A comparison of Q Index Ranked Journals: Library and information Science productivity and research trends (2011-2020)

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Publishing in the prestigious research avenues is considerable important for the researchers and academicians. However, selecting the right journal to suit the research topic and quality of research is a tiresome task.

Studying the nature of the research published in differently ranked journals is important to understand the difference of research and publication trends. This study aims to examine a differences and similarities of the research published in the Q1 and Q4 ranked Library and Information Science (LIS).

A total 21,437 documents were selected from WoS Q1 and Q4 category LIS journals for this study. Then the data of Q1 and Q4 journals was separately accessed, analyzed and compared with different tool including MS Access, MS Excel, Gaphi, Biblioshiny, and VOS Viewer software.

We found significant differences in the LIS research themes and publication trends between the Q1 and Q4 category publications. The Q1 journals are publishing on emerging bibliometrics, technology related topics like social media, information systems, machine learning etc., innovating practices and research. While, Q4 journals mostly publish about academic libraries, information seeking, literacy and behavioral research. Topical evaluation reveled citation analysis, bibliometrics, social media, innovation and collaboration as emerging topics in both Q1 and Q4 category journals but differ in terms of total publications order.

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This is the first study to the best knowledge or understanding by the authors to examining the similarities and differences in a Q1 and Q4 ranked LIS journals related to the research trends, publishing institution, individuals, countries, etc. It also identifies and compares the Q1 and Q4 journal's major research topics, topical evolution over years, most citied research themes that can also be considered a novel contribution to the field. This study provides a holistic overview of topical evolution and emerging research foci for the LIS researchers, especially early career researchers, academicians, and research students to make right decisions for research topic, publication avenues, collaborators, and potential areas of interest to attract research grants. This method of comparing category-based research trends can assist library practitioners working for research support and information literacy to assist their users in the selection of topics for potential publications and publication avenues to create impact.

Keywords: Bibliometric indicator, library and information sciences, research trends, journal citation ranking, quartile 1, quartile 4

Highlights

- Using Q index rank indicator as a source of identifying emerging research topics for the early career researchers.
- There is a difference between research topics published in Q1 and Q4 journals.
- Both Q1 and Q4 journals mainly focus on technology related topics but the Q1 journals publish disruptive technologies while Q4 journals publish about application of technologies.
- The Q4 journals top research trends are in least to appear in Q1 journals.

INTRODUCTION

Journal Ranking Systems

A journal's impact has been used to determine the essential sources of disciplinary knowledge to be used by researchers or acquired for the libraries (Saarela et al., 2016) and most recently for the author and institutional ranking (Abramo et al., 2012). Over the years, numerous approaches have been used to rank journals, such as citation metrics, school lists (ABDC), acceptance rates,

and expert assessments (Lowry et al., 2013; Saarela et al., 2016) and opinion based ranking (Cornillier & Charles, 2015). Several databases offer a ranking of thousands of journals which the researchers accept as a measure of quality, influence (Länzel & Oed, 2002), prestige (Wallin, 2005), transparency and accountability (Espeland & Sauder, 2007). The first one is Thomson Reuters' Web of Science's Journal Citation Rank (JCR), which included 12172 peer-reviewed journals in 2021 under 236 subject categories. Second is Scopus database's SCImago Journal Rank (SJR) which 27278 journals under 333 subject categories.

The Journal Impact Factor (JIF) was the first metric proposed by Garfield (Garfield, 1972) and considered most important in any subject domain by academicians, researchers, and practitioners. The IF is calculated by the ratio of the average number of times articles of a journal has been cited to the number of citable articles published in the two preceding years (Cornillier & Charles, 2015, p. 172). Next, the IF journals are categorized into quartiles based on their IF in JCR and SJR (Guerrero-Bote & Moya-Anegón, 2012). The quartile index defines the rank of the journal in a specific field of study. This index based on the PageRank algorithm groups top journals into quartile one (Q1 = 25%), next less impactful journals into quartile two (Q2=50%), lesser impactful into quartile three (Q3=75%) and least impactful journals into quartile four (Q4=100%). This classification further indicates the impact of the research published in these journals (Guerrero-Bote & Moya-Anegón, 2012). We proposed that the journals indexed in different quartiles present different focus of research and practices in any subject domain. A study of differences of these foci can be of great value for researchers of a specific subject domain.

Bibliometric studies for performance analysis

The bibliometrics analysis is being used to evaluate the research performance of individuals and institutions for competitive advantages. It is both prestigious and a prerequisite for academicians and researchers to show their research performance by publishing in the highly impact factor (IF) journals. It significantly contributes to their hiring, promotions, attaining research grants and getting hold to competitive administrative roles like deanship (Snizek, 1995), journal editorships.

Similarly, the institutions of highly impact creating authors rise and

sustain on the global institutional ranking, for example, QS World University Rankings, Times Higher Education etc. Research output in the recognized journals provides a competitive advantage to these institutions that include attracting world-class researchers and teachers, increased admissions of intelligent domestic and international students, competitive funding shares (Ovseiko et al., 2012), more substantial industry liaison for innovation, international institutional collaboration (Abramo et al., 2012) and overall impact to national research and development (Abramo & D'Angelo, 2018). The increased emphasis on the research performance and its usage for personal and institutional rankings put enormous pressure on the researchers to publish in high IF journals and, in most cases, only in quartile one journals. Scientific publication in IF journals is a long and tiring process that includes desk rejections, long wait time, irrelevant rounds of revisions, and rejections after rounds of revisions. Among other parameters of the research publication, one aspect is an insightful selection of right publication avenue. Hence, it is important to understand the publication trends of targeted journals to increase the pace of research output, although mostly early career researchers find difficulties in selecting research topics viable for considerate impact and potential publication (Ameen et al., 2019). Therefore, it is foremost value for the researchers to understand the topical evaluation within their field of study. Researchers use different methods to acquire understanding of research trends that include talking to peers, assessing call for papers, conference themes (Jiang et al., 2018), analysis of research grants and projects (Chen et al., 2016). Different techniques are in use to capture the research trends e.g., text-mining techniques (Nie & Sun, 2017), semantics-based dynamic modeling (Daud, 2012), bibliometric studies (M. H. Huang & Chang, 2014) and review studies (Donthu et al., 2021).

This study aims to increase researchers' insights from a specific field by comparing the peer-reviewed and impact factors (IF) journals ranked under different categories, i.e. Q index ranking. We propose that analysis and comparison of the topical evolution from the journals indexed under different ranking categories can help researchers and academicians identify and select the right research publication avenues, collaborators, and potential areas of interest to attract research grants. The remaining of this paper is organized into four sections. In the first section, we discuss various

journal ranking systems, and we elaborated scope and implications of this study. It is followed by an illustrative view of the Library and Information Sciences subject and research domain by briefing its historical development, LIS education, and research avenues, including journals and top professional conferences. In the second section, we provided research questions and a detailed research methodology indicating a step-by-step data collection, filtering, and analysis process. The third section provides data analysis and discussion into two sub-sections: research productivity and thematic analysis. And the last section provides a discussion, implications of this research, conclusion, and directions for future research.

