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A Bibliometric Analysis of the Evolution and Impact of Reference Services and Information Literacy Programs in Academic Libraries (2014-2024)

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ABSTRACT

This study presents the bibliometric analysis on topic of Information Literacy (IL) program and reference services in academic libraries. The main objective of this study is to examine the correlations between 3182 research papers cited from the year 2014 to 2024 in Scopus-indexed scholarly publications. This study means to systematically analyse the topic research trends, identify authors, influential journals and emerging topics to provide insights into the evolution and impact of the academic libraries IL and reference services. This study answered the two research questions with the significant results that contribute to research growth. From the findings, it has been a substantial increase in the number of articles in peer-reviewed journals over the years and provides insights of academic libraries evolved to meet the demands of the rapidly changing information and technology landscape and will shapes the future optimization of academic libraries service.

INTRODUCTION

The evolution and impact of reference services and information literacy programs in academic libraries have been significant, driven by technological advancements and changing user needs. Academic libraries have evolved to meet the demands of a digital age. The evolution of academic libraries' reference services and information literacy initiatives highlights libraries' importance in a rapidly changing of the information and technology. Academic libraries today have greatly expanded their digital offerings, not just to include electronic books or journal articles but also to support software application discovery and use. At the very least, they have encountered and mastered the art of the search algorithm (Association of College & Research Libraries, 2022).

The rise in literacy, combined with recent technological advancements, has resulted in expanding technology in education. In the field of library science, bibliometric analysis has been widely used to assess the impact of research papers, journals, and publications on the topic of library services. Academic libraries have increasingly integrated digital resources, leading to a decline in traditional reference transactions and users often prefer search engines like Google and Google Scholar for information retrieval (Bandyopadhyay

& Boyd-Byrnes, 2016). Academic libraries' reference services and information literacy programs (ILPs) have evolved to better engage users and keep up with technological improvements. Most libraries offered vibrant specialized assistance to facilitate users' information needs. This bibliometric study provides insights into the evolution of scholarly attention to information literacy (IL) programs and reference services in academic libraries.

LITERATURE REVIEW

The technological evolution in academic libraries

Over the past 25 years, academic libraries have undergone significant transformation with the advent of new technologies, reshaping traditional services to better support the evolving needs of users in teaching, learning, and research. Academic libraries play a crucial role in improving educational outcomes, advancing research, and supporting broader societal goals. The responsibilities go beyond simply providing resources to include knowledge management, scientific evaluation, and community engagement, all of which align with national educational policies and sustainable development objectives. To keep pace with the fast-changing information and technology landscape, academic libraries have notably improved their reference services and information literacy programs.

The integration of tools such as cloud computing, IoT, and automation has reshaped service delivery and enhanced user engagement. These technologies have not only modernized reference services but also facilitated the development of information literacy programs, making them more relevant in the digital age (Moruf & Dangani, 2020). Moreover, academic librarian services also evolved significantly with the emerging technologies, transforming traditional services to meet the changing needs of users for the teaching, learning, and research activities. Furthermore, their significant contribution to provide reference services and information literacy programs are aligned with the rapidly evolving information and technology landscape through digital resources and sophisticated information management systems. The academic library landscape has undergone a significant transformation in recent decades, driven by the rapid advancements in information technology and the changing needs and expectations of users (Dupuis, 2019).

The integration of new methods of information storage and transmission, such as the shift from physical book collections to networked digital resources has impacted the role of academic libraries (Ricker, 2004). Academic libraries are being challenged to demonstrate their value and relevance to their institutional stakeholders, funders, and governance boards to merit the continuous spending on them (Association of College & Research Libraries, 2011). This is because of a decline in traditional reference questions as users increasingly prefer to find information independently using search engines and online resources (Seal, 2011). Therefore, academic libraries must stay relevance and adapt the emerging technologies for better service delivery.

The Impact of Technology on Reference Services and Information Literacy Programs in Academic Libraries

In response to the rapidly evolving information and technology, academic libraries have significantly increased their information literacy initiatives and reference services. These changes have transformed libraries into dynamic educational hubs, fostering information literacy and providing tailored support to users. The expanding services beyond traditional resources to assist users utilizing the technologies advancement. With the advancement of information and technology, reference services have changed from traditional in-person consultations to digital options like live chat, email assistance, and Artificial intelligence (AI)-powered solutions. These advancements facilitate better service delivery and resource management (Ngoaketsi, 2021). Libraries now support the discovery and use of various software

applications, aiding students and faculty in their academic and research endeavours (Ming, 2020). The evolve of library automation and online reference services, the function of reference librarian is evolving from educating users by offering the right tools for retrieving needed information sources.

