

Competencies of Library Professionals in Higher Education: A bibliometric analysis of global research output (1996–2025)

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Mrutyunjay Sethy¹, Sabitri Majhi²

ABSTRACT

Purpose: This study examines the growth and development of research on the skills, competencies, and personality traits required by Library and Information Science (LIS) professionals in higher education institutions. Rather than assessing the competencies of academic librarians directly, the study provides a bibliometric overview of the research published on the competencies required by LIS professionals over the past three decades.

Methodology: A systematic search of the Scopus database was conducted for the period 1996–2025 using the PRISMA framework. The search initially retrieved 7,652 records, which were screened and refined to obtain a final dataset of 2,914 research articles. Microsoft Excel, Python, and the Biblioshiny package in R were used to analyse publication output, citation impact, and relationships among selected bibliometric indicators.

Findings: The results show a substantial growth in research on LIS professional competencies during the study period. Publication output increased from a small number of articles in the late 1990s to

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Sabitri Majhi



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¹ Dept. of Library and Information Science, Berhampur University, India; Email: sethyrmutyunjay@gmail.com ; ORCID: [0000-0002-9382-6578](https://orcid.org/0000-0002-9382-6578)

² PG Dept of Library and Information Science, Sambalpur University, India; Email: sabitrirajhi@suniv.ac.in ; ORCID: [0000-0003-3290-6301](https://orcid.org/0000-0003-3290-6301)

<i>several hundred articles annually after 2020, with an average annual growth rate of 12.1%. The retrieved literature received more than 48,000 citations, with an average of 16.4 citations per article and an h-index of 92. However, the citation rate per article has declined in more recent years, falling from more than 15–20 citations for articles published during the mid-1990s to early 2000s to fewer than 10 citations for articles published after 2015. A moderate-to-strong positive correlation was found between annual publication output and mean citations per article ($r = 0.62$), whereas a strong negative correlation was observed between article volume and citable years ($r = -0.95$), indicating the important effect of publication recency on citation accumulation.</i> Implications: <i>The study highlights the increasing scholarly interest in the professional skills and competencies required of LIS professionals in higher education. The findings can inform academic librarians, LIS educators, and institutions involved in professional development and academic research by identifying the growing body of knowledge surrounding LIS competencies. The decline in citation rates among recent publications also suggests a need to improve the visibility, dissemination, and scholarly engagement of research in this area.</i>	
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Keywords: Bibliometric Analysis, Competencies, Skills, PRISMA, Citation Impact, Research Evolution

1. INTRODUCTION

In the contemporary knowledge-driven society, higher education institutions rely heavily on academic libraries to support teaching, learning, and research activities. The effectiveness of these libraries is largely determined by the competencies of library professionals who manage information resources, provide advanced information services, and facilitate access to scholarly communication systems. With the rapid advancement of digital technologies, the role of librarians has expanded beyond traditional collection management to include data management, digital scholarship, information literacy instruction, and research support services. Consequently, the development of professional competencies has become a critical requirement for library professionals working in higher education institutions. Recent studies emphasise that modern academic librarians must possess a diverse set of competencies, including technological skills, data management abilities, and collaborative capabilities to effectively support institutional research and learning environments (Bentil & Liew, 2024; Sa’ari et al., 2024)

The capability set, which is a requisite for library and information science (LIS) professionals, is so diverse, complex, and perpetually evolving that they are essentially the ones who have to literally live and breathe the latest changes in the information ecosystem. One of the main components of these skills is the flawless integration of the desired personality traits with the professional abilities. Research reveals that the level of library and information professionals'

skill is largely influenced by their individual personality traits, which in turn suggests that not only can personality tests be used to discover skills but also that they can be employed to establish recruitment criteria at the highest academic and research institutions (Mandal et al., 2025). The professional skills of library and information science (LIS) specialists are not limited to technical expertise; they also encompass the ability to work well with others and certain motivational factors that influence employees' performance in their respective jobs. According to Nagata (2010), these skills are most often easily identifiable and are even more pronounced than individuals' cognitive or intellectual skills. This highlights the importance of a well-rounded approach to developing both soft and hard skills in LIS through formal education and on-the-job training. In addition, the extension of library and information science professionals' roles in higher education is geared towards creating information-literate students who can competently interact with a complex global society. It thus implies a move from merely skills-based to a deeper understanding of the social, cultural, economic, and political factors governing information access, retrieval, use, and creation (Kutner et al., 2012). To perform at their best, LIS professionals must invest in continuous professional development. The ever-changing dynamics of higher education and new information technologies call for university libraries not only to adjust but also to empower their employees with the necessary knowledge and skills to provide resources and services effectively (Tseke, 2021).

Academic libraries remain at the core of the education system. Apart from serving as the main knowledge sources for teaching, learning, and training, they also indirectly help educational institutions achieve their goals and missions (Bhatt, 1995; Mandal et al., 2025). As main repositories of knowledge and access points to information, academic libraries together with the librarians, should come up with innovative ways of meeting users' information needs in the light of the revolutionary change in knowledge creation and management, the ceaseless appearance of the new web sources, and the progress of information search and retrieval tools (Mosha & Ngulube, 2024; Mandal et al., 2025). This is a direct result of the sharp rise in demand for Information Technology during and even after the COVID-19 pandemic (He et al., 2021; Mandal et al., 2025). The rapid online dissemination of information, technological advancements, and generational shifts are redefining library services in the twenty-first century (Kaur & Sharma, 2018; Mandal et al., 2025). Continuous professional development has been made mandatory to keep pace with these technological upgrades (Rehman et al., 2024; Mandal et al., 2025).

This study aims to develop a model of the key competencies that library and information science professionals are expected to possess in a modern, technologically oriented library, while accounting for their personality traits. The model, such as this, would be an extremely convenient tool for recruitment organisations to identify candidates who not only have the highest potential to cope with the ongoing development and maturation of library services but also to contribute to them (Mandal et al., 2025).

The statement above clearly underscores the pivotal role of continuous learning and the ability to adapt to technological change when interacting with others (Ferguson & Harrington, 2020; Raju, 2020; Dube et al., 2024). The present systematic literature review (SLR) focuses primarily on the core skills and competencies required of librarians in today's technology-dependent workplace. It also investigates how these skills are realised in current educational curricula and highlights the challenges librarians face in acquiring and improving them (Dube et al., 2024).

1.1. Objectives

The objectives of the study as follows:

- To identify and quantify the most critical competencies for LIS professionals in higher education
- To analyze the distribution and frequency of key skills and personality traits among LIS professionals
- To interpret the graphical data, highlighting common trends and patterns
- To assess the correlation between specific competencies and professional effectiveness
- To develop a data driven framework for the professional development of LIS personnel
- To provide actionable recommendations based on the analyzed visual data to enhance LIS education and training programs.

2. REVIEW OF LITERATURE

Kumar and Bhatt (2019), in their study, argue that a common finding in the LIS literature is the importance of acquiring technical (hard) and interpersonal (soft) skills by professionals. Some experts have claimed that soft skills are as crucial as hard skills in achieving success towards the professional level. Insufficient focus on soft skills and professional communication has resulted in librarians being less successful in the global job market, despite holding degrees and qualifications. In the same way, Gabhane (2015) found that skills such as effective communication, strategic management, and negotiation are acquired gradually through education and experience, and that integrating specialised knowledge with soft skills contributes to library development and the personal growth of librarians. Sadlapur and Patil (2014) had listed a wide range of soft skills that are necessary for good library services like communication, teaching, listening, attentiveness, negotiation, team work and writing. In tandem with this, Sadlapur and Kamble (2021) emphasized that library professionals need to be continuously trained to stay updated with the dynamic LIS environment by acquiring a set of comprehensive skills including technical, soft skills, leadership and decision-making skills. Similarly, Balagopal (2019) proposed library managers to possess management skills such as planning, organizing, leading, controlling, time management and decision making to improve the effectiveness and quality of library service.