Scope and significance of the study

There are three types of bibliometric indicators: quantity indicators to measure the productivity of a particular researcher; quality indicators to measure the quality or performance of a researcher's output; and structural indicators to measure connections between publications, authors, and areas of research (Valérie & Pierre, 2010). The purpose of this paper is to construct a new prospect by extending quantitative and qualitative bibliometrics indicators, the *'Q index rank indicator'*, to assess and compare two or more journal categories of any specific subject domain. We propose that this assessment can bring scientific insights and research directions for researchers and academicians of a specific subject domain, as they will be able to:

    i.   Weigh the publication outlets both for quality and quantitative purposes

    ii.   Identify the main areas of the research focus of journals ranked underdifferent categories

    iii.   Compare the research focus' differences and similarities of journalsranked under different categories

    iv.   Identify the time evolution of research topics appearing in differentjournals ranked under different categories

    v.   Recognize emerging and reoccurring authors in different journals rankedunder different categories

To use this new method, we selected the Library and Information Science (LIS) from the Web of Science subject domain and compared journals indexed in its two categories, quartile 1 (Q1) and quartile 4 (Q4). For this purpose, bibliometric methods have been used to quantitatively analyze the

retrieved data to compare research productivity and impact. We aim to answer following questions:

1. What is the publication chronology of LIS journals publish in Q1 and Q4 categories?
2. Which countries publish most in the Q1 and Q4 categories of the LIS subject domain?
3. Which LIS journals publish more research in the Q1 and Q4 categories?
4. Who are the most productive LIS authors, and what are their authorship patterns in the Q1 and Q4 categories?
5. Which type of documents are most published in the Q1 and Q4 categories?
6. What is LIS topical trends, and how they evolve in the past ten years?
7. What are the emerging research themes of LIS journals categorized in the Q1 and Q4 categories?

RESEARCH METHODOLOGY

Bibliometrics is a set of mathematical and statistical methods used to analyze and measure the quantity and quality of books, articles, and other forms of publications. In the past two decades, there has been incredible growth in bibliometrics studies (Cappelletti-Montano et al., 2021). Some of the contributing factors of this growth are, an overall increase in the research related practices,i.e. research publications, research collaborations, increased number of journals and yearly issues, hybrid and electronic publication systems, increased accessibility to published research, the strength of research indexing and ranking platforms (Cornillier & Charles, 2015), and availability of content analysis tools collectivity provides favorable conditions to conduct bibliometric research(Franceschini & Maisano, 2011). The bibliometrics analysis assists in understanding the relationships among published research through citation analysis and depicts the research evaluation (Huang & Chang, 2008). Through citation analysis, researchers assess the research performance of a subject domain, a specific topic, a specific journal (Pan et al., 2018), an institution (Saarela et al., 2016), a country (Abramo & D'Angelo, 2018; Scarpa et al., 2018) orindividuals (Agarwal et al., 2016) by integrating the knowledge of collaborators, research collaborations that can be beneficial to scientific development by increasing research productivity (Huang et al., 2015).

This section provides information about the data collection, data cleaning and analysis methods. We collected the data of LIS articles and conferences of the past ten years (2011-2020) categorized in Q1 and Q4 categories to answer these questions. We focus on the past ten years to have an in-depth topical analysis.

Data Collection

The researchers compiled a complete list of International Standard Serial Number (ISSN) of all journals in the LIS subject category from the Journal Citation Report (JCR) to fetch data of Q1 and Q4 journals. To retrieve the data of LIS Q1 journals, a query (table 1) was executed in the ISSN field on June 12, 2021.A total of 17026 results were retrieved with a period from 2011 to 2020. For the comparison purpose, document types, article, proceedings paper and review were included, and the remaining 1655 other document types were excluded. The reason is that, in social sciences, only three major document types are considered for the analysis. Therefore, a total of 15605 documents were selected for the collection. We included these types of studies to have a maximum coverage to the topics of interest emerged during past 10 years. Therefore, we provided topical evolution of the top 70 topics in table 9 and 10. This vast coverage is aligned with objectives of this study to provide sufficient information to new researchers and LIS students.

Table 1

Search query, inclusion criteria and results

LIS Journals Q1			Results
	Query	IS=(0268-4012 OR 1083-6101 OR 0276-7783 OR 0963-8687 OR 0378-7206 OR 0740-624X OR 0306-4573 OR 1367-3270 OR 1751-1577 OR 1350-1917 OR 0736-5853 OR 1067-5027 OR 1540-1960 OR 1556-1607 OR 0742-1222 OR 1365-8816 OR 0268-3962 OR 1047-7047 OR 1471-7727 OR 1536-9323 OR 0138-9130)	17026
	Inclusion Criteria	Refined by: PUBLICATION YEARS: (2020 OR 2019 OR 2018 OR 2017 OR 2016 OR 2015 OR 2014 OR 2013 OR 2012 OR 2011). Indexes: SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, ESCI, CCR-EXPANDED, IC. DOCUMENT TYPES: (REVIEW OR EARLY ACCESS OR ARTICLE OR PROCEEDINGS PAPER)	15605
LIS Journals Q4			

Query	IS=(1531-2542 OR 1368-1613 OR 0090-7324 OR 1094-9054 OR 2514-9288 OR 0795-4778 OR 0024-2667 OR 2475-0158 OR 0024-2527 OR 2164-8034 OR 0098-7913 OR 0187-358X OR 0373-4447 OR 0103-3786 OR 0104-0146 OR 1195-096X OR 0363-0277 OR 0034-5806 OR 0023-9283 OR 0044-2380 OR 1587-8694 OR 1525-2531)	51261
Inclusion Criteria	Refined by: PUBLICATION YEARS: (2020 OR 2019 OR 2018 OR 2017 OR 2016 OR 2015 OR 2014 OR 2013 OR 2012 OR 2011) Indexes: SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, ESCI, CCR-EXPANDED, IC. DOCUMENT TYPES: (REVIEW OR EARLY ACCESS OR ARTICLE OR PROCEEDINGS PAPER)	5832

Similarly, to retrieve data of LIS Q4 journals, a query (table 1) was executed. A total of 51261 results were retrieved for the period from 2011 to 2020. These results included 40847 book reviews. For the comparison purpose, document types were limited to the same as Q1 category, and only article, proceeding papers and reviews were included. A total of 5832 documents were selected for the analysis. The data was imported in CSV, RIS, and BIB format touse MS Access, MS Excel, Endnote, and visualization software for further processing. Afterwards, a duplication check was made using Endnote (a citation management software) to applying a match on the author, title, and year. No duplication was found for both quartile results.

Data analysis

Author name anomalies were found for both quartiles' authors. Therefore, the authors' names were carefully checked by visiting organizations, Google Scholar, LinkedIn, author personal web pages, etc., and the anomalies were removed. Further issues were found regarding authorship and keywords in Q4 journals. There were 32 anonymous authors and 3423 records in Q4 journals that did not have author keywords. The data of Q1 and Q4 journals was separately accessed and analyzed through a rigorous process using bibliometric tools MS Access, MS Excel, Biblioshiny, and VOS Viewer software. This software was found suitable to perform the required analysis for this study (Pan et al., 2018). We used VOS Viewer to run a word co-occurrence scale of 5 analyses that helped us identify emerging keywords clusters. First, we exported these clusters to Gaphito download as CVS files. Then we used MS access to standardize the words for singular and plural, British and American English and country names as they appear as full names or abbreviations. Later, this thesaurus was used to create a fresh set of clusters in VOS viewer.

RESULTS

The analysis of the results is divided into two sections. The first section isthe journals productivity analysis and second is thematic analysis of research areas as published in Q1 and Q4 category journals.

Research Productivity Analysis

This section provides insights from the comparison of the Q1 and Q4 category journals about the chronological distribution of publications, top publish countries, journals publishing most research, most productive authors and authorship patterns and types of documents published.