The implementation of chatbots AI-driven systems, has enhanced online support by providing automatic and custom responses to user queries. These chatbots help in making library resources more accessible and provide insights into user needs (Reinsfelder, O'Hara-Krebs, 2023). AI refers to the science and technology of research and development of theories, methods, techniques, and application systems for simulating and extending human intelligence, which is connected to the challenge of utilizing computers to comprehend or imitate the intelligence of humans without any logical order or algorithm (Bjola, C 2022). AI as machine-based technique with algorithmic power for making predictions, diagnoses, recommendations, and decisions, has gained prominence in the educational community in recent years due to its potential to support learning in various contexts. With diverse applications such as intelligent tutors for content delivery, feedback provision, and progress supervision, the field of AI in education has demonstrated technological advances, theoretical innovations, and successful pedagogical impact (Chen et al., 2022).

The integration of technologies advancement in information resources, the creation of virtual reference services and the emphasis on comprehensive information literacy programs are all important components that will shapes the future optimization of academic libraries service. As technology continues to evolve, academic libraries are adapting to meet the ever-changing needs of students, faculty, and researchers.

METHODOLOGY

This study is a qualitative research method using systematic review and analyzed by bibliometric analysis, the research approach evaluates publications and production in a certain study field. The data of the research was collected from the Scopus citation web page to search the journal articles and conference papers. Scopus is the leading choice for bibliometric studies because of its comprehensive, up-to-date, and high-quality dataset, along with its robust analytical tools that help researchers gain deep insights into publication patterns, citation impact, and trends within specific fields like information literacy and reference services in academic libraries. The terms used for search strings is as follows:

"information literacy programs" OR "library's user education" OR "reference services" OR "university librar*" OR "academic librar*" OR "college librar*" OR " higher education librar*" OR "Reference Servic*" AND technolog* OR "Information Literacy Programs OR *Digital Referenc*" OR "Information Literacy" OR "Library Instruction" OR "Research Skills" OR "Virtual Reference" OR "Library Collaboration Networks" OR "Information Management" OR "Library Trends"

RESEARCH QUESTIONS

This bibliometric study aims to answer the following research questions (RQ):

RQ1: What is the importance aspect of information literacy (IL) programs and reference services in academic library literature in terms of publication trends, journals, authors, articles, countries and institutions?

RQ2: What is the intellectual structure of literature, how has it evolved over the years and what are recent research trends in this domain?

To answer the research question, a bibliometric analysis has been conducted. The selected publication papers are limited only from year 2014 to 2024 and only to records in the form of journals articles and conference papers, with only at the final publication stage and written in English language. The results of the sorting are saved in CSV and RIS formats. To visualize the results of the analysis, the RStudio is a

software tool for constructing and visualizing bibliometric networks application is used. The analysis of the data gathered used Biblioshiny, a specialized program supported by the RStudio environment. This software facilitated quantitative studies in bibliometrics, assisting in the comprehensive understanding of the research domain, its dynamics, and trends (Aria & Cuccurullo, 2017).

RESULTS AND DISCUSSIONS

This paper presents results from a bibliometric analysis of the topic information literacy (IL) program and reference services in academic libraries and its evolving changes for the last 10 years (2014-2024). This study also examines the existing research articles and conference papers to identify the topic trends, authors, influential journals and emerging topics to provide insights into the evolution and impact of the emerging technologies in academics library. Thus, this study may help the policymakers and practitioners make informed decisions. This is because of the library policies should be flexible and forward-thinking to effectively address the opportunities and challenges presented by emerging technologies. These policies should direct to the incorporation of integration of new technologies, digital literacy initiatives, user-centered services, data privacy and security, accessibility and inclusivity, collaboration and partnerships.

The bibliometric review strictly adhered to the PRISMA Statement, a benchmark for providing comprehensive reporting frameworks for systematic reviews (Moher et al., 2010). The research journey, starting from the expansive literature search to the final selection and assessment of the articles, it is visually represented in the PRISMA flow chart (Figure 1). The PRISMA flow chart is a visual representation used in literature reviews to depict the process of selecting relevant articles and the attrition of irrelevant records throughout the review process (Chong et al., 2023). It is a reporting standard that aims to ensure transparency and provide a clear understanding of the core procedures used in a systematic review (A. Trifu et al, 2022). The PRISMA flow chart allows readers to quickly grasp the methods employed in the review and how the selection of articles was conducted (Lara A. et al., 2021)

In summary, this study involved systematic data analysis and process, encompassing the collection, selection, and analysis of **8,348 records** obtained from the Scopus database as of **10th November 2024**. This review adhered to a stringent methodology, ensuring the reliability, validity, and intellectual rigor of its findings then **5166 records will be removed** when the articles limit to **document types conference paper and journal articles, final publication and language English**. The Figure 1 below show the final complete metadata and its reliable quality used only in this study.

