online visibility. But only 78% of associations provided information about their Executive Body and 89% had a "Contact Us" section. These numbers suggest that while most of the associations are aware of the importance of

having a basic online presence, some still missed important governance and communication details, potentially impacting member engagement and transparency among stakeholders.

Quality of information presented was examined according to content accuracy and currency to evaluate reliability of information. Table 4 reveals that 77.8% (14/18) of the websites had accurate and relevant information, while 66.7% (12/18) of the websites had regularly updated seminars, publications and events information. Online outdated and static content were observed in associations like Delhi Library Association, Gujarat Library Association, Society for Information Science and UPLA, which showed inconsistencies in the digital content maintenance and governance. Overall, there are many platforms that support the basic features of digital communication, but they are not always updated and so are not always a good platform for dynamic communication within an organization.

4.3 Web 2.0 and Interactive Features

Table 5 measures the extent of digital interactivity by examining five of the key Web 2.0 characteristics: presence of RSS feeds, sitemaps, internal keyword search, membership login and visitor counters. The analysis shows that the use of interactive functionality is not widely used for most association websites. The most frequently used features are sitemaps (7 of 18 sites, 38.9%) and a visitor counter (7 sites, 38.9%).

Table 4 — Accuracy and Currency of Website Information

Sr. No.	Name of Library Association	Accuracy & Relevance of Information	Latest Information about Seminar/Publication/Events
1	ALA	Yes	No
2	BLA	Yes	Yes
3	BSLA	Yes	Yes
4	CGLA	Yes	Yes
5	DLA	No	No
6	GLA	No	No
7	IALA	Yes	Yes
8	IASLIC	Yes	Yes
9	IATLIS	Yes	Yes
10	ILA	Yes	Yes
11	KSLA	Yes	Yes
12	KLA	Yes	Yes
13	MLA	Yes	Yes
14	PLA	Yes	No
15	RRRLF	Yes	Yes
16	SALIS	Yes	Yes
17	SIS	No	No
18	UPLA	No	No

These elements are mainly used for navigation and for basic usage statistics. Other more sophisticated interactive features are significantly under-represented: membership login is found on 4 websites (22.2%), internal keyword search on 3 websites (16.7%) and RSS feeds (the most dynamic feature for real time updates) on just 2 websites (11.1%). The figures are also significantly lower when compared to the results obtained by Dhar and Gayan (2022) who found 34% of international library association sites to be active with membership login, which indicates that Indian associations lag behind their international counterparts in terms of digital interactivity. The overall distribution shows that the majority of LIS associations' websites are not interactive websites but more like digital information repositories. The narrow selection of Web 2.0 elements also limits users' participation, the speed of communication and potential to improved digital interaction.

4.4 Content Coverage and Subject Scope

Analysis of the content coverage (Table 6) shows that content of the websites is very aligned with the associations' mission objectives: 83.3% (15 of 18) of associations have good mission alignment. An equal percentage (83.3%, 15/18) provided adequate responses to informational needs, indicating good content responsiveness. However, all of the websites

Table 5 — Adoption of Web 2.0 and Interactive Features on LIS Association Websites

Sr. No.	Name of Library Association	RSS Feed	Site map	Keyword Searching	Membership Login	Visitor counter
1	ALA	AV	AV	AV	AV	NA
2	BLA	NA	NA	AV	NA	AV
3	BSLA	NA	NA	NA	NA	AV
4	CGLA	NA	NA	NA	NA	NA
5	DLA	NA	AV	NA	NA	NA
6	GLA	NA	NA	NA	NA	NA
7	IALA	NA	NA	AV	NA	NA
8	IASLIC	NA	AV	NA	NA	AV
9	IATLIS	NA	NA	NA	NA	AV
10	ILA	NA	AV	NA	AV	NA
11	KSLA	NA	NA	NA	NA	NA
12	KLA	AV	AV	NA	AV	AV
13	MLA	NA	AV	NA	NA	NA
14	PLA	NA	NA	NA	NA	NA
15	RRRLF	NA	NA	NA	NA	AV
16	SALIS	NA	AV	NA	NA	AV
17	SIS	NA	NA	NA	AV	NA
18	UPLA	NA	NA	NA	NA	NA

NA – Not Available; AV – Available

Table 6 — Content Coverage and Subject Scope of LIS Association Websites

S. No.	Name of Library Association	Coverage According to Objective/Mission	Coverage According to Need of the User	Coverage about Subject Matter	Terminology Familiar to User
1	ALA	Yes	Yes	Yes	Yes
2	BLA	Yes	Yes	Yes	Yes
3	BSLA	Yes	Yes	Yes	Yes
4	CGLA	Yes	Yes	Yes	Yes
5	DLA	No	No	No	Yes
6	GLA	No	Yes	No	Yes
7	IALA	Yes	Yes	Yes	Yes
8	IASLIC	Yes	Yes	Yes	Yes
9	IATLIS	Yes	Yes	Yes	Yes
10	ILA	Yes	Yes	Yes	Yes
11	KSLA	Yes	No	Yes	Yes
12	KLA	Yes	Yes	No	Yes
13	MLA	Yes	Yes	Yes	Yes
14	PLA	Yes	Yes	Yes	Yes
15	RRRLF	Yes	Yes	Yes	Yes
16	SALIS	Yes	Yes	Yes	Yes
17	SIS	Yes	Yes	Yes	Yes
18	UPLA	No	No	No	Yes