Communication skills appear to be one of the most consistently highlighted skills in the LIS literature. Effective communication plays a crucial role in professional development and is associated with personality development, understanding complex situations, and overall career success, as emphasized by Sarkar (2020). Similarly, Moita (2015) stated that communication has close linkages with the development of personality in librarians, and therefore, the librarians need to develop skills of library teaching, writing, project management, public relations, interpersonal skills and customer relations. Afkhami et al. (2019) gave empirical input to the area, testing the communication skills of librarians, and the result showed that there was strong performance in non-verbal communication skills, but weak performance in verbal communication skills with no significant difference on the basis of demographic and professional characteristics. This discovery is indicative of the need for specific training for library employees in verbal communication. Saunders et al. (2013) in their international study found that research skills, information literacy, oral communication and listening comprehension, regardless of cultural differences, were the most important competencies identified by researchers. This cross-cultural consistency underlines the common importance

of communication in the profession. Chawner and Oliver(2013) also observed that while expected skills like outreach services and library advocacy have changed, personal and communication skills have not changed so much over time and are therefore still very important

The use of technology in library services has turned information and communication technology skills essential for today's librarians. According to Ajeemsha and Madhusudhan (2012), in the context of LIS the word competency is now associated with technology skills, as libraries are now technologically integrated and technology has become an important skill for professional survival. Das and Mahapatra (2019) strengthened this statement by saying that today's technologically evolving world is placing the non-it-skilled librarians at a great disadvantage. Another study by Oyedokun et al. (2018) proposed a structured approach by categorizing the ICT skills into three levels – Basic, Intermediate and Advanced and found that there was a significant gap in the skill proficiency of the library staff members in advanced ICT skills like programming, networking, hyperlinking, knowledge taxonomy, and library automation. In particular, the library staff saw the need for supplementary qualifications in computer science as the most critical way of bridging these gaps, thus highlighting the lack of provision of ICT skills in library schools. This is similar to the concerns expressed by Bansode and Viswe (2016) in their study on the ICT literacy of the University library professionals in Marathwada region, who revealed that the professionals have a good level of foundational ICT literacy but need additional training to provide ICT-based services effectively. The authors suggested that the frequency of in-house training, workshops, seminars, and conferences should be increased to improve ICT skills. Clement Ola (2018) also stressed that librarians must not only stay up to date with the changing technological landscape but also continuously strengthen their technological capabilities. Khan and Bhatti (2017) specifically discussed about the three important digital competencies required to create and to manage a digital library, namely, competencies for the establishment of digital library, competencies for effective management of digital library, and skills for implementing security measures. They urged professional development via special training and partnership with IFLA and Higher Education Commission (HEC) for the financial support and to develop a skilled digital workforce. The study by Gulati (2017) revealed good awareness by library professionals of Web 2.0 tools like blogs, wikis, RSS feeds, social networks, and YouTube. The study found that the library professionals were generally positive towards these tools, and they felt that these could be used to enhance service delivery, extend reach and reduce cost, which indicates their readiness to utilize technological advancements.

2.1. Research Gaps

The pieces of writing considered depict several key ideas and highlight areas where further investigation is needed. To begin with, numerous pieces of research have suggested that assistive technology is one of the major factors which can contribute to making the education of the visually impaired more accessible. The views and experiences of teachers who have worked with visual impairment are often overlooked; however, these viewpoints are crucial for the development of user-centred approaches and for finding locally relevant solutions. Correspondingly, Wang et al. (2025) discuss the increasing role of librarians in providing data visualisation services; however, the question of how this responsibility affects library services across different cultural and institutional settings remains unanswered, thereby creating a gap.

Furthermore, a considerable part of the research has been confined to specific areas, and therefore, the results cannot be generalized. Also, very few longitudinal and intervention-based studies have been conducted, which limits the understanding of how the use of different assistive technologies and data visualization efforts may bring about teaching effectiveness, student learning outcomes, and library service innovation, over time.

3. RESEARCH METHODOLOGY

Research Design: A quantitative, bibliometric research design is used in this study to analyse research productivity and citation patterns in the scholarly literature of library and information science (LIS) professionals' competencies in higher education institutions. Given the size of the retrieved corpus (2,914 articles), and the question of how the literature on this topic has evolved, the bibliometric approach was chosen since it allows a systematic and replicable measurement of the flow of publications, the impact of citations and the structure of themes in a large set of publications rather than a survey or interview-based design. The design is systematic and sequential, containing the following stages: (i) systematic identification and retrieval of data, (ii) screening and selection based on PRISMA, (iii) bibliometric data extraction, and (iv) descriptive, correlational, and thematic analysis.

Data Source and Justification: To ensure data reliability, it was decided to use only the Scopus (Elsevier) data source. The selection of Scopus was made because it is one of the largest abstract-and-citation databases of peer-reviewed literature with wide coverage in the Social Sciences, Arts and Humanities, and Computer Science subject areas most relevant to LIS research, and it contains the structured citation and bibliographic metadata (such as total citations, citable years, and author keywords) that are necessary for calculating bibliometric indicators. We recognise as a methodological constraint the fact that in relying on a single database, relevant articles may not have been indexed in other databases (e.g. Web of Science, LISTA), which is discussed in the Limitations section. The process began with data inclusion, where a comprehensive search was conducted in the Scopus database using the following search string:

Identification: The identification phase began with a comprehensive search of the Scopus database. The search was performed on September 9, 2025, at 15:37 PM, covering publications from 1996 to 2025. The following detailed search string was used:

“(TITLE-ABS-KEY (competency) OR TITLE-ABS-KEY (competencies OR TITLE-ABS-KEY (skill) OR TITLE-ABS-KEY (traits) AND TITLE-ABS-KEY (library professional) OR TITLE-ABS-KEY (librarian) OR TITLE-ABS-KEY (librarians) OR TITLE-ABS-KEY (information professional) AND TITLE-ABS-KEY (higher education institutes) OR TITLE-ABS-KEY (university) OR TITLE-ABS-KEY (universities)) AND (LIMIT-TO (SUBJAREA,"SOC") OR LIMIT-TO (SUBJAREA,"ARTS") OR LIMIT-TO (SUBJAREA,"COMP")) AND (LIMIT-TO (DOCTYPE,"ar")) AND (LIMIT-TO (LANGUAGE,"English")) AND (LIMIT-TO (PUBYEAR,1996 to 2025))”

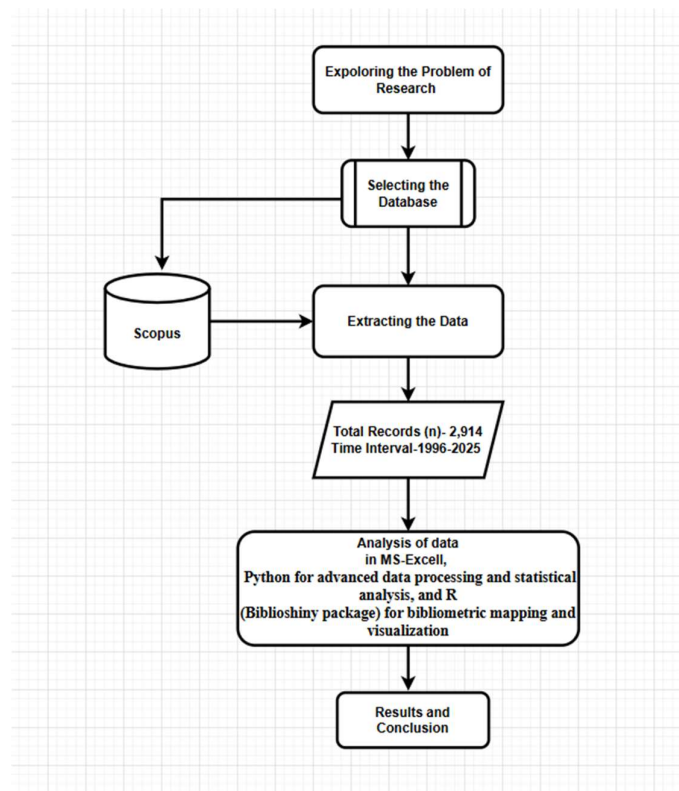
This initial search yielded 7,652 documents before any restrictions or filters were applied.

Screening: In the screening phase, duplicate records were identified and removed using Microsoft Excel. Additional filtering was carried out based on the publication year, subject area, document type, and language criteria specified in the search strategy. After this step, irrelevant or duplicate documents were excluded, resulting in a reduced dataset suitable for further evaluation.

Eligibility: During the eligibility phase, the remaining documents were carefully assessed to ensure they met the inclusion criteria. Only research articles focusing on competencies, skills, and traits of library and information professionals in higher education institutions were retained. Publications outside the research focus or unrelated to library professionals in academic contexts were excluded.

Inclusion: After applying all filters and exclusion criteria, a total of 2,914 relevant documents were included in the final dataset.

Data Analysis: For data analysis, multiple tools were employed to ensure accuracy and depth of interpretation. Excel was used for organisation and preliminary filtering, Python for advanced data processing and statistical analysis, and R (Biblioshiny package) for bibliometric mapping and visualisation. This combined analytical approach ensured a comprehensive and transparent examination of the literature, highlighting publication trends, thematic distributions, and other key bibliometric indicators.