Chronological distribution of publications in Q1 and Q4 journals

The chronological distribution of publications in Q1 and Q4 journals is shown in table 2. The data indicate a consistent growth in the number of publications in Q1 journals in most cases, with 2020 as the full year publishing thehighest number of publications. Similarly, an upward trend in the number of publications in Q4 journals has been found up to 2017, and then a slight decline was found after 2017. The citation-wise analysis ranked the year 2011 at the first position in securing citations in both Q1 and Q4 journals categories.

Table 2

Chronological distribution of publications in Q1 and Q4 journals

Publication Year	Quartile 1 LIS Journals		Quartile 4 LIS Journals	
	TP	TC	TP	TC
2011	1150	49830	473	1966
2012	1318	48575	503	1585
2013	1412	48593	570	1809
2014	1501	42064	578	1448
2015	1422	37447	581	1428
2016	1518	32620	607	1128
2017	1642	27728	735	1133
2018	1709	20200	628	602
2019	1679	11340	637	355
2020	2020	4607	520	69

TP=Total Publications; TC = Total Citations

Comparison of top publishing countries in Q1 and Q4 journal category

Table 3 highlights the top 20 countries which have published in Q1 and Q4 journals. The data ranked the USA as the top country publishing the highest number of researches in both Q1 and Q4 journals. The data ranked China at the second top position in publishing research in Q1 journals, followed by the UK, Canada, and Spain. In comparison, Brazil grabbed the second highest position in Q4 journals, followed by Germany, Spain, and Canada. Interestingly, the USA, Canada, and Spain appeared among the top five positions in both Q1 and Q4 journals. Australia remained at the six positions on both quartiles. The data reveals a significant difference in the number of citations obtained by the countries in Q1 and Q4. The countries in the Q1 journal category secured much higher citations as compared to the countries in Q4. The same trend has been seen in terms of T_U1 (total usage in the last 180 days) and T_U2 (total usage since 2013). The USA takes the overall lead in securing the number of citations and usage counts.

Table 3

Top 20 publishing countries in Q1 and Q4 journals

Quartile 1 LIS Journals					Quartile 4 LIS Journals				
Country	TP	TC	T_U1	T_U2	Country	TP	TC	T_U1	T_U2
USA	5792	146816	25139	270664	USA	2039	5722	1214	20316
China	2562	47132	18235	157606	Brazil	648	654	303	5718
UK	1359	31214	6700	64430	Germany	269	254	85	1549
Canada	854	21986	4256	42150	Spain	241	517	128	3177
Spain	834	15545	2855	38218	Canada	208	704	133	2766
Australia	818	17058	3800	36877	Australia	202	523	240	2289
Germany	817	16311	3696	39674	UK	149	443	104	1775
South Korea	715	15235	3342	38130	South Africa	133	330	96	1834
Netherlands	654	18360	2316	31230	Hungary	123	64	56	777
Taiwan	630	15306	2998	43317	China	117	273	389	3209
Italy	549	10044	2029	21634	Mexico	109	123	47	984
France	431	7236	2006	18348	Japan	83	63	31	774
India	340	5425	2524	16035	Sweden	78	307	62	975
Singapore	317	6929	1971	19555	Nigeria	76	117	49	936
Belgium	313	4803	802	13693	Finland	70	240	69	948

Switzerland	290	5803	1190	12492	South Korea	59	172	64	890
Finland	284	7694	1498	15186	France	48	111	29	594
Sweden	268	5240	1124	11527	Malaysia	33	120	35	595
Brazil	267	3333	1074	10719	Austria	33	43	9	259
Denmark	247	5528	1321	12691	New Zealand	31	76	32	383

TP=Total publications, TC=Total citations, T_U1= Total usage in last 180 days, T_U2= Total usage since 2013

Top organizations publishing in Q1 and Q4 journals

Most productive organizations in both quartiles have been shown in Table 4. The analysis ranked Wuhan University from China at the top position in Q1and Universidade Federal de Santa Catarina (UFSC) from Brazilin the Q4 quartiles. The further analysis revealed two organizations from China, two from the USA, and one from Hong Kong in the top five organizations publishing in Q1 journals. Four organizations from Brazil maintained their positions among the top five organizations in Q4 journals. The City University of Hong Kong secured the highest number of citations and total usage since 2013. Whereas Wuhan University maintained the highest usage count in the last 180 days. The citation and usage comparison between Q1 and Q4 organizations shows a significant difference. The organizations from Q1 obtained higher citations and usage scores as compared to the Q4 organizations.

Table 4

Top 10 organizations publishing in Q1 and Q4 journals

Quartile 1 LIS Journals					Quartile 4 LIS Journals				
Organization	TP	TC	T_U1	T_U2	Organization	TP	TC	T_U1	T_U2
Wuhan University	256	3860	1827	16591	The Federal University of Santa Catarina	79	53	44	948
City University Hong Kong	225	6672	1681	17301	The Federal University of Minas Gerais	77	87	30	608
Indiana University	212	5945	997	10688	University of Illinois	74	228	40	753
Harvard University	199	5842	203	4512	University EstadualPaulista	74	58	29	559
Chinese Academy of Sciences	178	2877	722	10452	University Federal Paraiba	59	54	15	395
Vanderbilt University	158	4646	129	2866	University of Brasilia	59	61	16	519

National University of Singapore	157	3390	950	10081	The National Autonomous University of Mexico	59	50	16	529
Katholieke Universiteity Leuven	156	2042	467	7110	University of Sao Paulo	58	82	24	556
Brigham & Women's Hospital	152	2995	61	1767	The Federal University of Rio de Janeiro (University of Brazil)	57	70	35	572
Arizona State University	148	2993	874	8144	The University of North Carolina	54	142	33	489

Most publishing journals in Q1 and Q4 categories

Table 5 presents the most publishing journals in Q1 and Q4 quartiles. The journal, Scientometrics, published the highest number of publications and ranked at the first position in Q1 distantly followed by the Journal of the American Medical Informatics Association and International Journal of Geographical Information Science. Similarly, the journal Information Research-An International Electronic Journal published the highest number of publications belonging to Q4, followed by Library Journal and Informacao & Sociedade- Estudos. There is a close competition between Scientometrics and the Journal of the American Medical Informatics Association in securing the total number of citations. Still, Scientometrics leads all journals in both usage counts. Further analysis also highlights a significant difference in obtaining citation and usage scores among Q1 and Q4 journals. The journals from Q4 are far behind Q1 journals in terms of total publications, total citations, and usage counts.

Table 5

Top 10 publishing journals in Q1 and Q4 categories

Quartile 1 LIS Journals					Quartile 4 LIS Journals				
Journals	TP	TC	T_U1	T_U2	Journals	TP	TC	T_U1	T_U2
Scientometrics	3183	40829	10191	160457	Information Research-An International Electronic Journal	762	2326	559	9688
Journal of the American Medical Informatics Association	1921	40261	1353	27861	Library Journal	679	305	19	566
International Journal of Geographical Information Science	1132	17289	2652	36726	Informacao & Sociedade- Estudos	443	365	175	2655

International Journal of Information Management	1065	30441	9343	64207	Serials Review	336	673	264	4180
Information Processing & Management	964	11547	2997	24799	Portal-Libraries and the Academy	321	2038	278	5762
Telematics and Informatics	896	14042	3442	51313	Investigacion Bibliotecologica	308	303	131	2873
Journal of Informetrics	790	14720	2545	33052	Reference & User Services Quarterly	297	885	67	1992
Journal of Knowledge Management	739	16327	4349	34548	Econtent	258	44	18	1908
Information & Management	720	19205	5191	46410	Transinformacao	253	412	124	3990
Government Information Quarterly	630	17612	2807	26974	Law Library Journal	240	544	66	2006

Most productive authors in Q1 and Q4 journals

The most prolific authors who published in Q1 and Q4 journals are shown in Table 6. The analysis discloses fascinating results. Most of the authors who published in Q1 journals belong to European countries. Only two are from the USA, maintaining seventh and ninth positions. The USA occupied all top positions except the ninth position in Q4, which South Africa holds. The authors from Q1 journals also published more documents as compared to Q4 authors. Similarly, the authors from Q4 journals have obtained citations only in single digits with nine highest citations. In comparison, the authors from Q1 journals secured significantly higher citations as compared to the authors from Q1 journals.