Adoption of web 2.0 and interactive features in lis association websites

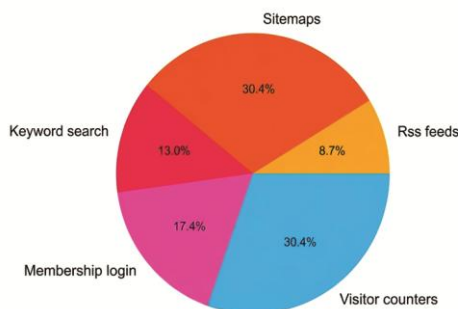


Figure 4 — Adoption of Web 2.0 and Interactive Features on LIS Association Websites

(14 of 18) address subject coverage, but only to a limited extent or breadth, as some associations do not have a complete depth or breadth of disciplinary content. Terminology familiarity is at the highest level of achievement (100%; 18 of 18) and this indicates that all associations have consistent use of clear and widely recognized LIS vocabulary which is an expected result for a specialist practitioner user group, but that LIS vocabulary has not been a barrier to use.

The findings are summarised in Figure 5 in the four evaluative dimensions. There are values ranging from 77.8% to 100%, mission alignment at 83.3%, user needs at 83.3%, subject coverage comparatively lower at 77.8%, and the terms familiar at 100%. The overall results indicate a fairly consistent digital content landscape, with a need for a greater depth of information on some websites, to better meet the

Content Coverage and Subject Scope of LIS Associations

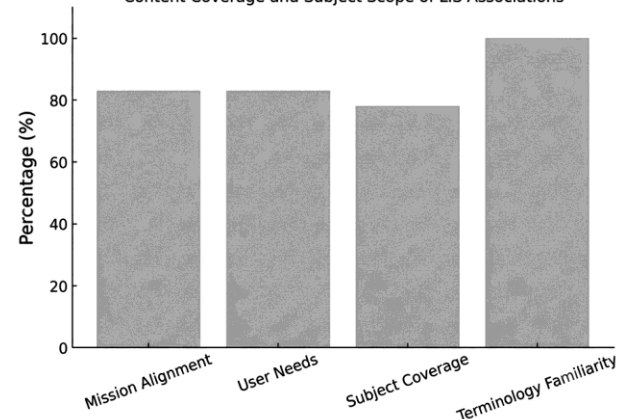


Figure 5 — Content Coverage and Subject Scope of LIS Association Websites

information needs of LIS practitioners and researchers.

4.5 Link Availability and Navigation

The current usability issues are summarized as follows: The usability problems are summarized as follows: The study of the 18 active LIS association websites shows a significant difference and a striking unbalance in the linking practice, both internal and external. Table 7 shows only 22.2% (4 out of 18) of websites have external links to other organisations or professional resources, suggesting that association websites are not integrated with the wider LIS information ecosystem but are more likely to be inward-looking. This weak external linking pattern

Table 7 — Link Availability and Navigation Features

Sr. No.	Name of Library Association	Links to Other Websites	Links for Further Information	Back & Forward Link
1	ALA	NA	NA	AV
2	BLA	NA	NA	AV
3	BSLA	AV	AV	AV
4	CGLA	NA	AV	AV
5	DLA	NA	NA	NA
6	GLA	NA	NA	NA
7	IALA	NA	AV	AV
8	IASLIC	NA	AV	AV
9	IATLIS	NA	AV	AV
10	ILA	AV	AV	AV
11	KSLA	NA	AV	AV
12	KLA	AV	AV	NA
13	MLA	NA	AV	AV
14	PLA	NA	NA	NA
15	RRRLF	NA	NA	AV
16	SALIS	NA	AV	AV
17	SIS	AV	AV	NA
18	UPLA	NA	NA	NA

NA – Not Available; AV – Available

directly confirms that the Web Impact Factor calculation methodology reported in §3.5 is methodologically excluded as the number of external links observed is below the minimum threshold set by Thelwall (2009, p. 47) for the statistically valid calculation of Web Impact Factor. Internal connectivity was relatively robust: 61.1% (11 of 18) of websites provided links to additional information like membership information, publications, and event information; 66.7% (12 of 18) of websites allowed the users to navigate backwards as well as forward easily, making it easier for the user to browse internally. Figure 6, which visualises this difference between external and internal linking, shows that currently the information flow from LIS associations in India is more focused on the internal direction of information than on creating wider inter-organisational digital connections.

Overall, the websites of LIS associations show that they are in good shape in terms of supporting information accessing and basic navigation within the association, but are not yet ready to support them externally for cross-organisational collaboration, sharing of resources and professional visibility in the wider national and international LIS community.

4.6 Usability and User-Friendliness

The usability features assessed show that most association websites are usable and navigable by their intended audience (Table 8). In the evaluation of user-friendliness in websites, 83.3% (15 of 18) websites