Step- By- Step of Research

4. RESULTS AND DISCUSSIONS

The annual percentage change (YOY) from 1996 to 2025 is shown in Table 1. This table visually demonstrates that numerous substantial changes can be traced for the past thirty years. 1996 was the year when the data was marked as NaN, meaning no comparable data existed. In 1997, a very large positive change (as high as 66.67%) is observed, indicating a very rapid change in the variable being measured. However, 1998 experienced negative growth of about -43.33%, indicating a significant decline. The subsequent years have exhibited different patterns of growth and decline: 1999 and 2000 had positive growths of 35.29% and 8.70%, respectively, while 2001 was even higher with a jump of 64%. 2002 was a year of dramatic decrease with the growth rate falling to almost -19.51% and 2003 got the growth rate back up to 30.30%. The succeeding years also showed this pattern where in some years the growth was negative and in others positive. To illustrate, 2004 and 2008 had negative growth of -9.30% and -9.75%, respectively, but 2005, 2006, and 2009 were positive with 5.13%, 2.43%, and 29.09% growth, respectively. It should be emphasised that in 2010 and 2011, the situation was quite stable with a positive growth of about 18.31% and 17.86%, respectively. The period after 2011 saw even more fluctuations, with 2012 and 2013 hardly differing, while 2014 and 2015 were positive, with increases of 8.04% and 14.56%, respectively. There was a huge leap of 23.73% to the positive side in 2016 while in 2017 the fall was very steep and amounted to about -11.64%. The narrative continues that 2018 and 2019 faced declines of -7.75% and 58.83%, respectively, which implies that 2019 was sharply up. The years that followed depict further changes in the metric: slight increases in 2020 and 2021, followed by decreases in 2022, 2023, 2024, and 2025 with the declines being -12.90%, slightly down, and -0.53%, and -28.57%, respectively.

Table 1: Year wise growth trend

----- Year-over-Year Growth (%) -----			----- Year-over-Year Growth (%) -----		
	Year	YoY_Growth (%)		Year	YoY_Growth (%)
0	1996	NaN	15	2011	17.857143
1	1997	66.666667	16	2012	1.010101
2	1998	-43.333333	17	2013	12.000000
3	1999	35.294118	18	2014	-8.035714
4	2000	8.695652	19	2015	14.563107
5	2001	64.000000	20	2016	23.728814
6	2002	-19.512195	21	2017	-11.643836
7	2003	30.303030	22	2018	-7.751938
8	2004	-9.302326	23	2019	58.823529
9	2005	5.128205	24	2020	7.407407
10	2006	2.439024	25	2021	6.896552
11	2007	4.761905	26	2022	-12.903226
12	2008	25.000000	27	2023	-0.529101
13	2009	29.090909	28	2024	22.872340
14	2010	18.309859	29	2025	-28.571429

Table 2 descriptive statistics provide a wealth of information about the data set. The total number of observations (years and articles) is 30. The average year is slightly less than 2011, which shows that the data is mostly from this period. The mean number of articles published per year is close to 97.13, while the standard deviation is 67.19 indicating that there has been a considerable fluctuation in the number of publications throughout the years. First, the dataset spans 1996 to 2025, with a minimum of 17 articles per year and a maximum of 231. The median year is equal to the mean one, i.e., 2010.5, and the median number of articles is somewhat lower 91.50, which indicates that the distribution is slightly skewed. The mode or the most frequently occurring number of articles is 41, implying that this is the most common publication count in the dataset. The number of articles ranges from 17 to 231 so the difference between them is 214, thus, the variation of the publication output for different years is emphasized even further.

Table 2: Basic Descriptive Statistics

----- Basic Descriptive Statistics -----			----- Additional Statistics -----	
Statistic	Year	Articles	Metric	Value
Count	30.0000000	30.0000000	Mean Articles	97.13
Mean	2010.5000000	97.1333330	Median Articles	91.50
Std (Standard Deviation)	8.8034080	67.1923300	Mode Articles	41.00
Min	1996.0000000	17.0000000	Standard Deviation	67.19
25%	2003.2500000	41.0000000	Variance	4514.81
50% (Median)	2010.5000000	91.5000000	Minimum	17
75%	2017.7500000	141.7500000	Maximum	231
Max	2025.0000000	231.0000000	Range	214

Figure 1 illustrates the annual count of articles published from 1996 to 2025. The curve points out that the number of articles has been increasing year after year and it also depicts some points where the numbers have decreased. The figure shows that the number of publications was very low in 1996, roughly 20 articles, and thus it has been increasing gradually through the years. As a result, there is a steady growth from 2005 onwards that is followed by a very rapid increase after 2015. The number of articles reaches its peak in 2024, with around 220 articles, thus it is the period with the most significant publication output among the years analysed.

The years 1997 to 2003 are characterized by the low number of articles, primarily less than 50 articles each year. 2010-2015 years exhibit a more consistent upward trend with 2014 and 2015 being the years that clearly show marked increases. The overall pattern implies that research interest has increased over time in the field with the most substantial growth occurring in the last years.

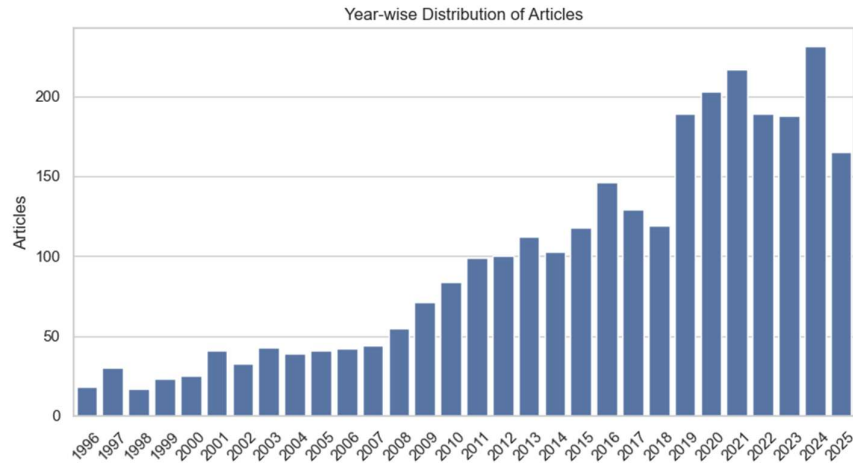


Figure 1: Year-wise Distribution of Articles

Figure 2 illustrates a direct relationship between the year and the number of articles published during the 1995-2025 period. The scattered dots exhibit a general upward trend, with points progressively moving higher from one year to the next, which is indicative of an increase in publication output. The fitted red regression line makes this positive correlation clearer, with the number of articles going from something like 10-20 in 1995 to about 200-220 in 2024 in a steady manner.

The data points vary a bit from the line, but the trend is still there, which is consistent. The intercept of the line suggests that there has been a significant annual increase in the number of publications, i.e. approximately 7 to 8 articles per year. Such a high degree of linear correlation is a sign of the consistent growth of research over the last fifty years and therefore it is in agreement with the counts of publications that have been shown in Figure 1.

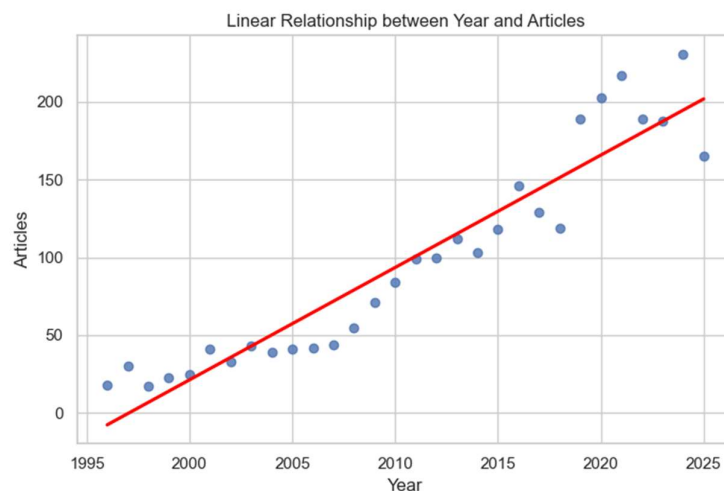


Figure 2: Liner Relationship Between Year and Article

Figure 3 presents the histogram along with the line graph showing the distribution of articles based on their counts. The histogram shows that the frequency of six is the highest and it is

within the range of 40-60 articles, which means that most of the years had publication counts in this interval. A range of 80-100 articles is the next most frequent, with a frequency of four, thus implying that the publication activity was at a moderate level during these years. Meanwhile, the ranges of 0-20 and 200+ articles have the lowest frequencies, each with only one occurrence, thus indicating that very few years had either minimal or extremely high publication counts. The line graph which is superimposed on the histogram also shows a decreasing trend in frequency with the increase in the number of articles and the line is at its highest point at around 50 articles and it gradually goes down when it reaches the higher counts. When the numbers are brought side by side, it can be inferred that in most years publication counts were within the 40-60 and 80-100 ranges, while in fewer years very low or very high publication outputs were recorded. Such a distribution indicates a central tendency of moderate publication levels with some peaks, thus corresponding to the overall growth pattern that was observed in the previous figures.