Completeness of bibliographic metadata - **3182** documents from **Scopus**

Metadata	Description	Missing Counts	Missing %	Status
AB	Abstract	0	0.00	Excellent
DT	Document Type	0	0.00	Excellent
SO	Journal	0	0.00	Excellent
LA	Language	0	0.00	Excellent
PY	Publication Year	0	0.00	Excellent
TI	Title	0	0.00	Excellent
TC	Total Citation	0	0.00	Excellent
AU	Author	2	0.06	Good
C1	Affiliation	31	0.97	Good
CR	Cited References	72	2.26	Good
DE	Keywords	435	13.67	Acceptable
DI	DOI	551	17.32	Acceptable
RP	Corresponding Author	974	30.61	Poor
ID	Keywords Plus	2475	77.78	Critical
WC	Science Categories	3182	100.00	Completely missing

Figure 1: The Completeness of Bibliographic Metadata retrieved from Scopus

Figure 2 below provides a visual representation of the sequential steps employed in the search strategy, further emphasizing the systematic and rigorous nature of the review process.

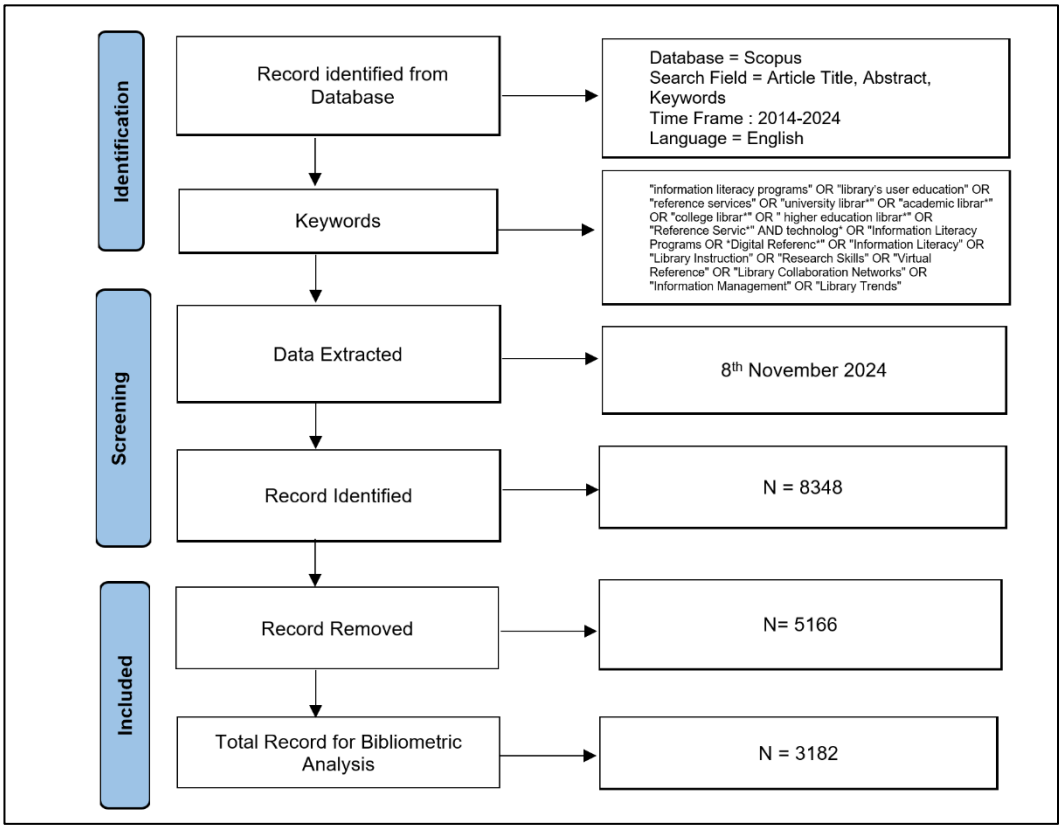


Figure 2: Flow diagram of search strategy using Prisma Table (adapted from Moher et al., 2010

Main Information

This paper systematically studying the quantitative aspects of the literature to uncover patterns, trends, and insights. The main information of this analysis can be organized around several key components that help researchers to understand how research has evolved over time, the impact of specific studies, and the broader academic landscape of the field.