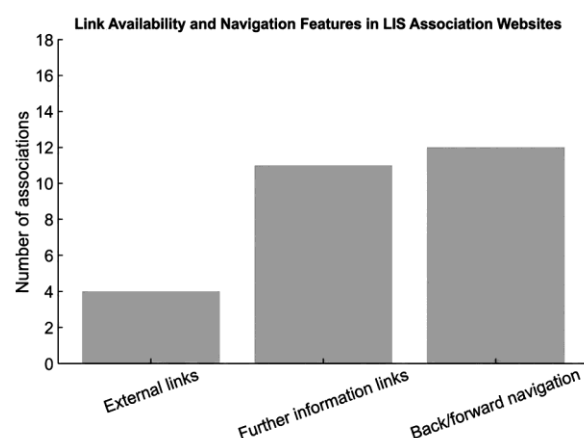


Figure 6 — Link Availability and Navigation Features

were found to be user friendly as they have good layouts, user friendly navigation structure and easy presentation of content. Three associations (Delhi Library Association, Gujarat Library Association, UPLA) got the 'No' on the user-friendliness criteria, which shows a lack of the clearness of navigability, page formatting, or the structural elements within the site that affected easy browsing. In terms of ease of understanding the content, 94.4% (17 out of 18) of sites offered information that was easy to understand. UPLA, however, was the only exception with No for both of the factors mentioned (i.e. a structural and language barrier to usability). This distinction is significant because although there is some structural usability gaps within three associations, there is a

Table 8 — Usability and User-Friendliness Scores of Association Websites

Sr. No.	Name of Library Association	User Friendly	Easily Understandable
1	ALA	Yes	Yes
2	BLA	Yes	Yes
3	BSLA	Yes	Yes
4	CGLA	Yes	Yes
5	DLA	No	Yes
6	GLA	No	Yes
7	IALA	Yes	Yes
8	IASLIC	Yes	Yes
9	IATLIS	Yes	Yes
10	ILA	Yes	Yes
11	KSLA	Yes	Yes
12	KLA	Yes	Yes
13	MLA	Yes	Yes
14	PLA	Yes	Yes
15	RRRLF	Yes	Yes
16	SALIS	Yes	Yes
17	SIS	Yes	Yes
18	UPLA	No	No

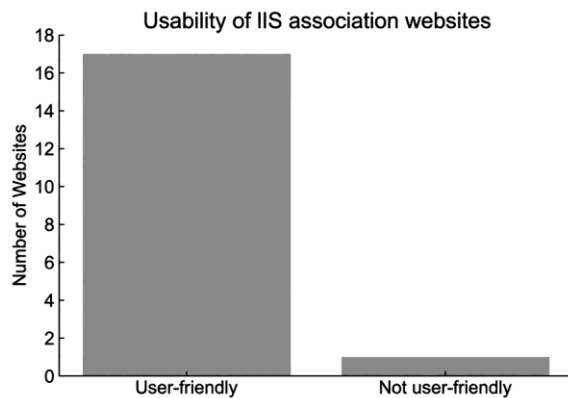


Figure 7 — Bar chart comparing user-friendly vs not user-friendly counts

wider dissemination of clarity of written language within the sector, indicating that the most significant factor to effective digital presence is not related to content communication skills.

4.7 Digital Maturity Patterns

The radar chart (Figure 8), the heatmap (Figure 9) and the cluster dendrogram (Figure 10) are advanced visual analyses that give a multidimensional understanding of the digital maturity of the 18 active websites of the LIS associations. Together, these visualizations show that there are significant gaps in the use of Web 2.0 features and that there is a significant digital divide in the sector. For this purpose, a radar chart comparing the top three digitally mature associations (ILA, Kerala Library Association (KLA), Assam Library Association) with

Top 3 vs bottom 3 LIS associations — Web 2.0 feature adoption (averaged)

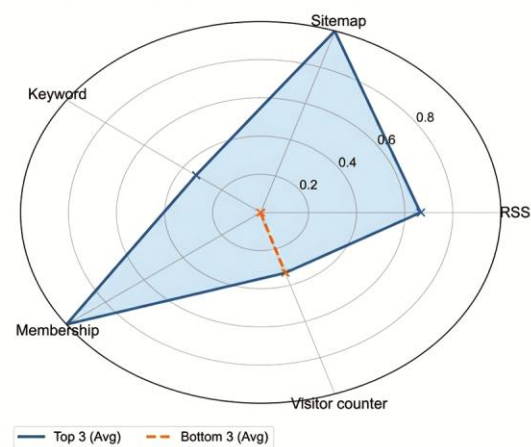


Figure 8 — Radar Chart Comparing Web 2.0 Feature Adoption (Top 3 vs Bottom 3 Associations)

the bottom three (Punjab Library Association (PLA), Gujarat Library Association (GLA), Karnataka State Library Association (KSLA)) is shown in Figure 8. The polygon showing the top three is wide and well formed, meaning that in each of the five features, adoption is consistently higher than in the others, with sitemaps averaging 1.0, membership portals averaging 1.0, and RSS feeds and keyword search showing some but significant adoption. On the other hand, the bottom three show a much smaller polygon, with scores of 0 or very low in all features, and visually communicate the level of the digital divide in the sector.

Figure 9 shows a heatmap of the complete 18×5 binary feature matrix, indicating that some interactive features are more frequently found in some associations and less frequently in others, and that there is only a small subset of associations that have multiple interactive features. Structural features and interactive features are most widely used in the Kerala Library Association, Assam Library Association, and ILA. It is in the moderate maturity band as IASLIC has partial adoption, namely, sitemap, visitor counter, but not RSS, keyword search or membership login. Most associations exhibit little or no implementation, especially in the areas of keyword search and RSS feeds. A heatmap provides further evidence of the lack of recognized digital standards or a consistent development approach in the sector.