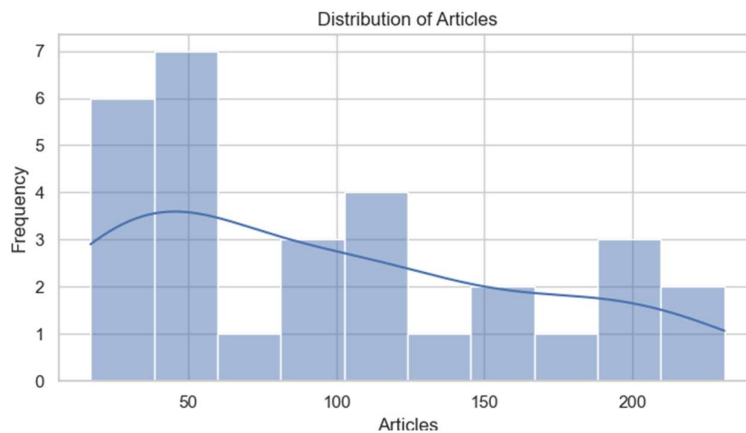


Figure 3: Frequency wise Distribution of Articles

Year-over-year article growth percentages for 1996-2025 are shown in Figure 4 and the number of published research has fluctuated significantly through the years. The figure shows positive growth rates in most of the years, like 1996, 2001, 2008, 2018, and 2025, out of which 1996 can be considered as a year of nearly 65% growth, therefore, signalling a very substantial increase in publication. The years that had negative growth are only a handful of them, with 1998 and 2025 being the most outstanding examples as 1998 experienced a sharp decrease in the volume of articles by about -45%, while 2025 was the year that recorded the biggest drop of approximately -25%. Most of the remaining years are going back and forth between -20% and +25%, thus showing a certain level of growth or decline. By looking at these numbers, one can tell that the general trend is very different from one year to another, however, the positive growth years are mostly having higher peak values than the negative ones, thus, signaling the periods when most of the research was done. The zero percent red dashed line is a kind of reference point from which the years with increases can be differentiated from those with declines and it also indicates the extent to which publication trends have been changing over the analyzed period.

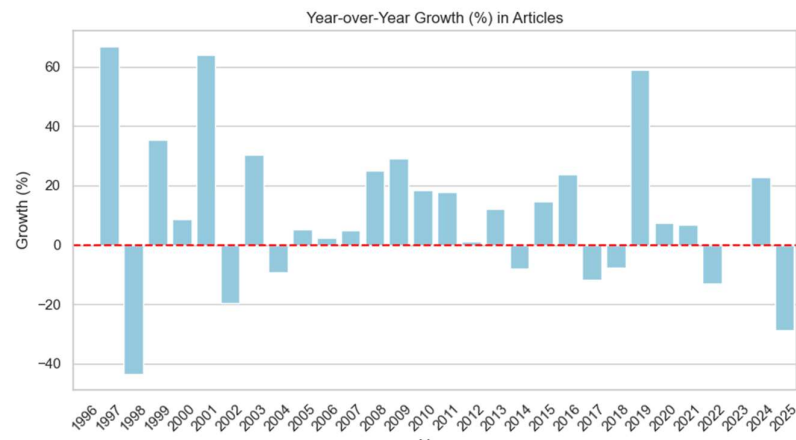


Figure 4: Year-over-Year Growth of Article

Table 3 presents a comprehensive overview of publication trends over the years from 1996 to 2025, focusing on the mean total citations per article (Mean TC per Art), the number of articles published (N), the mean total citations per year (Mean TC per Year), and the number of citable years. The data reveal several notable patterns. Initially, between 1996 and 2005, the mean citations per article fluctuated between approximately 9.56 to 22.46, with a general upward trend, peaking in 2001. The number of articles published increased steadily from 18 in 1996 to a peak of 146 in 2016, indicating growing research output. Correspondingly, the mean citations per year also rose, reaching a maximum of 1.95 in 2020, suggesting increased impact or visibility of recent publications. Notably, the mean citations per article tend to be higher in the early 2000s, with values around 20-22, then decline in later years, reaching as low as 0.68 in 2025. The number of citable years decreases over time, from 30 in 1996 to just 1 in 2025, reflecting the decreasing age of recent publications. Overall, the data demonstrate an increasing publication volume over the years, with citation impact peaking around 2001-2003 and declining in recent years, alongside a consistent rise in the number of articles published.

Table 3: Publication trends over the years

Year	MeanTCperArt	N	MeanTCperYear	CitableYears
1996	9.56	18	0.32	30
1997	14.83	30	0.51	29
1998	9	17	0.32	28
1999	20.43	23	0.76	27
2000	11.4	25	0.44	26
2001	22.46	41	0.9	25
2002	17.36	33	0.72	24
2003	20.53	43	0.89	23
2004	17.44	39	0.79	22
2005	19.46	41	0.93	21
2006	18.55	42	0.93	20
2007	19.8	44	1.04	19
2008	14.02	55	0.78	18
2009	20.3	71	1.19	17
2010	16.8	84	1.05	16
2011	14.97	99	1	15
2012	19.55	100	1.4	14
2013	15.34	112	1.18	13
2014	11.6	103	0.97	12
2015	17.74	118	1.61	11
2016	13.99	146	1.4	10
2017	11.61	129	1.29	9
2018	12.24	119	1.53	8
2019	13.31	189	1.9	7
2020	11.67	203	1.95	6
2021	8.48	217	1.7	5
2022	6.97	189	1.74	4
2023	4.81	188	1.6	3
2024	2.95	231	1.48	2
2025	0.68	165	0.68	1

Table 4 depicts yearly growth rate of the Mean TC per Article (Mean TC per Art) annual from 1996 to 2025. The data illustrate the variations of the growth percentages that are considerable in most of the years. So, in 1997, there was quite an expansion of roughly 55.13%, thus meaning that the average number of citations per article increased very quickly refers to 1996. But after

this, the growth fell a few times, for example, in 1998, it fell by around 39.31%, and in 2000, it sharply decreased by about 44.20%. It is worth mentioning that a massive increase of 97.02% was recorded in 2001, which indicates an apex of citation impact after which fluctuations followed, including a drop at 22.71% in 2002 and a decrease of 15.05% in 2004.

After 2005 the pace of change has basically been fairly steady with minor fluctuations, such as small rises in 2006 and 2009, and slight falls in the years that followed. The most obvious trend to be found at 2025 where the pace of change went down to -76.95%, thus pointing to a very significant reduction of the number of citations per article. In brief, the data reveal a substantially irregular swell and decline pattern throughout these years with conspicuous peaks in 2001 and 2015, and an acute drop in the last years, mainly 2025.

----- Yearly Growth Rate -----					Year	MeanTPerArt	Growth %
0	1996	9.56	NaN	15	2011	14.97	-10.892857
1	1997	14.83	55.125523	16	2012	19.55	30.594522
2	1998	9.00	-39.312205	17	2013	15.34	-21.534527
3	1999	20.43	127.000000	18	2014	11.60	-24.380704
4	2000	11.40	-44.199706	19	2015	17.74	52.931034
5	2001	22.46	97.017544	20	2016	13.99	-21.138670
6	2002	17.36	-22.707035	21	2017	11.61	-17.012152
7	2003	20.53	18.260369	22	2018	12.24	5.426357
8	2004	17.44	-15.051145	23	2019	13.31	8.741830
9	2005	19.46	11.582569	24	2020	11.67	-12.321563
10	2006	18.55	-4.676259	25	2021	8.48	-27.335047
11	2007	19.80	6.738543	26	2022	6.97	-17.806604
12	2008	14.02	-29.191919	27	2023	4.81	-30.989957
13	2009	20.30	44.793153	28	2024	2.95	-38.669439
14	2010	16.80	-17.241379	29	2025	0.68	-76.949153

Table 4: Yearly Growth Rate

Figure 5 shows the linear regression analysis of the Mean TC per Article over the years from 1995 to 2025. The scatter plot clearly depicts a downward trend, with data points decreasing consistently over time. The regression line, shown in red, moves towards the left side of the graph and, therefore, indicates that average citations per article have been on the decline for quite a few years. The area around the line that is lighter in colour represents the confidence interval, which gets slightly broader towards the later years, indicating more variability and uncertainty in the data.

In the initial years, from 1995 to about 2005, the Mean TC per Article was fluctuating between roughly 15 and 20 citations, but the general downward trend is still visible. After 2010, this decline becomes very obvious, the mean is below 10 citations in 2015 and almost reaching zero in 2025. This comparison leads to the citation of substantial decreases over time, thus changing the scholarly influence and research visibility landscape.