Table 6
Most productive authors in Q1 and Q4 journals

Top LIS Authors Published in Q1 Category					Top LIS Authors Published in Q4 Category				
Author	TP	TC	Affiliation	Country	Author	TP	TC	Affiliation	Country
Bornmann, L	103	2484	Max Planck Society	Germany	Berry, Jn	49	1	Free Lib Philadelphia	USA
Thelwall, M	81	1904	University of Wolverhampton	UK	Enis, M	48	9	Library Journal	USA
D'angelo, Ciriaco Andrea	77	1428	University of Rome Tor Vergata	Italy	Schwartz, M	45	8	Library Journal	USA
Abramo, Giovanni	77	1462	Consiglio Nazionale DelleRicerche - CNR	Italy	Peet, L	38	8	Library Journal	USA

Abramo, G	76	1450	Consiglio Nazionale delleRicerche - CNR	Italy	Grensing-Pophal, L	34	8	Freelance Business Journalis	USA
Leydesdorff, L	61	1920	Univ Amsterdam	Netherlands	Hoffert, B	33	4	Library Journal	USA
Bates, Dw	60	1488	Harvard Univ	USA	Martin, Ej	31	3	Martinspiration	USA
Rousseau, R	56	551	KU Leuven	Belgium	Whisner, M	26	23	Univ Washington	USA
Lowry, Pb	48	1840	Virginia Tech	USA	Fourie, Ina	20	32	Univ Pretoria	South Africa
Huang, Mh	46	617	Natl Taiwan Univ	Taiwan	Fox, Bl	19	3	Library Journal	USA

Authorship patterns in Q1 and Q4 journals

Next, we analysis the authorship patterns of Q1 and Q4 LIS journals (see table 7) presents the authorship patterns preferred by the researchers for Q1 and Q4 journals. The data ranked 2013 as the most productive year in publishing single-author publications and the year 2020 as most productive in contributing the highest number of multiple author research in the Q1 journals. The year 2020 also contributed the highest total number of publications in the Q1 journals. Some publications with anonymous authorship are found in the Q4 journals. The year 2017 remained the most productive for a single author, multiple authors, and contributing total publications for Q4 journals.

Table 7
Authorship patterns in Q1 and Q4 journals

Authorship pattern for Quartile 1 LIS Journals						Authorship patterns for Quartile4 LIS Journals					
PY	Single Author Publications	Multiple Authors Publications	TP	DC	RSA	PY	Anonymous Publication	Single Author Publications	RSA	Multi author Publications	DC	TP
2011	161	989	1150	0.86	0.14	2011	3	236	0.498943	234	0.49	473
2012	207	1111	1318	0.84	0.16	2012		294	0.584493	209	0.42	503
2013	219	1193	1412	0.84	0.16	2013	4	323	0.566667	243	0.43	570
2014	202	1299	1501	0.87	0.13	2014	2	310	0.536332	266	0.46	578
2015	170	1252	1422	0.88	0.12	2015	3	300	0.516351	278	0.48	581
2016	162	1356	1518	0.89	0.11	2016	6	313	0.515651	288	0.47	607
2017	164	1478	1642	0.90	0.10	2017	7	355	0.482993	373	0.51	735
2018	187	1522	1709	0.89	0.11	2018	3	301	0.479299	324	0.52	628
2019	126	1553	1679	0.92	0.08	2019	1	284	0.44584	352	0.55	637
2020	168	1852	2020	0.92	0.08	2020	3	194	0.373077	323	0.62	520
Grand Total			15371			Grand Total						5832

Degree of Collaboration; dc = multiple-authored publications / total publications; Rate of Single Authorship; RSA = single authored publications / total publications

Most preferred document types

The most preferred document types adopted by the researchers who published their research in Q1 and Q4 journals have been presented in Table 8. The data show that the highest number of publications have the document type 'Article' in both Q1 and Q4 journals. The second most preferred document type in Q1 journals appeared to be as 'Review' and 'Article; Proceedings Paper' in Q4 journals.

Table 8
Most preferred document types

Document Types Published in Q1					Document Types Published in Q4				
Document Type	**TP**	**TC**	**T_U1**	**T_U2**	**Document Type**	**TP**	**TC**	**T_U1**	**T_U2**
Article	14599	298262	60815	669384	Article	5288	10334	3175	51929
Article; Proceedings Paper	182	3617	585	10633	Article; Proceedings Paper	404	850	282	4312
Review	590	21125	4573	36234	Review	140	339	136	1706

Thematic Analysis

This section provides thematic analysis of the Q1 and Q4 category LIS journals. The thematic analysis is useful to gain insights on the retrospective and current research topic trends and to ideate future research directions. In this section we present topical evolution from 2011-2021, chronological evaluation of keyword and thematic analysis based on the author keyword as appeared in the journal of Q1 and Q4 categories.

Topical evolution of the journals

After analyzing the author-supplied keywords, the topical evolution of the journals in the Q1 category has been shown in Table 9. The data ranked citation analysis, bibliometrics, social media, innovation, and collaboration in the top five positions. The data also show an upward trend in some topics starting from 2011 to 2020. In some cases, the topics maintained the trend without any significant change, but in some cases, a downward trend is also observed. Similarly, the topical evolution of the journals in the Q4 category based on the keywords supplied by the authors. The findings ranked academic libraries, information literacy, bibliometrics, information science, and librarians at the top five positions, respectively.

The analysis shows an upward and consistent trend in terms of keywords in many cases over the years.

Chronological distribution of citations obtained against the author keywords

Next, we analyzed the citations received against each author keywords over the year (Table 10). The data ranked social media, citation analysis, innovation, knowledge management, and social networks at top positions in achieving the attention of researchers. The findings showed both upward and downward trends in securing citations against the author keywords. The findings indicate an increasing trend in the citations up to 2016 and a downward trend afterward in most cases. The results also revealed that some of the hottest and current topics did not find a place among the top 20 positions in Q1 journals. Similarity, the citations received by the author keywords over the years in Q4 journals has been analyzed and compared with Q1 journals. The author keywords like academic libraries, information literacy, bibliometrics, research productivity, and collaboration maintained the top five positions with the highest number of citations, respectively. The findings indicate an increasing trend in the citations up to 2017 and a downward trend afterwards in most cases. It is also evident from the data that many of the current hot topics did not maintain positions among the top 20 keywords.