The cluster dendrogram (Figure 10) clusters associations based on similarity in Web 2.0 feature adoption profiles, with a cophenetic distance threshold of 1.5 and a resulting three stable and

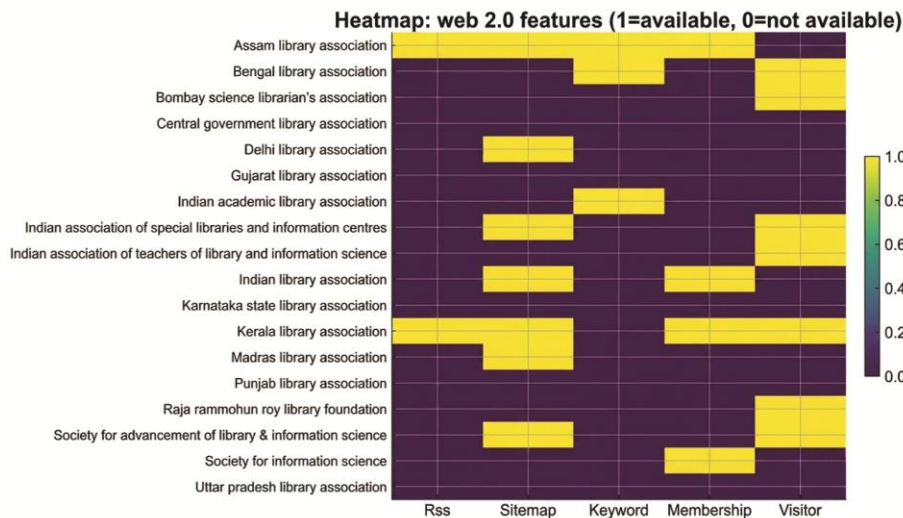


Figure 9 — Heatmap- Web 2.0 Feature Distribution Across All LIS Associations

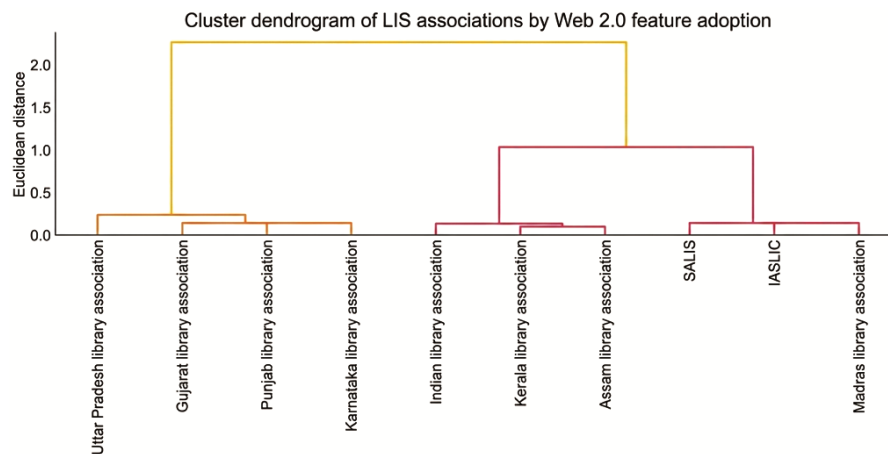


Figure 10 — Cluster Dendrogram - LIS Associations by Web 2.0 Feature Adoption

coherent clusters. The clusters represent different levels of digital maturity as below: b) High maturity cluster: Kerala Library Association, Assam Library Association and ILA, all of which show high adoption of interactive and structural Web 2.0 features, and are also more ready to enter the digital world than other LIS groups in India. b) Associations that have some success with some of the features, and none with others IASLIC, SALIS, and Madras Library Association indicate partial and inconsistent adoption, with some features (such as visitor counters and sitemaps) and others (such as RSS feeds and keyword search) being used, but not all, suggesting a developing, but incomplete, shift toward interactive digital platforms. C) Low maturity: Punjab Library Association, Karnataka State Library Association, Gujarat Library Association, UPLA, and others with a

very limited or zero Web 2.0 functionality — all of which are using a fixed structure on the web with no additional features.

The cluster dendrogram (figure 10) shows the grouping by the LIS Associations based on the Web 2.0 features. The radar chart, along with the heatmap and dendrogram, establish the fact that the digital preparedness of Indian LIS associations is diverse. What the high maturity cohort (KLA, ALA and ILA) shows is that it is possible to achieve meaningful adoption of Web 2.0 in the Indian LIS associational context if adequate organizational capacity exists and a proper professional setup. Partial progress is represented by the moderate-maturity tier, IASLIC, SALIS and Madras Library association. The majority of the large low maturities suggests that the sector is digital underperforming rather than outperforming

with the exception being the few outperformers. This three-tier stratification has implications for the professional communication, member involvement and organizational visibility, and highlights the importance of the need for targeted digital development strategies and increased sector-wide standardization as detailed in the following sections – Discussion and Recommendations.

5. Discussion

The results of this study paint a picture of an industry with uneven and partial digitalization, with a small group of highly developed and professionally mature associations having a meaningful digital presence, and the rest having limited and resource-poor digital environments. The results are summarized in the four dimensions of the Björneborn and Ingwersen (2004) webometric framework; they are then framed in relation to relevant literature and analyzed in terms of the structure that accounts for these patterns.