Table 1: Primary information on relevant articles

Description	Results
MAIN INFORMATION ABOUT DATA	
Timespan	2014:2024
Sources (Journals, Books, etc)	529
Documents	3182
Annual Growth Rate %	0.46
Document Average Age	4.83
Average citations per doc	7.63
References	85797

DOCUMENT CONTENTS	
Keywords Plus (ID)	4112
Author's Keywords (DE)	6525
AUTHORS	
Authors	5916
Authors of single-authored docs	849
AUTHORS COLLABORATION	
Single-authored docs	991
Co-Authors per Doc	2.36
International co-authorships %	8.957
DOCUMENT TYPES	
article	2828
conference paper	354

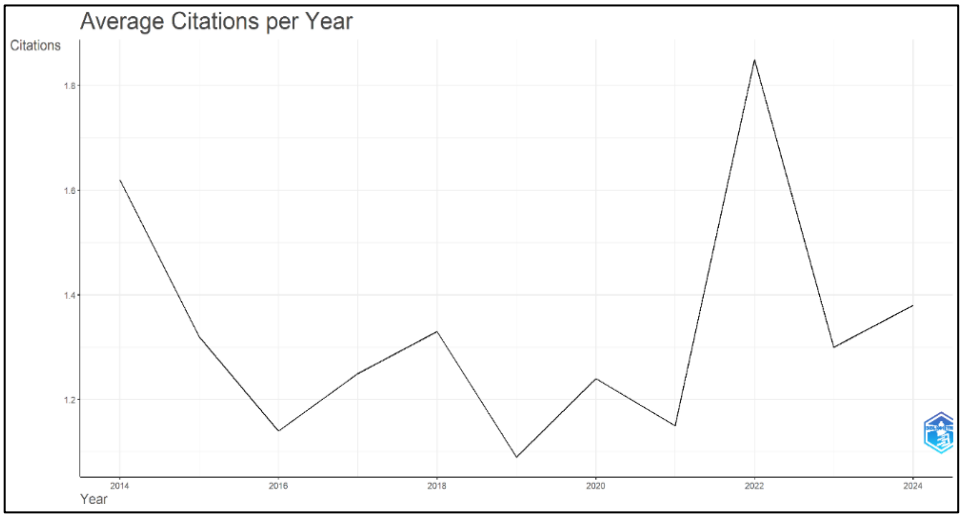
Publication trends of article published per year

Table 2 below displays the number of publications over time. Figure 2 displays the average citation which is the growth and decline in the volume of publications within a specific time frame (2014-2024) to track how interest in reference services and information literacy has evolved.

Table 2: Annual publication and citation trend

Year	MeanTCperArt	N	MeanTCperYear	CitableYears
2024	1.38	245.00	1.38	1
2023	2.6	268.00	1.30	2
2022	5.54	284.00	1.85	3
2021	4.58	408.00	1.15	4
2020	6.2	345.00	1.24	5
2019	6.56	337.00	1.09	6
2018	9.29	285.00	1.33	7
2017	9.98	265.00	1.25	8
2016	10.3	252.00	1.14	9
2015	13.16	259.00	1.32	10
2014	17.77	234.00	1.62	11

Figure 3: Average citations per year



Most Relevance Source

Table 3 and Figure 4 below provide the top 25 most popular journal in this study. This identifying the most relevant sources is crucial for understanding where impactful research has been published. Relevant sources typically include high-impact journals and conference proceedings that consistently contribute to shaping knowledge in the field of study. Researchers can gain a comprehensive understanding of the evolving landscape of reference services and information literacy programs in academic libraries, and their impact on student success and academic learning.

Table 3: The top 25 most popular journals in the subject

Sources	Articles
Library Philosophy And Practice	373
Journal Of Academic Librarianship	216
Reference Services Review	130
Evidence Based Library And Information Practice	76
Library Management	73
Library Hi Tech	72
Journal Of Library Administration	71
College And Research Libraries	61
Journal Of Information Literacy	56
Desidoc Journal Of Library and Information Technology	49
Journal Of Library and Information Services in Distance Learning	48
College And Undergraduate Libraries	47
Electronic Library	46
Library Hi Tech News	43
Public Services Quarterly	42

New Review Of Academic Librarianship	41
Digital Library Perspectives	39
Portal	39
Communications In Information Literacy	38
International Information And Library Review	38
Internet Reference Services Quarterly	37
ACM International Conference Proceeding Series	32
IFLA Journal	31
Proceedings Of the Association for Information Science and Technology	28
Reference Librarian	26