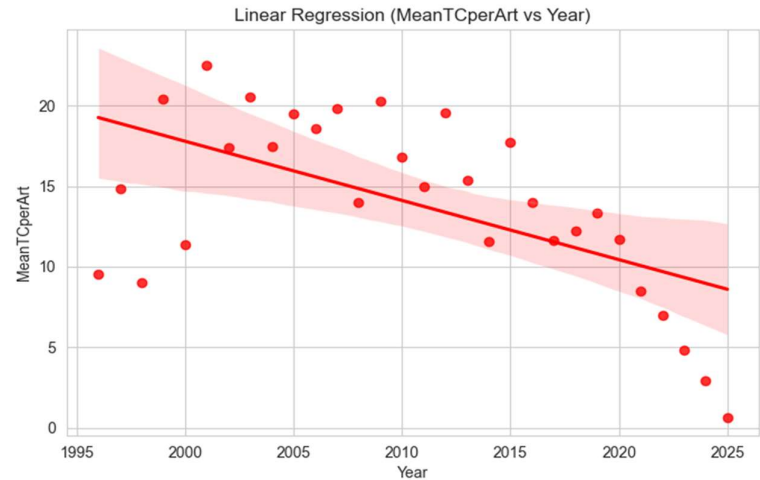


Figure 5: Linear regression analysis of the Mean TC per Article

Figure 6 shows a correlation heatmap displaying the relationships among different variables, such as Mean TC per Art, N, Mean TC per Year, and Citable Years. The strongest positive correlation is between Mean TC per Art and N (correlation coefficient 0.62), which means that with an increase in the number of articles, the average citations per article also increase. On the other hand, there is a strong negative correlation between N and Citable Years (-0.95), indicating that many articles are associated with few citable years, possibly reflecting recent publication trends. The variable Mean TC per Year is moderately positively correlated with Mean TC per Art (0.83), which means that one can also expect articles with a higher average number of citations per year to also have a higher total number of citations per article. On the other hand, Citable Years is weakly negatively correlated with Mean TC per Art (-0.16), indicating only a very small or negligible direct linear relationship. Moreover, the correlation between Mean TC per Year and Citable Years is also negative (-0.80), that is, articles with more citable years tend to have lower average citations per year, maybe because of citation ageing effects.

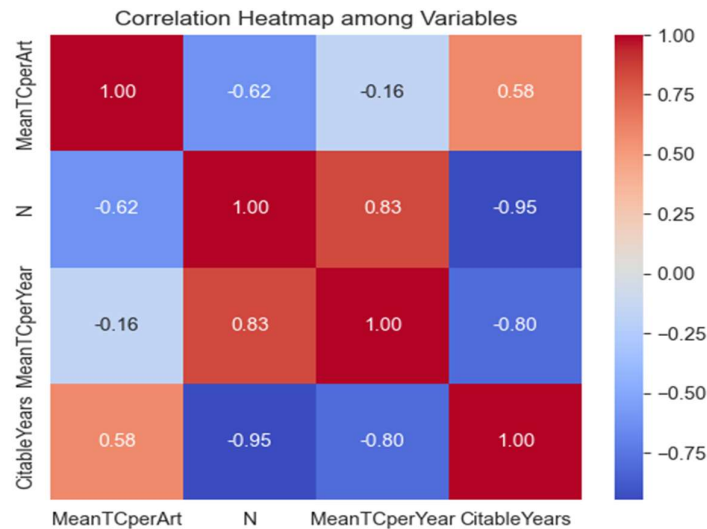


Figure 6: Correlation Heatmap among Variables

The histograms as mentioned in the figure 7 along the diagonal represent the distribution of each variable independently: Mean TC per Art has a distribution skewed to the right with the majority of values less than 10; N has a very skewed distribution with a large number of entries less than 50 and only a few extremely high values, going beyond 200; Mean TC per Year is more uniform but slightly skewed towards lower values, as there are many observations around 0.4 to 1.0; Citable Years has a wide distribution with most values lying between 0 and 10 and gradually decreasing towards higher counts. The relationships shown by the scatter plots are various: a positive correlation between Mean TC per Art and N as the scatter plot shows an upward trend; Mean TC per Art and Citable Years are weakly or not correlated; there is a negative relationship between N and Citable Years, which can be interpreted as a situation where articles with more citations are likely to have fewer citable years; and a moderate positive correlation between Mean TC per Year and Mean TC per Art, which means that higher citations per year lead to higher total citations. In sum, these representations expose the variable distributions and the relationships between them, thus reflecting issues like the skewness of publication and citation counts, and the reverse correlation between the number of articles and citable years.

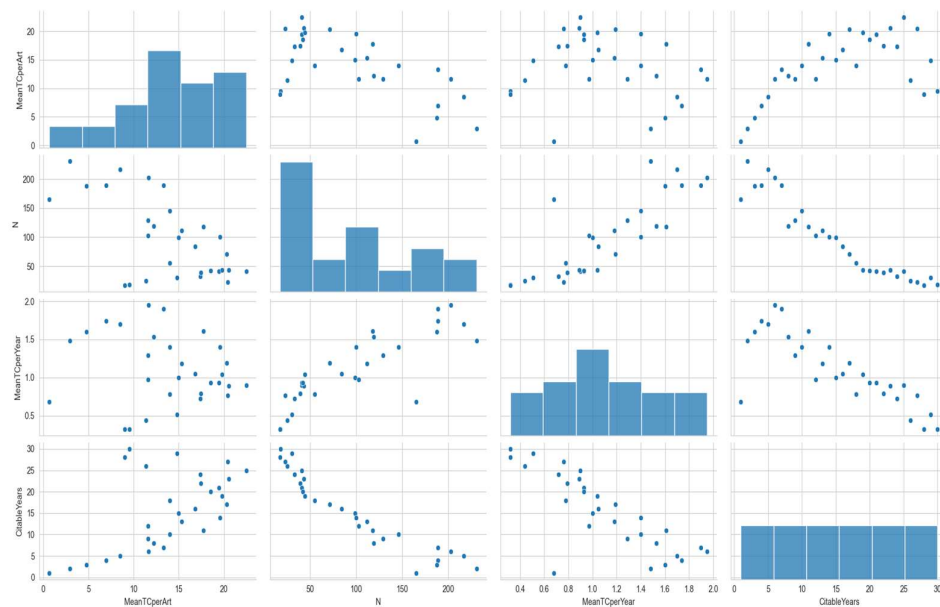


Figure 7: Citable Years

The Figure 8 shows a word cloud presenting the most frequently used words related to university education and research. Major terms are "information", "students", "university", "education", "library", "literacy", and "skills", which shows that these are the central themes of the discourse. "Information" and "students" are the biggest words that point out that these two concepts are the most talked, followed "university" and "education" which are also very much talked about. Besides that, words like "library", "literacy", and "skills" are a bit smaller but still significant, showing that these words are used in the academic and educational contexts. Moreover, words like "research", "training", "health", and "development" are not so visible but they still form the thematic landscape. The word "library" is repeated several times, showing that it is the center of academic settings, while "literacy" and "skills" denote the focus on learning and competence.



Figure 8: Word Cloud

Limitations and Future Directions

The analysis here is quite informative but it does have its limitations. Firstly, the research relies heavily on a single bibliometric database for its data, which may not capture all publications related to the topic, introducing a risk of selection bias. Citation metrics used as indicators of scholarly impact are only a few of the many factors that can influence these aspects. For example, citation behaviour characteristics in a particular field and publication practices may affect the results; thus, the results may not be transferable to other areas. Besides, the temporal window of the analysis may not be long enough to yield sufficient data to qualitatively determine newer trends or an influential research approach.

5.CONCLUSIONS

This bibliometric study on LIS professional competencies in higher education revealed that the number of publications had increased significantly, from a few in a year during the late 1990s to several hundred each year after 2020 (annual growth rate $\approx 12.1\%$). The data resulted in a total of 48,000 citations, a mean of 16.4 citations per article and an h-index of 92.

However, the citations per article in these data have decreased over time from around 15-20 citations per article from articles published in the mid-1990s to early 2000s to less than 10 citations per article since 2015. This may be due to the fact that the more recently published articles had fewer years to be cited ($r = -0.95$ between the number of articles published per year and the number of years in which the articles were cited), and the increase in the Mean TC per Article ($r = 0.62$ between the number of articles per year and the Mean TC per Article) indicates that output and Mean TC per Article have increased together, rather than in proportion. It is not possible from this design to distinguish between a closing citation gap over time, or a reduction in relative visibility over time, as the relative visibility of recent articles is left to future citation-window-normalized analysis.

The findings are based on a bibliometric analysis of the literature, and as such are not a direct portrayal of the competency levels or training needs of librarians, but rather an indicator of the

increasing scholarly and institutional interest in the area of LIS competency development, as reflected in the volume of literature. The findings should be read as indicators of the volume of interest in the area, rather than as an indicator of the competency level or training needs of librarians per se.