5.1 Content Quality: Adequate but Unevenly Maintained

The quality of the content is adequate but is not consistently maintained. The information usability dimension in the framework proposed by Björneborn and Ingwersen (2004) is evaluated by analyzing the accuracy, currency, coverage and usability of information found in institutional websites. Indian LIS association websites do not look too attractive in comparison to these criteria. Content accuracy in terms of score from evaluative criteria is relatively high, 77.8% of websites scored above the evaluative criterion, and mission alignment is at 83.3% with a score above the evaluative criterion, which is consistent with the Haneefa and Venugopal (2010) assessment of Indian national library websites where informational adequacy was also found to be the strongest performing dimension of the evaluated criteria. But content is even more important. One third of the associations did not have updated information as the Chandra (2015) study on Web impact of Indian LIS associations and Brahma and Verma (2018) study on the study of the impact of university websites (based on NIRF) found content stagnation in association websites not due to technological limitations but because of lack of formalized digital editorial governance. This interpretation is confirmed by the present results: The associations with the lowest currency scores (DLA, GLA, SIS, and UPLA) are not the technologically weakest associations in total, indicating that governance and staffing

structures are likely the immediate cause of content neglect rather than technical barriers. The highest content dimension score was usability with 83.3%, meaning that most associations have developed a functional level of usability in their navigation, but three showed compound usability and content clarity issues that need specific remediation.

5.2 Link Structure: Isolated Digital Entities

The link structure pillar assesses how websites are connected to the wider network of inter-organizational digital connections via external hyperlinking and structured internal connections. The results on this dimension are the most troubling of all the dimensions examined. Only 22.2% of association websites had external connections with related professional bodies, or government agencies or LIS resources, which is low compared to other institutional benchmarks. Even in developed Indian public and national libraries, Verma and Brahma (2017a) found that there is low external link density due to lack of awareness about SEO practices among users and lack of conventions for reciprocal linking in the library sector. The present study reveals that this trend is also applicable to professional associations, and that it might be accentuated because of professional associations' operational models that are mostly voluntary. In the case of Sri Lanka, Ramanayaka et al. (2018) reported that in the South Asian web environment of university libraries, lack of external links was the most consistent predictor of low web impact scores, with the allied result of the absence of professional web management staff in the LISs in Sri Lanka in comparison to the presence of such staff in the other institutional web sites in South Asia, indicating a structural parallel that could be directly translated into the context of the Indian LIS association studied here. The message is obvious: associations' ability to link with each other and to be linked to others will continue to be low if they do not have the human resources in-house or inter-associational coordination within association groups to support reciprocal linking practices, which is also the case for professional visibility and discoverability via search engines.

5.3 Web 2.0 Adoption: A Critical Structural Gap

The most important finding of the study is the technological evaluation pillar of the framework, which is the one most relevant to the present-day digital maturity. The adoption of Web 2.0 on LIS association websites is very low in India and is

consistent across all association websites. The other two dimensions that achieve the lowest level of implementation are RSS feed at 11.1% and keyword search at 16.7% which is twelve percentage points below the international benchmark set by Dhar and Gayan (2022) of 34% membership login adoption rates among similar library associations internationally; both are significant areas needing improvement, particularly for membership management as this is a core operation of any library organization that has clear benefits from the use of digital tools. The adoption rates are in line with the general trend described by Mukunde and Prakashe (2023) which argues that voluntary staffing and limited institutional resources are the two main structural barriers to the adoption of Web 2.0 in LIS professional bodies. In a comparable study, Walia and Gupta (2015) concluded that there is a general trend among Indian LIS institutions to focus on providing information rather than interactive features. The result is that most association sites are static, rather than dynamic, web properties—limiting their ability to engage members, reach out to them in real time, and conduct professional outreach in today's dynamic digital world. It is worth mentioning that the Web 2.0 features evaluated in this study are a pre-existing set of features based on previous similar studies. In the current assessment framework, the following features were not considered because of their methodological incomparability: the integration of social media, the mobile friendliness of a website and the security of the website protocol HTTPS. However, the low adoption figures for these basic features indicate that performance on harder-to-measure more modern indicators is even lower and hence will need systematic and sustained measures to resolve the digital divide.

5.4 Digital Maturity Stratification

A Structural Divide The cluster analysis reveals that the 18 active association websites fall into three different digital maturity levels: The first cluster of three websites has high maturity, Kerala Library Association, Assam Library Association, and ILA. The second cluster of three websites are at a moderate level of maturity, namely, IASLIC, SALIS and Madras Library Association. The majority of the remaining twelve websites are at a low level of maturity. This stratification on 3 levels is not arbitrary. It captures structural factors that have a long-term effect on a professional association's ability to support digital development, including factors such

as its organizational age, geographic location, professional infrastructure and membership base. There are several similarities in the high-maturity associations, all three are the oldest and most institutionalized associations in India, each has a significant number of members and all have their headquarters in areas of the country that have established LIS professional networks and higher education institutions. As a matter of fact, Kerala Library Association and Assam Library Association are state-oriented associations, where the public library legislation and government library development programmes have a long history of fostering the professionalization of library services which helps to sustain higher digital standards indirectly in the professional bodies. The patterns align with Ramanayaka, et al. (2018) who found that the overall performance of an organization's institutional websites is closely linked to the overall institutional infrastructure setting in which the organization operates. The low maturity majority, on the other hand, has smaller, concentrated or new associations, limited resources for their organization, and no dedicated digital management position in their organization, and no publicly documented digital development plan. This structural orientation is in line with the theoretical framework put forward by Björneborn and Ingwersen (2004) that technological evaluation scores are not just about technical capacity, but are also indicative of institutional tendencies and choices concerning the use of digital development as a professional priority. This digital divide, as documented in this study is a governance and resourcing divide just as much as it is a technological divide.