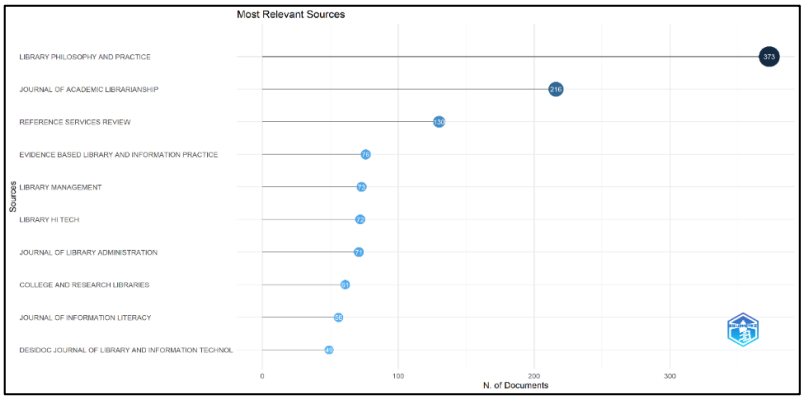


Figure 4: The 10 most popular journals in the subject

Most cited authors

Identifying the most cited authors to reveal key researchers who have had a significant impact on the field. These authors are typically responsible for pioneering research, developing influential frameworks, and contributing to the development of key practices in the areas of reference services and information literacy. Table 4 below displays the top 25 most cited authors and Figure 5 shows the top 10 most cited authors in this study field.

Table 4: The 25 most cited authors

Authors	Articles	Articles Fractionalized
Dr	13	3.58
Michalak R	12	7.03
Sheikh A	12	6.17
Khan A	11	5.08
Chiu Dkw	10	2.77
Julien H	9	3.03
Li Y	9	2.33

Rysavy Mdt	9	4.33
Wang L	9	3.09
Zhang L	9	4.42
Zhang Y	9	2.58
Ahmed S	8	3.17
Ashiq M	8	2.25
Bhatti R	8	3.08
Li X	8	2.67
Mahmood K	8	2.54
Pinto M	8	2.50
Rafiq M	8	2.62
Ahmad S	7	1.99
Gross M	7	2.20
Hamad F	7	2.67
Hervieux S	7	3.70
Latham D	7	2.20
Mutula S	7	3.17
Raju J	7	4.83

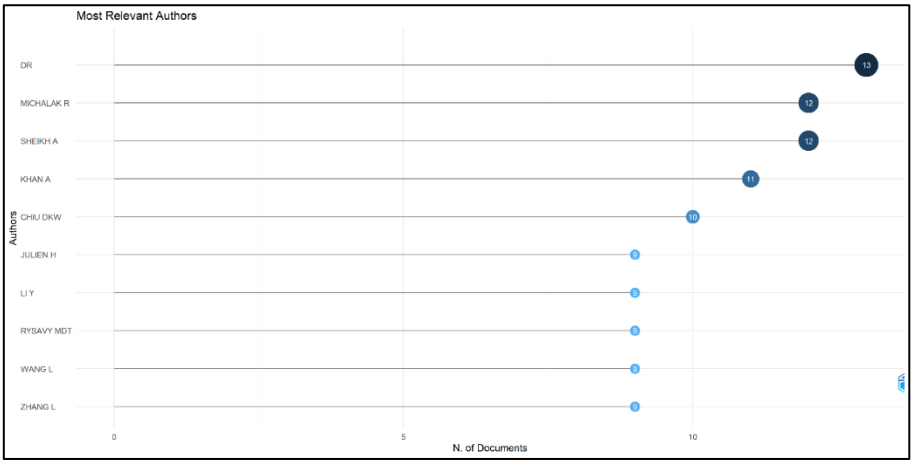


Figure 5: The top 10 most cited authors

Most cited articles

The most cited articles in the field of reference services and information literacy in academic libraries from 2014-2024 helps pinpoint seminal studies that have had a significant impact on research and practice. These articles typically present foundational theories, innovative methodologies, or transformative practices that influence library professionals, educators, and researchers. Table 5 show the top 25 most global cited documents and Figure 6 show the top 10 most global cited documents.