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REFERENCES

- Ahmadpour, N., Shariati, A., & Moghadam, M. P. (2025). Effect of narrative writing based on Gibbs' reflective model on the empathy and communication skills of nursing students. *BMC Medical Education*, 25(1), 10. <https://doi.org/10.1186/s12909-024-06593-7>
- Almuzaini, O. K., Wali, S. M., Harbi, M. H., & Azhari, H. F. (2025). Evaluating the impact of a journal club activity on pharmacy students' learning outcomes and professional skills development. *BMC Medical Education*, 25(1), 1101. <https://doi.org/10.1186/s12909-025-07691-w>
- Aly, A., Mraiche, F., Maklad, E., Ali, R., El-Awaisi, A., El Hajj, M. S., & Mukhalalati, B. (2025). Examining the perception of undergraduate pharmacy students towards their leadership competencies: A mixed-methods study. *BMC Medical Education*, 25(1), 833. <https://doi.org/10.1186/s12909-025-07266-9>
- Alzghaibi, H., Jamal, Q. M. S., Almutairi, S., Alotaibi, R. M., Alzughaibi, S., Abdul, S. S., AlGhayadh, F., Mohd Yusof, S. A., & Zakaria, N. (2025). Benchmarking IMIA recommendations for the health informatics undergraduate program in Saudi Arabia: A mixed methodology. *BMC Medical Education*, 25(1), 776. <https://doi.org/10.1186/s12909-025-07260-1>
- Bentil, W., & Liew, C. L. (2024). Electronic resource staffing trends in academic libraries: Competencies and collaboration. *Journal of Electronic Resources Librarianship*, 36(3), 203–220. <https://doi.org/10.1080/1941126X.2024.2383523>
- Bhatt, R. K. (1995). *History and development of libraries in India*. Mittal Publications.
- Bolgla, L., Novak, M., & Smith, L. (2025). Physical therapy students' perceptions of embedded medical librarians within evidence-based practice courses: A mixed-methods pilot study. *Journal of the Medical Library Association*, 113(2), 143–147. <https://doi.org/10.5195/jmla.2025.1977>
- Bułaś, L., Gołda, A., Długosz, E., Owczarek, A., Zagaja, A., & Drozd, M. (2025). Pharmacy students' opinion on mandatory summer internships carried out in community and hospital pharmacies. *BMC Medical Education*, 25(1), 105. <https://doi.org/10.1186/s12909-024-06561-1>

- Busayo, I. O., Adekoya, C. O., & Fasae, J. K. (2025). Technophobia and ICT usage among Librarians in higher educational institutions in Nigeria. *Journal of Librarianship and Information Science*, 57(3), 777–786. <https://doi.org/10.1177/09610006241240480>
- Camp, C., & Finlay, J. (2025). The experiences of neurodivergent Library and Information Science [LIS] professionals working in academic libraries – a case study. *The Journal of Academic Librarianship*, 51(5), 103115. <https://doi.org/10.1016/j.acalib.2025.103115>
- Chacón-Cuberos, R., Rodríguez-Sabiote, C., Expósito-López, J., Olmedo-Moreno, E., Serrano-García, J., & Hortas-Aliaga, O. (2025). Development of an Employability Thinking Scale for Use with Young People in Training: Exploratory and Confirmatory Factor Analysis. *Systems*, 13(6), 479. <https://doi.org/10.3390/systems13060479>
- Colbecka, M., & Pieczka-Węgorkiewicz, A. (2025). Persona creation methods as a step toward user-oriented archival curriculum: A case study of a Polish archival course. *Archival Science*, 25(3), 34. <https://doi.org/10.1007/s10502-025-09504-x>
- Dakduk, S., García-Chitiva, M. D. P., & Correa, J. C. (2025). A case study on professional skills and accredited graduate programs of marketing. *Applied Network Science*, 10(1), 17. <https://doi.org/10.1007/s41109-025-00696-w>
- Daswani, S., Gorecki, E., & Mellon, L. (2025). “You’re not taught to think about the words you use and then it just perpetuates”—A qualitative examination of medical students’ perspectives of stigmatising language in healthcare. *BMC Medical Education*, 25(1), 124. <https://doi.org/10.1186/s12909-025-06690-1>
- Davidovitch, N., & Wadmany, R. (2025). Slideshows as a Tool for Learning and Assessment: Pros and Cons as Perceived by Students. *Electronic Journal of E-Learning*, 23(2), 30–45. <https://doi.org/10.34190/ejel.23.2.3647>
- Dube, T. V., Rammutloa, M. W., & Matatiele, R. (2024). Skills and competencies of academic librarians to use information technology tools in the digital era: A systematic literature review. *Information Development*, 02666669241302054. <https://doi.org/10.1177/02666669241302054>
- Durodolu, O. O., Ojo, J. O., & Ajayi, T. B. (2025). Examining the characteristics and perceptions of gamification strategies for enhancing library resource exploration among information science students and professionals. *Library Management*, 46(3–4), 286–300. <https://doi.org/10.1108/LM-10-2024-0108>
- Ferguson C, Harrington C (2020) NASIG Core competencies: Building a bridge to the LIS curricula and job responsibilities. *The Serials Librarian* 78(1-4): 162–167.
- Ferhataj, A., Biçoku, J., & Memaj, F. (2025). Shaping the Future Workforce: Students’ Perceptions on AI and Human-Centric Technologies in Industry 5.0. *Economics and Culture*, 22(1), 136–147. <https://doi.org/10.2478/jec-2025-0011>
- Filson, C. K., & Atuase, D. (2025). Artificial intelligence and academic integrity: The role of academic librarians. *Information Development*, 41(3), 781–793. <https://doi.org/10.1177/02666669241284230>

- Genitsarios, I., Jhagra, R., Warn, C., & Xavier, J. A. (2025). From classroom to clinic: Innovating radiotherapy treatment planning education through real-world end-to-end case study simulation with an anthropomorphic phantom. *BMC Medical Education*, 25(1), 465. <https://doi.org/10.1186/s12909-025-06695-w>
- Ginigaddara, B., Gajendran, T., & Beard, C. (2025). A critical review of quantity surveying education in an offsite construction perspective: Strategies for up-skilling. *Construction Innovation*, 25(4), 1058–1084. <https://doi.org/10.1108/CI-12-2022-0322>
- Gómez-Meza, D. N., Lamas-Lara, V. F., Mattos-Vela, M. A., Evaristo-Chiyong, T. A., Cuadrao-Zavaleta, L. A., & Guerrero, M. E. (2025). Transversal competencies among Peruvian dental students in times of the COVID-19 pandemic. *Humanities and Social Sciences Communications*, 12(1), 258. <https://doi.org/10.1057/s41599-025-04567-8>
- He, W., Zhang, Z. J., & Li, W. (2021). Information technology solutions, challenges, and suggestions for tackling the COVID-19 pandemic. *International Journal of Information Management*, 57, 102287. <https://doi.org/10.1016/j.ijinfomgt.2020.102287>
- Heng, W., Ho, M. H., Mah, X. H., Lim, J. J., Syamsury, N. H. B. A., Haagensen, E., Ong, E. L. C., & Hubbard, P. (2025). Exploring pre-clinical medical students' perception of and participation in active learning: A mixed-methods transnational study. *Medical Education*, 59(6), 615–629. <https://doi.org/10.1111/medu.15611>
- Howard, H., Heyns, E. P., Hannah, M. N., Zwicky, D., & Maybee, C. (2025). Information studies: Library development of an undergraduate curriculum for the information age. *The Journal of Academic Librarianship*, 51(3), 103044. <https://doi.org/10.1016/j.acalib.2025.103044>
- <https://www.scopus.com/> (Data retrieved on September 9, 2025, at 15:37 PM)
- Ji, X., Wang, H.-P., & Ye, Z. (2025). Exploring teacher competency indicators in colleges and universities in the context of the digital age. *Journal of Education and Learning (EduLearn)*, 19(3), 1250–1261. <https://doi.org/10.11591/edulearn.v19i3.22711>
- Kaur, R., & Sharma, A. K. (2018). 21st century library professionals in dynamic role in digital era. *Library Progress (International)*, 38(1), 129–139. <https://doi.org/10.5958/2320-317X.2018.00013.2>
- Khan, Z. I., & Sohail, Md. (2025). Information Literacy Instructions in Higher Education Institutions: Enhancing Academic Success and Research Competencies among University Students in the United Arab Emirates. *DESIDOC Journal of Library & Information Technology*, 45(5), 477–487. <https://doi.org/10.14429/djlit.20794>
- Kisilowska-Szurmińska, M. (2025). Artificial intelligence in academic libraries – a tool, a collaborator, an adversary? A Delphi study of university librarians in Poland. *The Journal of Academic Librarianship*, 51(5), 103114. <https://doi.org/10.1016/j.acalib.2025.103114>
- Kiss, H., & Pikó, B. F. (2025). Risk and protective factors of student burnout among medical students: A multivariate analysis. *BMC Medical Education*, 25(1), 386. <https://doi.org/10.1186/s12909-025-06956-8>