5.4 Digital Maturity Stratification: A Structural Divide

The cluster analysis identifies three distinct digital maturity tiers among the 18 active association websites: a high-maturity cohort comprising Kerala Library Association, Assam Library Association, and ILA; a moderate-maturity group comprising IASLIC, SALIS, and Madras Library Association; and a large low-maturity majority encompassing the remaining twelve associations. This three-tier stratification is not random. It reflects underlying structural conditions — organizational age, geographic location, professional infrastructure, and membership base that systematically differentiate associations capable of sustaining digital development from those that cannot.

The high-maturity associations share several characteristics: all three are among the oldest and most institutionally established associations in India, each maintains a substantial membership base, and each is headquartered in regions Kerala, Assam, and Delhi with well-developed LIS professional networks and higher education infrastructure. Kerala Library Association and Assam Library Association, in particular, operate within state contexts where public library legislation and government library development programmes have historically supported the professionalization of library services, providing an institutional environment that indirectly sustains higher digital standards in associated professional bodies. These patterns are consistent with Ramanayaka et al.'s (2018) finding that South Asian institutional web performance correlates strongly with the broader professional infrastructure context in which an organization is embedded.

Conversely, the low-maturity majority is characterized by smaller, regionally concentrated, or recently established associations with limited organizational resources, no evidence of dedicated digital management roles, and no publicly documented digital development strategy. This structural explanation aligns with the theoretical argument advanced by Björneborn and Ingwersen (2004) that technological evaluation scores reflect not merely technical capacity but the broader institutional commitments and resource allocations that determine whether digital development is treated as a professional priority. The digital divide documented in this study is, in this sense, a governance and resourcing divide as much as it is a technological one.

5.5 Towards a Sector-Wide Digital Agenda

The loose connection of external links, low adoption of Web 2.0 technologies, as well as a lack of content currency across most of the LIS associations' websites is indicative of the lack of any sector-wide standards framework for the digital dimension. Professional LIS associations in India do not have any comparable regulatory push for digital development as university libraries do in NAAC and NIRF (National Assessment of Accreditation and Citation) accreditation and certification processes. Without external accountability mechanisms, and with mostly voluntary governance bodies and limited funding, digital stagnation is the usual result. The digital environment is rapidly changing, with mobile-first

web design, real-time content delivery, and integrated social media communication becoming more commonplace, leaving associations with outdated web construction and infrastructure susceptible to a growing disconnect between their online presence and the expectations of younger and more digitally savvy LIS professionals (Talipova et al., 2024). Such a shift can be realized cooperatively at various levels: at the individual association level, with investment in the editorial governance process and in the implementation of basic interactive features; at the national coordinating level, through the creation and dissemination of a Digital Standards Charter, as proposed by IFLA India; and at the government funding agency level, through the incorporation of digital benchmarking criteria into the recognition and grant allocation process, as discussed in the Recommendations section.

The convergence of weak external linking, low Web 2.0 adoption, and content currency gaps across the majority of Indian LIS association websites reflects the absence of any sector-wide digital standards framework. Unlike university libraries, which are subject to NAAC and NIRF accreditation processes that include digital infrastructure as an evaluative criterion, professional LIS associations in India operate without comparable regulatory incentives for digital development. This absence of external accountability mechanisms, combined with predominantly voluntary governance structures and constrained financial resources, creates conditions under which digital stagnation is the predictable default outcome.

The emergence of increasingly dynamic digital environments — including mobile-first web design, real-time content delivery, and integrated social media communication — means that associations maintaining static web infrastructure risk progressively widening the gap between their digital presence and the expectations of younger, digitally native LIS professionals (Talipova et al., 2024). Addressing this trajectory requires coordinated action at multiple levels: individual associations must invest in editorial governance and basic interactive feature implementation; national coordinating bodies such as IFLA India must develop and promote a Digital Standards Charter; and government funding agencies must integrate digital benchmarking criteria into recognition and grant allocation frameworks, as elaborated in the Recommendations section.

Limitations of the Study

These five methodological limitations need to be understood in the context of the results of this study, which limits the scope of the conclusions that are drawn from the evidence presented. The observed patterns of digital maturity of the Indian LIS association websites is only a snapshot as data were collected from the beginning of early January 2025 to the end of early March 2025; it is essential that further research be conducted at two to three-year intervals to establish whether the observed patterns were enduring or ephemeral. Secondly, the sample consisted of only 23 LIS associations at the national and state level, with the exclusion of informal networks, sub-groups at the regional level, special interest groups, and digital-only communities; therefore, the results reported in this document are limited to this organizational type, and comparisons would require individual studies based on the regulatory context of each country. Third, the content evaluation, and Web 2.0 feature evaluation followed a simple present/absent (1/0) scale that allowed for the consistent comparison of content and Web 2.0 features across sites, but could not capture how well, how often, or how deeply each feature was used; for example, one portal may have 10 members and another may have thousands, but both would score equally for a Web 2.0 feature, such as a login portal, which was present. Future work should use graduated scales or Likert-type scales or include actual usage data. Fourth, the average number of indexed pages on the sites (which are less than 45) and external links (which are less than 12) were below the threshold required in the methodology of Thelwall (2009) and this study can therefore not be compared directly with earlier webometric institutional studies based on Web Impact Factor, although a larger or better-indexed site could be included in future studies. Lastly, the study did not evaluate accessibility or technical performance—dimensions that are increasingly being used by webometric researchers since 2020, such as page load speed, mobile responsiveness, color contrast, screen reader compatibility, and HTTPS security—that are just present and do not necessarily mean they are useful for users; future studies should utilize tools for measuring these aspects of a website, like WAVE or Google Lighthouse, to bridge the gap between features available and real usability.