Table 5: The top 25 most global cited documents

Paper	Total Citations	TC per Year	Normalized TC
Inhorn Mc, 2014, Hum Reprod Update	1169	106.27	65.79
Blackburn H, 2017, Sci Technol Libr	207	25.88	20.73
Cox Am, 2017, J Assoc Soc Inf Sci Technol	150	18.75	15.02
Tewell E, 2015, Commun Inf Lit	136	13.60	10.33
Yoon H-Y, 2016, J Acad Librariansh	125	13.89	12.14
Pinfield S, 2014, Plos One	122	11.09	6.87
Giovanis A, 2019, Int J Retail Disrtib Manage	106	17.67	16.16
Saunders L, 2015, J Acad Librariansh	106	10.60	8.05
Alle N, 2016, Int J Fluid Power	105	11.67	10.20
Julien H, 2018, Coll Res Libr	101	14.43	10.87
Tian Y, 2019, Procedia Cirp	100	16.67	15.25
Okunlaya Ro, 2022, Libr Hi Tech	97	32.33	17.51
Cheng F-F, 2018, Libr Hi Tech	97	13.86	10.44
Raju J, 2014, J Acad Librariansh	96	8.73	5.40
Koltay T, 2015, J Doc	96	9.60	7.29
Lo Ls, 2023, J Acad Librariansh	93	46.50	35.81
Delaney G, 2015, New Rev Acad Librariansh	91	9.10	6.91
Cao G, 2018, Electron Libr	87	12.43	9.37
Cha Sh, 2015, J Acad Librariansh	82	8.20	6.23
Moorefield-Lang Hm, 2014, Libr Hi Tech	82	7.45	4.61
Andrews Je, 2021, J Acad Librariansh	78	19.50	17.03
Hess Akn, 2016, Commun Inf Lit	77	8.56	7.48
Kruse Cs, 2015, Bmj Open	75	7.50	5.70
Cook M, 2019, Inf Technol Libr	73	12.17	11.13
Vassilakaki E, 2015, New Libr World	70	7.00	5.32

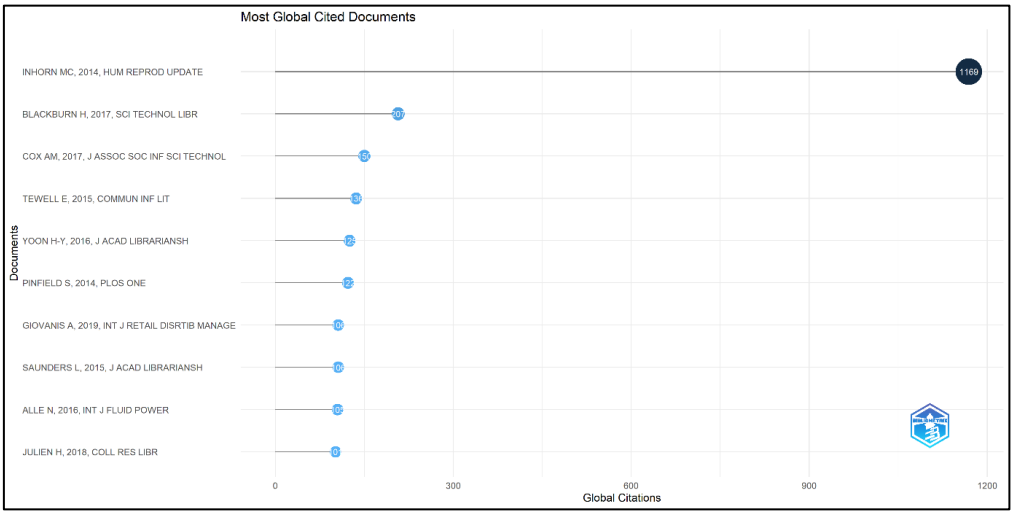


Figure 6: The top 10 most global cited documents

Most productive countries and institutions

By identifying the most productive countries and institutions provides valuable insight into where the majority of influential research has been produced. This information highlights the geographical and institutional hubs of research, innovation, and thought leadership in the field of academic library services, specifically around information literacy and reference services. Table 6 below displays the top 25 most productive countries and institutions that frequently produce publication in the study field.

Table 7: The 25 Most Productive Countries and Institutions

Region	Freq
USA	2541
India	609
China	582
Nigeria	524
Pakistan	258
Canada	237
South Africa	203
Uk	174
Australia	142
Malaysia	127
Indonesia	122
Iran	115
Ghana	114
Spain	68
Ukraine	57
Brazil	54

Affiliation	Articles
University Libraries	103
University Library	86
University Of The Punjab	46
University Of South Africa	44
Brigham Young University	42
University Of Nigeria	34
Mcgill University	31
University Of Cape Town	24
University Of Ghana	24
City University Of New York	23
Goldey-Beacom College	22
California State University	21
Federal University Of Technology	19
Nanjing University	19
University Of California	18
University Of Malaya	18

Philippines	53
Italy	52
South Korea	50
Greece	46
Thailand	43
Saudi Arabia	40
Germany	37
Netherlands	36
Japan	35

University Of Nevada	18
University Of Sargodha	18
Notreported	17
Wuhan University	17
Boise State University	16
Panjab University	16
Sam Houston State University	16
University Of Florida	16
University Of Pretoria	16

Most common keywords and word cloud

The most common keywords based on trends in academic library research paper published. These keywords reflect the changing nature of library services, the integration of new technologies, and the growing emphasis on student success and digital literacy. Figure 7 below shows the word cloud that plot keywords and Figure 8 shows the analysis of the keyword tree map based on the word cloud plot.