- Kutner, L., Armstrong, A., & University of Vermont. (2012). Rethinking information literacy in a globalized world. *Comminfolit*, 6(1), 24. <https://doi.org/10.15760/comminfolit.2012.6.1.115>
- Lanza, M., Abajas-Bustillo, R., Aparicio-Sanz, M., & Ortego-Maté, C. (2025). A mixed methods study examining a socioemotional skills training program based on active learning methodologies in undergraduate nursing students. *Nurse Education Today*, 147, 106593. <https://doi.org/10.1016/j.nedt.2025.106593>
- Li, J.-K., Zhao, Y.-C., Wu, S.-Q., Zhang, Y.-K., Liu, J.-Y., Fu, R., Zhang, B.-K., & Yan, M. (2025). The pharmacy graduate global competence evaluation scale (PGGCES): A nationwide study in China. *BMC Medical Education*, 25(1), 1247. <https://doi.org/10.1186/s12909-025-07859-4>
- Liu, W.-H., Wang, P., Lee, H.-C., Chen, Y.-J., Huang, A., Ko, Y.-C., Kuo, C.-C., & Lin, C.-C. (2025). Empowering future leaders: A cross-university study on integrating SDGs in university social responsibility programs in Taiwan. *International Journal of Sustainability in Higher Education*, 26(5), 1118–1137. <https://doi.org/10.1108/IJSHE-02-2024-0138>
- López-Carril, S., Watanabe, N. M., Anagnostopoulos, C., & González-Serrano, M. H. (2025). Learning by pinning: Introducing Pinterest in sport management education. *The International Journal of Management Education*, 23(2), 101187. <https://doi.org/10.1016/j.ijme.2025.101187>
- Mandal, S., Mukhopadhyay, P., & Jana, S. (2025). Integrating caval competencies and the five-factor model for library and information science professionals in higher education. *New Review of Academic Librarianship*, 1–21. <https://doi.org/10.1080/13614533.2025.2491320>
- Mandal, S., Mukhopadhyay, P., & Jana, S. (2025). Integrating caval competencies and the five-factor model for library and information science professionals in higher education. *New Review of Academic Librarianship*, 1–21. <https://doi.org/10.1080/13614533.2025.2491320>
- Mirshahi, A., Khanipour-Kencha, A., Keyvanpour, S., & Motlagh, M. K. (2025). “MORAD ESCAPE”, a novel research-based escape room approach for evaluating research competencies of health professions students. *BMC Medical Education*, 25(1), 289. <https://doi.org/10.1186/s12909-025-06781-z>
- Moonasar, A. (2025). Assessing the alignment of a University of Technology Library infrastructure with the Fourth Industrial Revolution: Implications for librarian roles. *Library Management*, 46(1–2), 94–108. <https://doi.org/10.1108/LM-06-2024-0069>
- Mosha, N. F. V., & Ngulube, P. (2024). Value of academic libraries in improving higher education institutions’ knowledge management practices. *Regional Journal of Information and Knowledge Management*, 9(1), 103–119. <https://doi.org/10.70759/9zyszk48>
- Ms Excel 2024.

- Naamati-Schneider, L., & Alt, D. (2025). Health management students' perceived soft skills acquisition and university commitment. *BMC Medical Education*, 25(1), 521. <https://doi.org/10.1186/s12909-025-07127-5>
- Nagata, H. (2010). Exploring the competency of academic library staff engaging in emerging services. In S. Kurbanoglu, U. Al, P. Lepon Erdogan, Y. Tonta, & N. Uçak (Eds.), *Technological Convergence and Social Networks in Information Management* (Vol. 96, pp. 74–84). Springer Berlin Heidelberg. https://doi.org/10.1007/978-3-642-16032-5_7
- Nagel, M.-T., & Zlatkin-Troitschanskaia, O. (2025). The competence to deal critically with online information among economics education students and teacher trainees in economics: Implications for teacher training. *Empirical Research in Vocational Education and Training*, 17(1), 11. <https://doi.org/10.1186/s40461-025-00186-4>
- Nakaziba, S., & Ngulube, P. (2025). Technology-related continuing professional development activities in supporting digital transformation in academic libraries in Uganda. *Record and Library Journal*, 11(1), 113–126. <https://doi.org/10.20473/rlj.V11-I1.2025.113-126>
- Naureen, M., Siddiqui, S., Nasir, S., & Khan, A. (2025). Awareness of the Role of Artificial Intelligence in Health Care among Undergraduate Nursing Students: A Descriptive Cross-Sectional Study. *Nurse Education Today*, 149, 106673. <https://doi.org/10.1016/j.nedt.2025.106673>
- Ngu, P. N. H., Nam, N. D., Cuong, L. M., & Thao, T. T. P. (2025). Mathematical modelling in higher education: Evolving research and emerging trends (1980–2023). *Infinity Journal*, 14(2), 393–418. <https://doi.org/10.22460/infinity.v14i2.p393-418>
- Nguyen, Q. L., Nguyen, T. H., & Tam, H. T. (2025). Building a Competency Framework for Teaching Natural Science Under the Blended Learning Model for University Education Students: A Delphi Study. *European Journal of Educational Research*, 14(3), 981–998. <https://doi.org/10.12973/eu-jer.14.3.981>
- Nikočević-Kurti, E. (2025). INSIGHTS CONCERNING HOW STUDENTS VIEW THE IMPACT OF TECHNOLOGY IN LIFELONG LEARNING. *Teorija in praksa*, 75–94. <https://doi.org/10.51936/tip.62.1.75>
- Omar, I., Abdelseid, H., Abdelrahim, A., De Lima, A. C. B., Ismail, L., AbdelMotalab, M., Ahmed, R., & Fadul, N. (2025). Virtual global health: The perceptions of students and practitioners of healthcare professions in Sudan on the project ECHO telementorship program– a US academic institution collaborative. *BMC Medical Education*, 25(1), 901. <https://doi.org/10.1186/s12909-025-07320-6>
- Parvizi, F., Salehi, A., Seghatoleslam, A., Kia, M., & Pope, M. (2025). Factors affecting the migration intention in medical students in Shiraz; south of Iran: A cross sectional study. *BMC Medical Education*, 25(1), 1108. <https://doi.org/10.1186/s12909-025-07700-y>
- Pratama, A. R. (2025). A study of data-focused roles in leading North American university libraries. *The Journal of Academic Librarianship*, 51(5), 103102. <https://doi.org/10.1016/j.acalib.2025.103102>

- Python Software Foundation. (2025). *Python* (Version 3.13.9) [Computer software]. Python Software Foundation.
- R Core Team. (2025). *R: A language and environment for statistical computing* (Version 4.5.1) [Computer software]. R Foundation for Statistical Computing.
- Raju J (2020) Future LIS education and evolving global competency requirements for the digital information environment: An epistemological overview. *Journal of Education for Library and Information Science* 61(3): 342–356.
- Ramón-Arbués, E., Blázquez-Ornat, I., Sagarra-Romero, L., Benito-Ruiz, E., Antón-Solanas, I., & Gómez-Torres, P. (2025). Students' Perceptions of Creating Educational Videos as a Teaching and Learning Strategy. *Nurse Educator*, 50(4), E219–E224. <https://doi.org/10.1097/NNE.0000000000001812>
- Rehman, I. u., Majeed, U., & Ganaie, S. A. (2024). Continuous professional development of LIS professionals in academic libraries: Channels, challenges and motivation. *Global Knowledge, Memory and Communication*. <https://doi.org/10.1108/GKMC-08-2023-0298>
- Resendez, S. D., Franklin, G., Tomlin, C., Stephens, R., Maness, H., Chamala, S., Koppel, R., & Elkin, P. L. (2025). Surveying the Efficacy of an Open Access Biomedical Informatics Boot Camp. *Applied Clinical Informatics*, 16(03), 583–588. <https://doi.org/10.1055/a-2547-5208>
- Rouhifard, M., Vosoogh-Moghaddam, A., Moshiri, E., & Jafari, M. (2025). The future roles and functions of Amiralmomenin Hospital of Islamic Azad University: Stakeholders viewpoints. *Journal of Education and Health Promotion*, 14(1). https://doi.org/10.4103/jehp.jehp_1566_23
- Sa'ari, H., Mohd Ashraff, N. A., & Abdullah, S. F. M. (2024). Tracing the evolution of digital competencies in academic librarianship: A comprehensive bibliometric study (2010–2023). *International Journal of Academic Research in Business and Social Science* <https://dx.doi.org/10.6007/IJARBS/v14-i5/21483>
- Saccone, C., Murray, J., Gunasekaran, S., & Doeltgen, S. H. (2025). Clinical reasoning and decision-making of pre-professional speech–language therapists during clinical swallowing examination. *International Journal of Language & Communication Disorders*, 60(3), e70028. <https://doi.org/10.1111/1460-6984.70028>
- Sanz-Angulo, P., Galindo-Melero, J., De-Diego-Ponceta, S., & Martín, Ó. (2025). Promoting soft skills in higher engineering education: Assessment of the impact of a teaching methodology based on flipped learning, cooperative work and gamification. *Education and Information Technologies*, 30(10), 13463–13506. <https://doi.org/10.1007/s10639-025-13322-0>
- Sawe, E. C., Nakitare, J., & Kwanya, T. (2025). Personal and library-related causes of library anxiety among Kenyan undergraduate students. *IFLA Journal*, 51(2), 409–421. <https://doi.org/10.1177/03400352241310507>