Table 9

Topical evolution - sorted on grand total of total citations from 2011-2021

		Q1 category												Q4 category										
Year of Publications		2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Grand Total		2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Grand Total
R	Author Keywords	TP	TP	TP	TP	TP	TP	TP	TP	TP	TP	G_TP	Author Keywords	TP	TP	TP	TP	TP	TP	TP	TP	TP	TP	G_TP
1	Citation Analysis	86	103	122	116	106	129	142	143	107	119	1173	Academic Libraries	3	4	6	6	29	19	37	32	29	32	197
2	Bibliometrics	65	52	64	78	84	85	78	76	65	64	711	Information Literacy	3	4	7	6	23	22	43	25	31	14	178
3	Social Media	4	22	54	41	66	75	90	94	89	121	656	Bibliometrics	5	2	9	11	8	15	20	13	12	14	109
4	Innovation	43	42	48	53	56	69	81	61	71	94	618	Information Science	12	17	10	5	10	10	11	16	7	5	103
5	Collaboration	41	51	50	73	53	72	68	52	54	50	564	Librarians	5	4	5	7	8	7	17	18	13	8	92
6	Performance	44	58	47	51	50	47	43	70	57	74	541	Public Libraries	4	4	4	6	10	10	10	15	12	14	89
7	Knowledge Management	65	59	57	50	38	48	51	43	36	39	486	Research Productivity	4	7	10	9	8	13	8	9	9	9	86
8	Social Networks	16	20	42	38	37	56	51	45	35	57	397	Electronic Resources	1	3	7	6	9	10	6	11	6	9	68
9	ElectronicHealth Records	1	1	5	10	50	50	64	46	65	74	366	Assessment	1	2	4	9	6	12	12	9	6	6	67
10	Information Systems	35	24	52	43	24	32	34	29	55	37	365	Library Instruction					13	11	14	9	13	7	67
11	Internet	16	29	31	30	32	38	31	22	30	23	282	Evaluation	6	2	8	9	3	4	11	10	5	8	66
12	Knowledge Sharing	8	24	29	28	28	34	26	29	33	31	270	Open Access	1	5	2	4	3	12	11	8	16	4	66
13	E-Government	37	33	31	37	18	26	23	14	18	20	257	Collaboration	3	3	1	2	8	12	14	8	5	7	63
14	Information Technology	17	19	17	13	30	29	40	28	33	28	254	Librarianship	2	1	5	1	4	9	9	12	8	7	58
15	Trust	18	18	23	26	29	20	24	35	30	25	248	Scholarly Communication	4	2	5	5	7	9	5	9	5	7	58
16	Scientometrics	13	17	28	23	32	27	29	29	25	22	245	Archives	3	3	8	2	7	1	6	9	6	10	55

#	Term	1	2	3	4	5	6	7	8	9	10	Total	Term	1	2	3	4	5	6	7	8	9	10	Total
17	Classification	16	17	20	22	15	29	17	31	37	37	241	Citation Analysis	1	1	5	4	2	6	14	7	3	9	52
18	Machine Learning		4	9	8	9	15	15	36	58	74	228	Knowledge Management	9	3	3	4	2	4	4	9	7	6	51
19	Privacy	13	8	18	10	25	22	25	28	29	42	220	Library and Information Science	5	4	4	4	3	6	5	9	5	5	50
20	Big Data		2	2	8	20	29	31	35	29	54	210	Social Networks	1	6	8	3	3	5	8	5	6	3	48
21	Case Study	16	18	26	22	22	26	17	16	27	19	209	Information Technology	6	6	6	5	2	5	4	3	4	5	46
22	H-Index	26	21	39	15	14	16	10	16	20	21	198	Reading	4	3	2	5	5	4		7	9	7	46
23	Natural Language Processing	3	5	21	4	21	18	18	19	32	50	191	Social Media	2	1	1	2	8	4	1	8	10	6	43
24	Co-Authorship	13	20	14	22	26	25	18	16	16	14	184	Higher Education	2	1	3		3	6	7	4	7	8	41
25	Informatics	2	3	12	5	16	29	19	24	32	42	184	Innovation	4	1	5	4	3	4	5	7	4	4	41
26	Impact Factor	14	33	20	19	11	18	17	16	16	17	181	Internet	2	7	2	5	5	5	5	3	6	1	41
27	GIS	16	21	26	17	23	13	18	18	11	14	177	Reference Services		1		1	4	8	7	5	7	8	41
28	Clustering	9	16	17	9	17	15	27	16	21	29	176	Information Management	4	2	3	1	5	7	6	4	5	2	39
29	Social Network Analysis	9	12	15	18	20	24	18	17	14	27	174	Cataloging	3	4	4	4	4	1	6	5	4	3	38
30	Twitter	1	5	9	12	17	26	20	27	23	31	171	Collection Development		2		2	4	4	6	4	5	9	36
31	Information Retrieval	12	16	17	10	17	18	22	19	14	18	163	Information Sources	2	1	2	7	3	4	8	2	3	4	36
32	Network Analysis	7	11	9	18	23	17	22	22	11	20	160	School Libraries	3	1	3	2	2	5	4	7	4	5	36
33	Gender	5	12	12	13	18	8	21	21	17	30	157	Metadata		3	2	4	1	6	6	5	4	3	34
34	Crowdsourcing	1	4	5	9	14	20	16	23	33	30	155	Classification	3	3	4	3	2	3	3	1	6	4	32
35	Research Evaluation	13	13	12	17	17	22	15	13	13	19	154	Ontology	1	4	3		2	1	4	6	4	6	31
36	Text Mining	5	4	13	11	19	15	12	23	17	33	152	Accessibility	2	1	1		1	1	2	10	2	10	30

#	Term											Total	Term												Total
37	Visualization	7	11	10	20	26	13	18	12	15	18	150	Information Behavior	2	1	3	4	1	4	6	3	3	2	29
38	E-Commerce	21	9	13	10	15	14	17	17	16	11	143	Electronic Journals	3	5	2	3	4	2		4	2		25
39	Bibliometric Analysis	12	10	13	8	21	17	12	17	16	16	142	Information Retrieval	2	4		3	2	3	3	2	1	5	25
40	Healthcare	7	6	3	15	15	12	14	16	22	30	140	Content Analysis	1	1		4	2	2	3	5	2	3	23
41	Altmetrics			2	10	11	21	15	32	16	30	137	Ebooks	1	2	1	3	1	4	3	2	2	4	23
42	Web of Science	3	6	11	16	11	17	20	20	15	18	137	Case Study	1				3	3	5	3	3	4	22
43	Uncertainty	11	15	10	14	12	10	11	11	19	17	130	Epistemology	6	2	1		4	2	2	1	2	2	22
44	Sentiment Analysis	3	2	2	3	12	14	14	12	28	34	124	Semantic Web		2	4	1	2	2	3	4	3	1	22
45	Data Mining	10	7	12	5	11	15	18	15	15	13	121	Teaching					4	3	4	3	6	1	21
46	Social Capital	5	13	10	13	17	11	9	14	14	14	120	Gender	1		1	2		1	1	2	4	8	20
47	Knowledge Transfer	8	20	14	14	13	7	12	9	11	10	118	Information Needs		1	4	2	2	5	1	3	1	1	20
48	Facebook	3	2	13	11	10	15	21	18	16	7	116	Records Management	1		1	3	3	4	2	2	2	2	20
49	Ontology	9	9	10	18	13	9	9	13	9	17	116	Web 2.0	2	6	1		2	4	1	1	3		20
50	Decision Support Systems	2	1	1	1	17	15	23	18	16	16	110	Information Architecture		5		1	2	3	3	3	2		19
51	Information Security	4	12	5	9	14	6	11	12	16	21	110	Information Society	3	3	1	1	3	3	2		3		19
52	Cloud Computing	4	4	12	15	6	16	6	15	11	14	103	Scientometrics	1	1		3	1	3	4	5	1		19
53	Peer Review	12	8	10	8	4	7	19	10	9	10	97	Big Data		1	1		1	1	3	1	6	3	17
54	Literature Review	5	3	5	9	14	12	10	6	16	14	94	Digital Preservation	2	2		1	1	3		4	1	3	17
55	Online Communities	4	4	6	11	11	13	9	13	9	9	89	E-Learning		5	1	4	2			1	3	1	17
56	Deep Learning					1	1	2	11	14	59	88	Linked Data			1	1	2	3	3	4	1	2	17