Figure 7: Word cloud plot of keywords

Figure 8: An analysis of the keyword tree map based on the word cloud plot

Trends topics

Table 8 and Figure 9 below show the tracking of most topics discussed in the publications these areas. There are 29 items as trends topics of this study. From the analysis, researchers may identify and study the emerging trends within a specific domain for understanding shifts in behavior, predicting future changes, and responding to real-time development.

Table 8: The Trend Topics

Item	Freq	Year_Q1	Year_Med	Year_Q3
access to information	7	2014	2015	2016
mobile libraries	7	2014	2015	2018
program development	5	2015	2015	2015
open access	9	2015	2016	2018
societies and institutions	9	2015	2016	2017
e-books	8	2015	2016	2018
education	56	2016	2017	2019
higher education	23	2016	2017	2019
internet	18	2016	2017	2018
Library	118	2017	2018	2021
librarian	84	2017	2018	2022
human experiment	53	2017	2018	2021
Human	157	2017	2019	2022
academic libraries	133	2016	2019	2022
information services	127	2017	2019	2021
libraries	366	2017	2020	2022
digital libraries	161	2017	2020	2022
information management	115	2017	2020	2021
university libraries	228	2018	2021	2022
engineering education	46	2017	2021	2023
big data	43	2020	2021	2022
artificial intelligence	20	2021	2022	2023
library management	20	2018	2022	2023
Nigeria	20	2017	2022	2023
collaborative filtering	17	2019	2023	2024
efficiency	11	2022	2023	2024
case-studies	9	2023	2023	2024
high educations	10	2023	2024	2024
users' experiences	9	2024	2024	2024

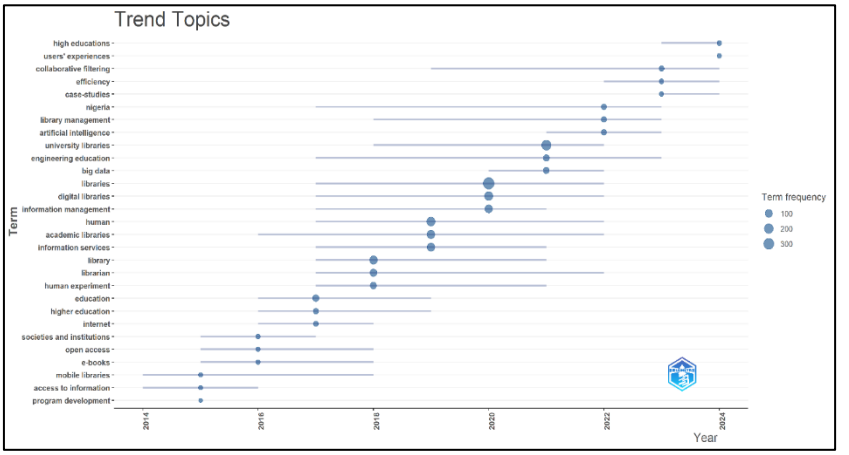


Figure 9: The Trend Topics

Co-occurrence Network

Figure 10 below shows the semantic networks or co-occurrence network maps identify the most commonly co-occurring words in the titles, abstracts or keywords of articles in a given set. These networks are useful in showing how potentially diverse areas of research interrelate and overlap within main topic.