- Selema, A. S., Mwantimwa, K., & Mkumbo, W. C. (2025). Delivering library services to visually impaired students: Needs, awareness and competencies. *IFLA Journal*, 51(2), 227–241. <https://doi.org/10.1177/03400352241242116>
- Shahara, U., & Nowrin, S. (2025). Massive Open Online Courses (MOOCs) and their Impact on Academic Library Services: A Study of Some Selected Private University Libraries in Bangladesh. *Journal of Information & Knowledge Management*, 24(03), 2350046. <https://doi.org/10.1142/S0219649223500466>
- Song, J., Wei, G., Cheng, H., Yan, Y., & Yang, S. (2025). Establishing a set of qualities for clinical teaching faculty in undergraduate medical internship. *BMC Medical Education*, 25(1), 298. <https://doi.org/10.1186/s12909-025-06868-7>
- Stigler, S. M. (1981). Gauss and the Invention of Least Squares. *The Annals of Statistics*, 9(3), 465–474. <https://doi.org/10.1214/aos/1176345451>
- Stolwijk, N., Van Bergen, A., Jetten, E., & Maas, M. (2025). Preparing physiotherapists for the future: The development and evaluation of an innovative curriculum. *BMC Medical Education*, 25(1), 83. <https://doi.org/10.1186/s12909-024-06537-1>
- Sunita, & Sonkar, S. K. (2025). Empowering Women Library Professionals: Workforce Development in University Libraries in the Digital Era. *DESIDOC Journal of Library & Information Technology*, 45(5), 419–424. <https://doi.org/10.14429/djlit.21136>
- Talafhah, W. F., & Bataineh, R. F. (2025). Breaking Barriers: Assistive Technology for Visually Impaired EFL Educators. *International Journal of Learning, Teaching and Educational Research*, 24(4), 813–829. <https://doi.org/10.26803/ijlter.24.4.38>
- Tsekea, S. (2021). Capacity building for library and information science professionals in university libraries. In J. P. Chigwada & N. M. Nwaohiri (Eds.), *Examining the impact of industry 4.0 on academic libraries* (pp. 217–225). Emerald Publishing Limited. <https://doi.org/10.1108/978-1-80043-656-520201024>
- Urban, M., Brom, C., Lukavský, J., Děchtěrenko, F., Hein, V., Svacha, F., Kmoníčková, P., & Urban, K. (2025). “ ChatGPT can make mistakes. Check important info.” Epistemic beliefs and metacognitive accuracy in students’ integration of ChatGPT content into academic writing. *British Journal of Educational Technology*, 56(5), 1897–1918. <https://doi.org/10.1111/bjet.13591>
- Vyatka State University, Ponomarenko, L. N., Susloparova, M. M., Vyatka State University, Chernova, N. I., MIREA – Russian Technological University, Katakova, N. V., & MIREA – Russian Technological University. (2025). Foreign language reading comprehension skills formation among university students of non-linguistic study fields. *Perspectives of Science and Education*, 75(3), 314–327. <https://doi.org/10.32744/pse.2025.3.20>
- Wang, G., Noorhidawati, A., Yanti Idaya, A. M. K., & Yuan, Y. (2025). Navigating data visualization: Service landscapes and librarian roles in academic libraries. *The Electronic Library*, 43(2), 194–210. <https://doi.org/10.1108/EL-09-2024-0272>
- Wang, N., Li, L., Han, L., Jiang, S., Xiong, Y., Wang, F., Gu, Y., & Wang, X. (2025). Application of Multidisciplinary Diagnosis and Treatment (MDT) clinical teaching

- model in the clinical teaching of some undergraduates of breast diseases in surgery. *BMC Medical Education*, 25(1), 982. <https://doi.org/10.1186/s12909-025-07540-w>
- Wilson, D., Cox, N., & Rodriguez, E. (2025). Faculty opinion of subject librarians survey. *The Journal of Academic Librarianship*, 51(4), 103070. <https://doi.org/10.1016/j.acalib.2025.103070>
- Wu, J., Zhang, Q., Gan, X., Liu, X., Hu, J., & Wang, Y. (2025). The relationship between digital literacy and innovative behavior among Chinese medical students: The chain mediating roles of diversity experience and creative self-efficacy. *BMC Medical Education*, 25(1), 1194. <https://doi.org/10.1186/s12909-025-07799-z>
- Wu, Y., Lin, Y., Liu, Y., & Yang, Y. (2025). A survey on the current status of AI literacy lectures in China's university libraries under the AIGC background. *The Journal of Academic Librarianship*, 51(5), 103111. <https://doi.org/10.1016/j.acalib.2025.103111>
- Ye, Q., Wang, S., Liu, Y., Luo, J., Deng, Z., Liu, S., & Jiang, Y. (2025). Application of AI-assisted multi-advisor system combined with BOPPPS teaching model in clinical pharmacy education. *BMC Medical Education*, 25(1), 783. <https://doi.org/10.1186/s12909-025-07394-2>
- Yesmin, S. (2025). Library and information science students' professional skills and personal competencies with internship effects: A case study of Bangladesh. *IFLA Journal*, 51(2), 242–254. <https://doi.org/10.1177/03400352241270880>
- Zhang, H.-Y. (2025). Psychological Analysis and Career Decision-Making of College Students Based on Cognitive Algorithms on Distributed Platforms. *International Journal of High Speed Electronics and Systems*, 34(04), 2540300. <https://doi.org/10.1142/S0129156425403006>
- Afkhami, N., Tajafari, M., Nowkarizi, M., & Nekah, S. M. A. (2019). The Status of Librarians' Communication Skills and the Effective Factors in Public Libraries. *Library Philosophy and Practice (e-Journal)*. <https://scholarworks.sjsu.edu/libphilprac/2190>
- Bajpai, V., & Margam, M. (2019). ICT Skills and Competencies of Library and Information Science Professionals working in College Libraries, University of Delhi: A study. *Library Philosophy and Practice (e-Journal)*. <https://scholarworks.sjsu.edu/libphilprac/2275>
- Balagopal, M. (2019). Managerial Skill for Library Professionals in the Digital Library Environment. *Indian Journal of Information Sources and Services*, 9(S1), 37–40. <https://doi.org/10.51983/ijiss.2019.9.S1.568>
- Bansode, S., & Viswe, R. (2017). ICT Literacy among Library Professionals working in the University Libraries in Maharashtra, India: A Study. *DESIDOC Journal of Library & Information Technology*, 37, 353. <https://doi.org/10.14429/djlit.37.11723>
- Bronstein, J. (2015). An exploration of the library and information science professional skills and personal competencies: An Israeli perspective. *Library & Information Science Research*, 37(2), 130–138. <https://doi.org/10.1016/j.lisr.2015.02.003>

- Chawner, B., & Oliver, G. (2013). A survey of New Zealand academic reference librarians: Current and future skills and competencies. *Australian Academic & Research Libraries*, 44(1), 29–39. <https://doi.org/10.1080/00048623.2013.773865>
- Ennis, L. A. (2010). Core Technology Competencies for Librarians and Library Staff: A LITA Guide. *Journal of the Medical Library Association: JMLA*, 98(1), 89–90. <https://doi.org/10.3163/1536-5050.98.1.023>
- Hodge, M. L. (2022). First-generation students and the first-year transition: State of the literature and implications for library researchers. *The Journal of Academic Librarianship*, 48(4), 102554. <https://doi.org/10.1016/j.acalib.2022.102554>
- KELPRO BULLETIN. (n.d.). Retrieved June 25, 2026, from https://kelprobulletin.in/Journals_more.php?page=22
- Kochert, J., Kirshenbaum, J. M., Bigerton, K., Scymcyk, J., McFerran, M., & Ezzo, C. (2022). Development of cross-cultural performance criterion measures: Critical issues and practical solutions. *International Journal of Cross Cultural Management*, 22(3), 517–542. <https://doi.org/10.1177/14705958221138458>
- Ola, A. (2018a). Research Skills, ICT Application and Sustainable Library Development. *Library Philosophy and Practice (e-Journal)*. <https://scholarworks.sjsu.edu/libphilprac/1839>
- OYEDOKUN, T., Oyewumi, F., Akanbi, M., & Laaro, D. (2018). ASSESSMENT OF ICT COMPETENCIES OF LIBRARY STAFF IN SELECTED UNIVERSITIES IN KWARA STATE, NIGERIA. *Library Philosophy and Practice (e-Journal)*. <https://scholarworks.sjsu.edu/libphilprac/1797>
- X. Faucher, K. (2014). An information meta-state approach to documentation. *Journal of Documentation*, 70(4), 503–525. <https://doi.org/10.1108/JD-09-2012-0118>