6 Conclusion

This study reveals the first all encompassing national level Webometrical evaluation of the web

presence of all the 23 professional Library and Information Science (LIS) associations in India, based on website availability, qualitative assessment of the websites content, acceptance of Web 2.0 features, usability and online visibility. The results indicate that the sector has broadly adopted a digital medium but not deeply enough as most sites are at a basic information level, not particularly interactive, with few links to external sites and a lack of regular updates to content. The features that are most widely implemented are sitemaps (38.9%) and visitor counters (38.9%), and the tools that are most essential to user engagement and discoverability, such as RSS feeds, are far less prevalent (11.1%), or even not implemented at all (16.7%). The findings based on the four-pillar analysis of Björneborn and Ingwersen (2004), i.e. content analysis, link structure, usage analysis, and technological evaluation, show that the sector is lacking in several critical areas: the content of associations' online presence is satisfactory (Pillar 1), their link structure is insufficient (Pillar 2), their usage analytics infrastructure is virtually nonexistent (Pillar 3), and their technological features are weak (Pillar 4). This is similar to that observed among other voluntary professional organizations that lack digital governance capacity (Dhar & Gayan, 2022; Ahmadian & Deshpande, 2013) and is also a structural (rather than merely technical) gap arising from various factors: limited resources, lack of mandatory digital standards, and mainly voluntary staffing of association secretariats, etc. The cluster analysis reveals a clear digital divide within the sector but in three distinct tiers. The success of the three associations, namely Kerala Library Association, Assam Library Association and ILA signifies the possibilities of having a strong digital presence within the associational ecosystem of Indian LIS. They appear to be enabling factors in that they are closely related to success in this study. The large majority of the low-maturity, however, suggests a non-uniform distribution of these enabling conditions. In terms of methodology, this study contributes to the webometric analysis of professional associations by using a cluster analysis for the initial data, a scoring system for the features of the website, and a content analysis of the literature on the website. The method used in this study consists of quantitative feature scoring, qualitative content assessment, and cluster analysis using Python within the integrated digital maturity framework, which was not implemented in previous work to analyze the webometric evaluation of

professional associations at the national level in the context of LIS in India. The digital maturity typology developed from cluster analysis (high, moderate, low) provides an instrument for replicable classification for future tracking and cross-national comparison. The study thus provides empirical information on the existing digital landscape as well as a methodological framework for future sectoral audits. There are three main limitations of the study. First, data reflect a cross-sectional snapshot (January–March 2025) and may not reflect increased or decreased activity of content, or changes over time. Second, insufficient external link data was obtained, preventing link-structure analysis, and so WIF could not be calculated. Third, the findings are limited to the context of the Indian national situation, and replication in other countries in order to generalise findings is needed. These limitations should be further explored in the future using a longitudinal design, automated crawling tools and international comparison samples.

7 Recommendations

The recommendations which came out of this study are evidence-based and directly linked to the digital deficiencies identified from the qualitative assessment, Web 2.0 feature analysis and digital maturity clustering. The gaps observed are at the organizational, infrastructural and policy level, thus the recommendations are organized by the stakeholder groups who are more likely to take action to address the gaps.

For LIS Associations:

- Ensure that a standardised website structure of homepage, executive body, contact, events, publications and membership portal is provided at a minimum.
- Enable dynamic tools to distribute and discover content – RSS feeds, XML sitemaps and by internal keyword search systems – as immediate priorities.
- Check content currency, accessibility compliance (WCAG 2.1), SEO metadata quality, and broken-link ratios twice a year via web audit.
- Designate an official digital officer to undertake website responsibilities.

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For IFLA India / National Coordinating Bodies

- Create and publish National Digital Standards Charter – with minimum website requirements for all affiliated associations.
- Identify and develop a national directory of LIS association profiles that can be linked to one another to boost the collective impact and reach of LIS associations online, through links.
- Conduct peer-learning workshops between high-maturity associations (KLA, ALA-Assam, ILA, IASLIC) and low-maturity associations.
- Every three years conduct a longitudinal follow-up webometric study to monitor the overall digital development in the sector.
- Create a periodic national digital benchmarking index for LIS association websites that will provide a measure of the development of usability, visibility, accessibility and Web 2.0 usage.

For Government & Funding Bodies (RRRLF, MHRD)

- Fund specific redevelopment, hosting and digital capacity building of websites for voluntary associations with low capacity.
- Increase access to and participation in digital media and social networking for young people in LIS associations.
- Develop a shared open-source CMS template as per the needs of Indian LIS Associations, thereby lowering the cost barrier in its adoption.

For LIS Educators and LIS Schools

- Incorporate assessment of websites and webometrics, into LIS curriculum and practical learning sessions along with the basics of SEO and digital governance.

- Have student perform web audits and usability testing of professional association sites as applied research.
- Incorporate practical training on content management systems (CMS), metadata optimisation and Web 2.0 tools into LIS laboratory courses.
- Encourage joint academic programs among LIS departments and professional organizations to improve websites and digital communications.

These recommendations put together an integrated digital development model for LIS associations in India. From the organizational perspective, associations need to improve the quality of their websites, their online interactivity and content control. National coordinating bodies should define common rules, and create a shared digital ecosystem, while governments should face infrastructural and financial challenges with targeted support and action mechanisms. At the same time, LIS educators have to do something to contribute: to create digitally competent professionals who have the ability to manage the web and communicate digitally. All these interventions can make the website of the LIS association into a dynamic, interconnected, professionally visible digital knowledge environment.