#	Term											Total
57	Citation Impact	6	4	6	8	10	7	7	12	9	13	82
58	Design Science	3	8	6	7	10	9	5	4	10	19	81
59	Scopus	3	2	5	8	12	13	6	16	8	8	81
60	Higher Education	5	5	4	10	8	6	9	18	7	8	80
61	Systematic Review	1	1	3	1	7	13	6	16	12	20	80
62	Open Access	2	1	3	7	8	8	6	14	10	19	78
63	Content Analysis	4	7	4	5	11	6	6	9	9	10	71
64	Digital Divide	7	8	5	7	5	6	11	5	8	8	70
65	Data Quality	3	7	5	8	1	12	9	9	9	6	69
66	Artificial Intelligence	2	2		2	3	3	1	2	12	37	64
67	Knowledge Creation	5	8	6	6	6	8	3	8	10	1	61
68	Topic Modelling	2			3	5	6	6	6	15	18	61
69	Open Data			3	6	5	14	9	7	6	9	59
70	Service Quality	6	8	6	2	2	6	7	5	5	6	53

Term											Total
Open Educational Resources			1	1		1	3		1	10	17
Facebook	1		2	1	1	1	2	3	3	2	16
Outreach				1	5	1	3		3	3	16
Interdisciplinarity	1	1	2	2	1		1	2	4	1	15
Research Data Management		1					3	4	6	1	15
Text Mining			1	1	1		2	2	5	2	14
Digital Literacy			2				1	3	4	3	13
Scopus		1		2		1	4	1		4	13
Web Of Science				2		2	3	2		4	13
Information Skills	1		1	2	1		1	2	2	2	12
Machine Learning				1	1		2	2	1	5	12
Trust				1	3		1		3	4	12
Twitter		1	2		1		2	2	3	1	12
User Experience				1	1	3	5			2	12

Table 10

Chronological distribution of citations obtained against the author keywords

		Quartile 1 LIS Journals												Quartile 4 LIS Journals									
	Year of Publications	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Grand Total		2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Grand Total
R	Author Keywords	Total Citations										G_TC	Author Keywords	Total Citations										G_TC
1	Social Media	861	3576	5791	2636	3777	2308	2559	2206	723	382	24819	Academic Libraries	47	20	17	23	124	74	117	49	22	6	499
2	Citation Analysis	2607	2338	2661	2702	1907	3331	2094	1398	419	108	19565	Information Literacy	8	9	31	20	92	105	160	34	19	3	481
3	Innovation	2327	2131	2336	1917	2409	1685	1982	1101	586	299	16773	Bibliometric	10	8	9	55	16	63	37	20	4	5	227
4	Knowledge Management	3422	2468	2547	1807	1088	1381	1294	684	320	67	15078	Research Productivity	2	19	21	56	15	52	17	5	4	1	192
5	Social Networks	856	1885	2452	2246	1802	1946	1234	740	262	134	13557	Collaboration	10	13	0	1	45	60	41	13	2	0	185
6	Bibliometrics	2698	1163	1667	1699	1363	1958	1212	759	338	55	12912	Library Instruction					72	35	58	11	4	0	180
7	Performance	2512	2110	1786	1324	1439	1215	781	1019	435	157	12778	Librarians	1	15	30	31	18	11	40	13	9	2	170
8	Collaboration	1817	1643	1406	1773	1537	1142	847	398	226	73	10862	Assessment	3	3	8	27	13	47	41	21	4	0	167
9	Trust	1811	711	1738	1724	1501	767	401	817	302	109	9881	Public Libraries	13	4	11	15	52	24	10	16	9	3	157
10	E-Government	1901	2698	1355	1152	858	663	567	184	152	65	9595	Scholarly Communication	57	7	23	14	13	5	11	7	0	1	138
11	Internet	440	3110	904	1138	1392	1082	575	435	249	117	9442	Open Access	8	20	11	11	0	46	15	15	6	0	132
12	Big Data		1791	123	330	2589	1597	1019	1171	389	296	9305	Evaluation	7	8	27	42	1	7	18	13	2	2	127
13	Information Systems	1648	1055	2354	999	619	602	570	604	612	152	9215	Electronic Resources	4	17	28	21	15	13	8	10	2	1	119
14	Knowledge Sharing	1127	1132	2173	1125	920	1178	533	442	345	58	9033	Information Science	17	31	9	5	11	18	5	13	7	1	117
15	Information Technol	1720	976	804	687	656	706	694	230	235	66	6774	Librarianship	1	1	2	18	4	42	34	9	3	0	114

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16	Privacy	2298	213	811	303	1213	577	503	287	257	129	6591	Higher Education	4	5	9		9	43	19	9	3	1	102
17	Twitter	12	490	1612	899	1028	919	480	475	213	80	6208	Citation Analysis	4	5	21	10	1	12	25	9	4	6	97
18	Electronic Health Records	35	50	97	573	1234	1445	1120	604	382	182	5722	Social Networks	0	5	19	10	3	19	10	5	15	0	86
19	Case Study	617	682	1522	533	472	593	299	155	233	61	5167	Reference Services		0		0	25	31	20	4	4	0	84
20	E-Commerce	1461	514	654	710	403	456	397	301	87	18	5001	Electronic Journals	26	14	11	18	4	2		2	2		79
21	Social Capital	573	1331	596	1009	505	329	234	186	118	25	4906	Web 2.0	56	6	2		9	4	0	0	0		77
22	Facebook	372	732	969	794	403	617	402	262	104	22	4677	Social Media	0	0	9	6	34	7	1	11	6	2	76
23	Cloud Computing	288	390	745	1102	140	1013	72	217	95	14	4076	Knowledge Management	32	3	3	5	2	6	4	12	3	0	70
24	Classification	448	446	409	680	253	582	301	476	424	46	4065	Content Analysis	4	2		35	10	2	6	8	1	0	68
25	Literature Review	327	176	236	263	1271	689	294	182	527	58	4023	Cataloging	17	11	21	4	5	1	4	1	2	0	66
26	Crowdsourcing	5	740	539	629	528	587	349	255	182	33	3847	Information Behavior	8	4	1	12	5	2	20	3	1	1	57
27	Scientometrics	435	277	660	491	564	393	341	404	137	21	3723	Archives	2	5	19	2	15	0	3	7	2	1	56
28	Co-Authorship	692	813	398	380	419	511	185	136	82	4	3620	Reading	6	0	1	8	12	9		5	11	0	52
29	Research Evaluation	352	829	424	580	312	736	186	104	74	14	3611	Library and Information Science	7	5	0	3	3	9	7	12	4	0	50
30	Social Network Analysis	642	484	536	559	283	390	199	323	49	47	3512	School Libraries	3	3	7	3	5	9	10	5	5	0	50
31	Web of Science	85	155	411	356	227	1449	281	389	70	40	3463	Collection Development		12		10	6	10	5	3	1	1	48
32	Information Security	148	724	301	634	848	197	233	128	134	31	3378	Information Technology	14	4	10	6	1	4	2	1	0	4	46