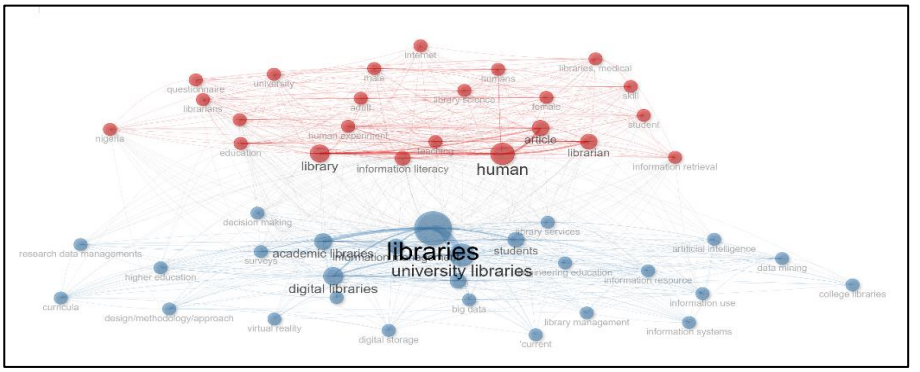


Figure 10: The co-occurrence network maps

Countries Collaboration

Figure 11 below shows the countries collaboration and working together closely in publication papers within same topic. By sharing knowledge and expertise, countries may contribute to more visible in scholarly publishing. From the mapping shows below, we can understand that there are actively collaboration and this analysis can be used to analyse academic networks, it's not just about recognizing individual publications but also about understanding how research communities are formed because scholars from various universities or research groups frequently cite one other's work.

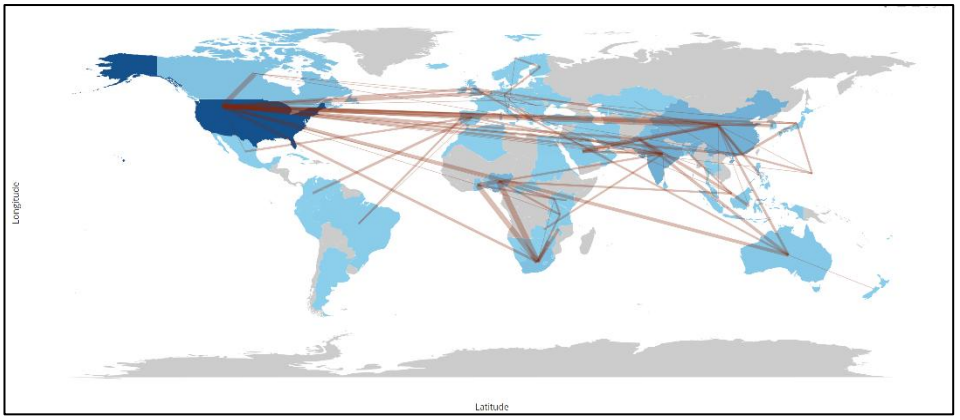


Figure 11: The maps of countries collaboration

Author co-citation network

Figure 12 below shows the co-citation analysis involves tracking pairs of papers that are cited together in the source articles. The analysis monitors the frequency with which other scholarly works cite these pairs together over time. Even if there are no direct authorship or citation linkages between various scholarly works, scholars might nevertheless find connections between them by looking at co-citation patterns.

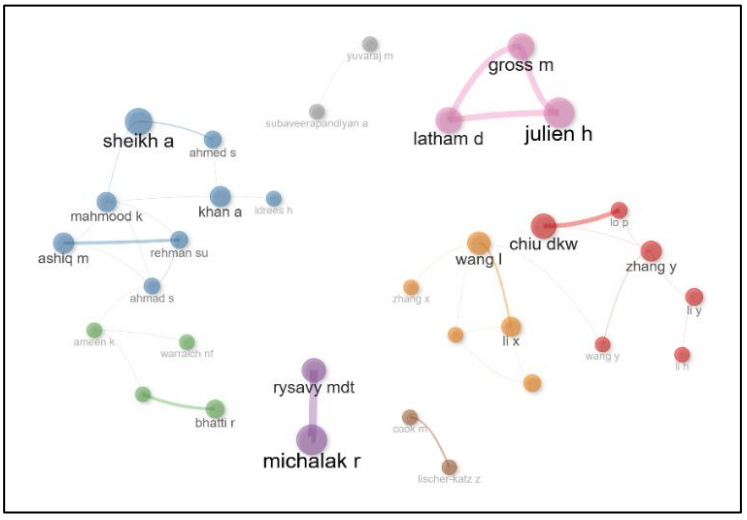


Figure 12: The Author co-citation analysis

CONCLUSION

This bibliometric analysis offers a thorough examination of the evolving trends in information literacy and reference services within academic libraries over the past decade (2014-2024). The findings highlight the increasing importance of digital literacy, the ongoing change of reference services via AI and virtual platforms, and the deeper incorporation of information literacy into academic courses. While the integration of emerging technologies presents issues and challenges, it also offers opportunities for libraries to enhance

their services and enriching the user's experience. Competence librarians are required to promote real-time information access and intelligent data analytics towards smart library services.

Looking ahead, future research could investigate how libraries are addressing the challenges posed by misinformation, as well as how they can more effectively utilize emerging technologies to enhance support for users' information needs. Despite the difficulties, integrating new technologies gives libraries the chance to improve and develop their offerings, which will ultimately improve the user experience. To enhance user experience and resource accessibility, policymakers should align the libraries policies with evolving technological trends.

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