References

- 1 Ahmadian F & Deshpande N J, Evaluation of selected library association websites, *Aslib Proceedings*, 65(2) (2013) 92-108.
- 2 Ali M L, Webometric analysis of alternative access to scholarly publication: Special reference to LibGen and Sci-Hub, *International Journal of Information and Knowledge Studies*, 3(1)(2023) 85-102.
- 3 Almind T C and Ingwersen P, Informetric analyses on the World Wide Web: Methodological approaches to "webometrics." *Journal of Documentation*, 53(4) (1997) 404-426.
- 4 Björneborn L and Ingwersen P, Toward a basic framework for webometrics. *Journal of the American Society for Information Science and Technology*, 55(14) (2004) 1216-1227.
- 5 Brahma K and Verma M K, Evaluation of selected universities' library websites listed by National Institutional Ranking Framework (NIRF) during the year 2017: A webometric analysis, *Journal of Scientometric Research*, 7(3) (2018), 173-180.
- 6 Chandra J, Web impact of Indian library associations. *RBU Journal of Library and Information Science*, 17 (2015) 12-19.
- 7 Clark J A and Rossmann D, The Open SESMO (Search Engine & Social Media Optimization) project: linked and structured data for library subscription databases to enable web-scale discovery in search engines. *Journal of Web Librarianship*, 11(3-4) (2017) 172-193.
- 8 Dhar P and Gayan M A, A webometric study of selected international library association websites: An evaluative study. *DESIDOC Journal of Library & Information Technology*, 42(3) (2022) 185-190.
- 9 Gadhavi G G, Content analysis of library websites of Institute of National Importance: A critical analysis. *International Journal of Innovative Research in Science, Engineering and Technology*, 6(8) (2017) 16620-16627. <https://doi.org/10.15680/IJIRSET.2017.0608280>
- 10 Hadagali B L, Hiremath S S and Kenchannavar P. Evaluation of Indian Institutes of Technology (IITs) library websites: A webometric analysis. *International Journal of Library and Information Studies*, 11(1) (2021) 1-14.
- 11 Haneefa M K and Venugopal A M K, Contents of national library websites in Asia: An analysis. *Annals of Library and Information Studies*, 57(2) (2010) 98-108.
- 12 Joicy J and Varghese R, Website evaluation of research and development institutions in India. *International Journal of Library Science*, 17(2) (2019) 45-53.
- 13 Madhusudhan M and Prakash S, Websites of Indian Institutes of Technology: A webometric study. *International Journal of Library and Information Studies*, 3(4) (2013), 93-107.
- 14 Mukunde K S and Prakashe V A, Webometric research: An evaluative review of published literature. *Res Militaris*, 13(2) (2023) 8322-8335.
- 15 Parmar K and Mandalia M, evaluating library websites using web analytics and link analysis. *International Journal of Information Research*, 5(2) (2016) 123-135.
- 16 Qiu, J, Chen Y and Chen P, An empirical study of web hyperlink analysis for academic institutions. *Scient metrics*, 61(3) (2004) 453-470.
- 17 Ramalingam J, Web page analysis of IIT websites: A webometric study. *International Journal on Digital Libraries*, 3(1) (2013) 55-63.
- 18 Ramanayaka T, Pasqual H and Jeyasekara S, . Webometric analysis of university library websites in Sri Lanka. *International Journal of Knowledge Studies*, 3(1) (2018), 85-102.
- 19 Satpathy K C, Indian library professionals at the crossroad: Who is to be blamed? In Book Chapters (Chapter 32). Indian Statistical Institute Repository. (2020) <https://digitalcommons.isical.ac.in/book-chapters/32>
- 20 Shukla A and Tripathi M, Backlink analysis of premier Indian institutes' library websites. *DESIDOC Journal of Library & Information Technology*, 36(5) (2016). <https://doi.org/10.14429/djlit.36.5.10944>
- 21 Shukla A and Tripathi A, Webometric Studies and Libraries. (Ess Ess Publications,;New Delhi) 2015.
- 22 Still J, A content analysis of university library web sites in English-speaking countries. *Online Information Review*, 25(3) (2001) 160-165.
- 23 Talipova B, Ganiyeva S, Normatov S, and Rakhmatullaev M, Website quality in libraries using an integrated approach of web analytics and fuzzy logic. *Res Militaris*, 13(2) (2024) 1-15.
- 24 Thanuskodi S A webometric analysis of selected institutes of national importance websites in India. *International Journal of Library Science*, 1(1) (2012) 13-18.
- 25 Thelwall M, Introduction to webometrics: Quantitative web research for the social sciences, (Morgan & Claypool Publishers; California), 2009.

- 26 Vález, M., & Ventura, A. (2020). SEO visibility and performance of university library websites. *Journal of Librarianship and Information Science*, 52(4), 1052–1068.
- 27 Verma, M. K., & Brahma, K. (2017a). A webometric analysis of national libraries' websites in South Asia. *Annals of Library and Information Studies*, 64(2), 116–124.
- 28 Walia, P. K., & Gupta, M. (2015). Web impact factor of selected national libraries' websites. *International Journal of Information Dissemination and Technology*, 5(3), 200–205.
- 29 Yalcin, M. A., & Köse, U. (2010). What is search engine optimization: SEO? *Procedia – Social and Behavioral Sciences*, 9, 487–493. <https://doi.org/10.1016/j.sbspro.2010.12.185>