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#	Term											Total	Term											Total
33	Sentiment Analysis	196	70	553	96	456	480	457	248	383	127	3066	Ebooks	0	1	16	8	1	13	5	1	0	0	45
34	Text Mining	79	127	1086	383	337	338	193	296	89	117	3045	Outreach				1	24	7	11		2	0	45
35	Natural Language Processing	156	108	543	61	766	403	309	323	228	102	2999	Classification	9	3	10	3	5	5	0	0	9	0	44
36	Healthcare	499	145	152	588	392	470	190	195	210	63	2904	Information Sources	1	0	7	15	5	0	12	2	0	0	42
37	H-Index	786	419	407	336	134	414	85	142	57	19	2799	Innovation	7	1	11	1	4	4	6	5	0	2	41
38	Impact Factor	243	824	519	322	148	276	202	126	66	25	2751	Teaching					17	5	15	1	1	0	39
39	Altmetrics			61	1024	428	483	247	328	118	43	2732	Information Needs		1	2	5	5	20	2	3	0	0	38
40	Machine Learning		134	205	278	291	323	225	558	560	145	2719	Semantic Web		7	14	0	3	2	1	6	2	0	35
41	GIS	492	505	607	283	361	168	126	92	41	38	2713	Scientometrics	2	0		11	0	6	10	5	1		35
42	Scopus	66	33	235	174	276	1246	98	388	31	29	2576	Records Management	0		0	14	11	2	3	2	2	0	34
43	Informatics	34	276	331	87	356	415	331	374	214	112	2530	E-Learning		9	0	11	8			2	3	0	33
44	Online Communities	444	320	213	509	356	342	193	99	29	6	2511	Internet	1	4	0	3	0	9	5	4	3	2	31
45	Network Analysis	281	233	316	479	436	265	232	168	29	69	2508	Case Study	0				10	6	9	4	2	0	31
46	Clustering	204	279	388	177	274	184	609	106	161	53	2435	Web Of Science				11		7	9	3		1	31
47	Gender	258	312	379	291	354	153	356	176	85	43	2407	Metadata		10	1	7	0	5	0	4	3	0	30
48	Knowledge Transfer	167	659	395	267	335	143	116	115	107	58	2362	Accessibility	7	5	6		1	0	0	10	0	1	30
49	Visualization	265	348	233	384	529	229	163	125	36	29	2341	Epistemology	13	0	2		7	4	1	2	0	0	29

Rank	Keyword	1	2	3	4	5	6	7	8	9	10	Total	Keyword	r1	r2	r3	r4	r5	r6	r7	r8	r9	r10	r11	Total
50	Uncertainty	186	684	126	381	295	203	183	94	71	31	2254	Research Data Management		10						6	12	1	0	29
51	Bibliometric Analysis	560	128	215	122	542	239	148	126	79	59	2218	Scopus		7		11		0		9	0		1	28
52	Data Mining	670	147	271	134	190	234	226	193	116	34	2215	Ontology	3	2	7			3	1	0	7	4	0	27
53	Systematic Review	19	225	83	16	286	637	388	262	168	60	2144	Digital Literacy			16					1	7	1	2	27
54	Design Science	93	387	805	175	288	206	57	57	40	25	2133	Information Retrieval	1	6		5	0	0		2	12	0	0	26
55	Open Data			213	490	503	433	257	64	42	33	2035	Information Management	7	0	3	0	6	6		1	1	0	0	24
56	Service Quality	265	376	357	159	53	348	253	103	60	19	1993	Text Mining			1	0	0			2	11	9	0	23
57	Information Retrieval	197	307	361	102	218	147	219	178	70	29	1828	Trust							8	11	0	4	0	23
58	Digital Divide	331	267	123	227	171	85	361	47	37	43	1692	Digital Preservation	2	12		0	5	1		2		0	0	22
59	Data Quality	34	179	82	369	17	523	274	153	46	5	1682	Big Data		0	0		0	1		3	0	14	0	18
60	Citation Impact	279	60	218	188	289	432	74	88	26	7	1661	Information Architecture		8		0	0	2		2	2	1		15
61	Ontology	310	146	169	320	174	159	107	135	43	12	1575	Interdisciplina-rity	0	3	1	4	3			0	2	2	0	15
62	Content Analysis	280	81	435	145	212	137	51	117	49	14	1521	Linked Data			3	4	2	1		2	2	0	0	14
63	Decision Support Systems	51	38	19	62	387	297	427	159	54	18	1512	Facebook	0		0	2	0	3		1	7	0	0	13
64	Peer Review	351	125	222	64	40	107	192	81	23	9	1214	User Experience				0	3	7		3			0	13
65	Knowledge Creation	171	200	226	192	102	82	56	88	55	0	1172	Open Educational Resources			0	0		2		10		0	0	12

No.	Term											Total	Term											Total
66	Deep Learning					190	17	304	302	145	177	1135	Twitter		0	1		4		3	1	0	1	10
67	Higher Education	160	66	47	144	119	41	109	273	93	18	1070	Information Society	4	2	1	0	0	1	1		0		9
68	Open Access	13	37	100	111	244	125	113	155	24	24	946	Gender	2		2	1		0	0	0	1	2	8
69	Topic Modelling	178			104	81	122	95	92	117	34	823	Information Skills	0		1	2	2		1	0	0	1	7
70	Artificial Intelligence	54	19		23	39	25	8	104	285	105	662	Machine Learning				0	0	2	1	1	0		4

Three field plots for Q1 and Q4journals

Three field plots for the Q1 journals category has been shown in Figure 1with author keyword (left), journal (middle) and country (right). The plot highlighted the keyword like citation analysis as the most frequently used keyword primarily published by Scientometrics and Journal of Informatics originated from the USA and China. The second most commonly used author keyword appeared to be bibliometrics, also mainly published in Scientometrics originated from the USA and China. Other prominent author keywords included social media, innovation, performance, collaboration, and knowledge management with major journals like Information & Management, International Journal of Information Management, and Journal of Knowledge Management from countries like Spain, the United Kingdom, Italy, and Korea. Three field plots for the Q4 journals category has been presented in Figure 2 with author keyword (left), journal (middle) and country (right). The keywords academic libraries and information literacy emerged as the most frequently used by the authors of Q4 journals mostly published by Reference Service Review and Serials Review originated from the USA. Other prominent keywords included information science and bibliometrics published by Informacao & Sociedade -Estudos, Trans informacao, and Investigacion Bibliotecologica from countries like Brazil and Spain.

Figure 1

Three field plot for Q1 journals
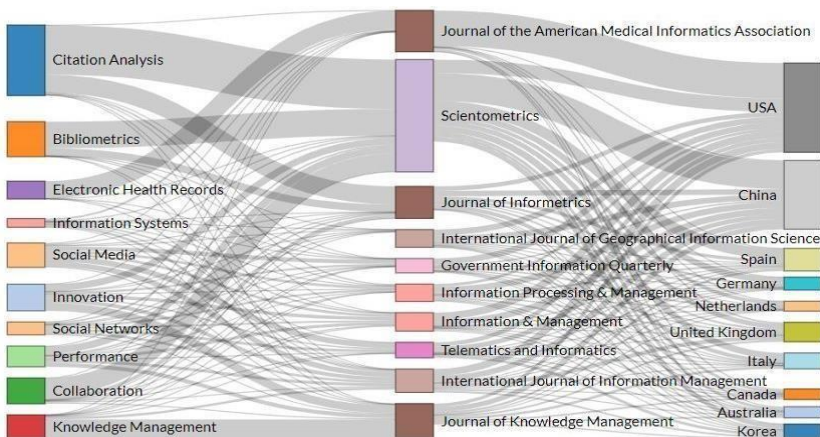
Figure 2

Three field plot for Q4 Journals
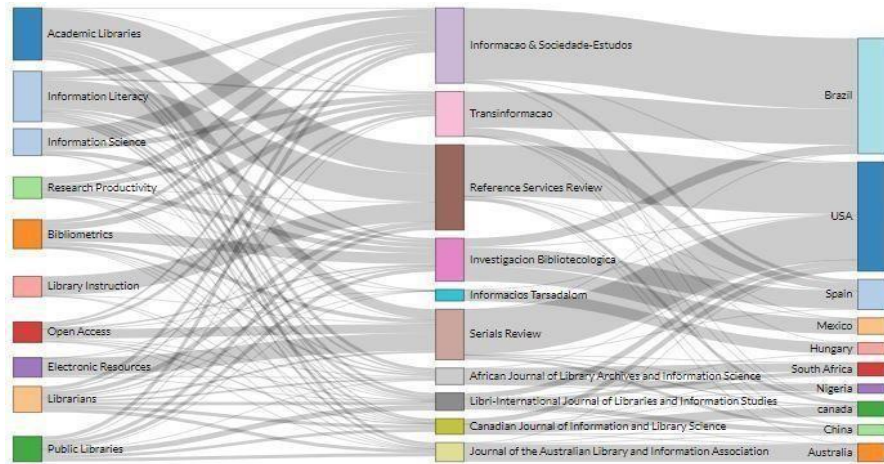
Clusters and sub-themes

The author keyword graph for the Q1 journals category is shown in Figure 3 with a minimum number of keyword occurrences as 60, from which 70 met the threshold. The graph divided all keywords into four clusters. The figure depicted social media, knowledge management, bibliometrics, and citation analysis as the most frequently used keywords. The author keyword graph for the Q4 journals is present in Figure 4, with a minimum number of occurrences of a keyword as 17 and 70 met the threshold. The graph divided the whole keywords into five clusters. The figure portrayed academic libraries, information literacy, library instruction, bibliometrics, and research productivity as the most frequently used author keywords.

Four clusters of prominent authors' provided keywords from the Q1 LIS journals and five clusters from the Q4 LIS journals (Table 11). We observe a visible difference between the areas of the research focus of journals index in the Q1 and Q4 category. The first cluster of Q1 journals emphasized disruptive technologies and related philosophical inferences like the digital divide, crowdsourcing, cloud computing, open innovation, e-commerce, GIS, information security etc. Similarly, the first cluster of Q4 journals emerged from the keywords related to technology inclusion, e.g., digital preservation, epistemology, information architecture, information management, information retrieval,

information science, internet, linked data, metadata, ontology, records management, semantic web, social media, etc. Journals of both categories have some similar topics in cluster 1, i.e. big data, information management, knowledge management, information technology, innovation, and social network.

Figure 3
Keywords graph for Q1 journals
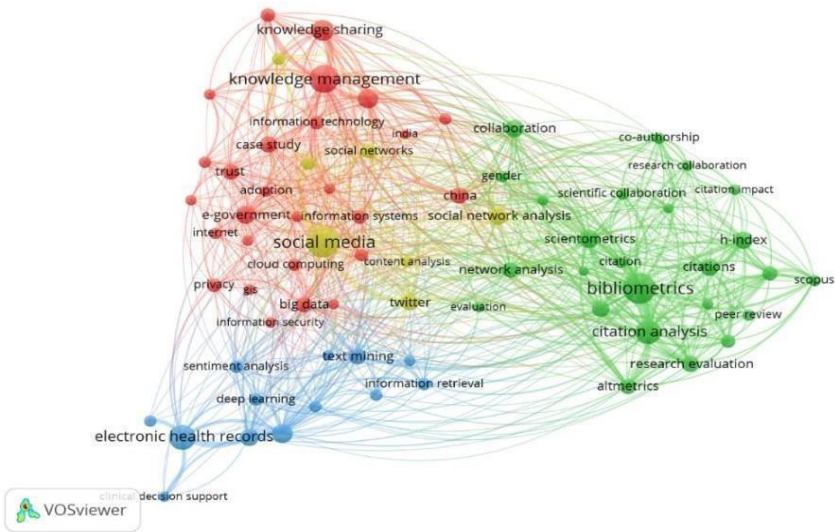
Figure 4
Keyword graph for Q4 journals
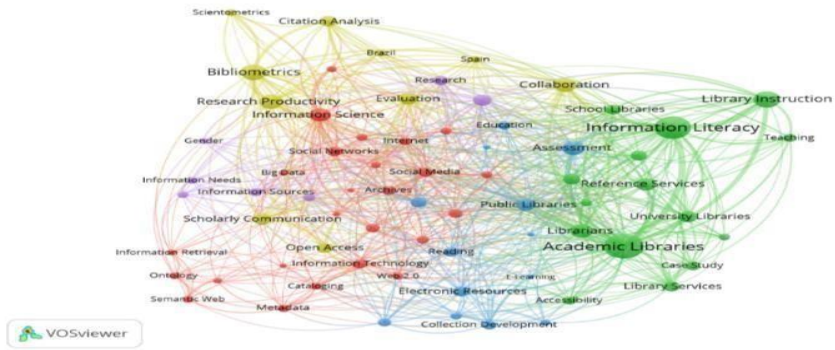
Opposite to cluster 1, the second set of keywords showed a significant difference between Q1 and Q4 journals' most published topics. The Q1 journals' cluster 2 is all about the bibliometrics and scientometrics studies and related terms. While the Q4 journal's cluster 2 is about the different types of libraries, library services and resources.

The topics that emerged in cluster 3 also showed a difference between Q1 and Q4 category journals research trends. The Q1 journals focus on classification, data mining, information retrieval, ontology, machine learning, natural language, sentiments analysis and text mining. While Q4 journals focus stay around library services and resources.

The least essential topics in terms of keywords appearance appeared in cluster 4, which remain different for both Q1 and Q4 journals. The last cluster of Q1 journals showed publication trends in the social media research areas, and Q4 journals showed research trends of bibliometrics research. Only the Q4 journals' keywords analysis showed the fifth cluster about information-seeking behaviors.

Table 11

Thematic analysis of author keywords clusters based on total link strength

Q1 Clusters and Sub-themes		Q4 Clusters and Sub-themes	
Cluster 1 Disruptive technologies	Adoption, Big Data, Case Study, Cloud Computing, Crowdsourcing,Digital Divide, E-Commerce, E- Government, Firm Performance, GIS, Healthcare, Information Security, Information Systems, Information Technology, Innovation, Internet, Knowledge Management, Knowledge Sharing,Knowledge Transfer, Literature Review, Open Innovation, Performance, Privacy, Social Capital, Social Networks, Trust, Uncertainty	Cluster 1 Emerging technologies	Archives, Big Data, Cataloging, Classification, Content Analysis,Digital Preservation, Epistemology, Information, Information Architecture, Information Management, Information Retrieval, Information Science, Information Technology, Innovation, Internet, Knowledge Management, Linked Data, Metadata, Ontology, Records Management, Semantic Web, Social Media, Social Networks,South Africa, Web 2.0

| Cluster 2 | Altmetrics, Bibliometric Analysis, | Cluster 2 | Academic Libraries, |
| Bibliometrics | Bibliometrics, Citation, Citation Analysis, Citation Impact, Citations, Co-Authorship, Collaboration, Evaluation, Gender,H-Index, Impact Factor, Interdisciplinarity, Network Analysis, Open Access, Peer Review, Productivity, Research | Library Services | Accessibility, Case Study, Communication, Diversity, Higher Education, InformationLiteracy, Librarians, Libraries, Library Instruction, Library Services, Reference Services, School Libraries, Teaching, University Libraries |

DISCUSSION

The bibliometrics research domain is gaining increased popularity, and new research avenues started accepting these studies. Bibliometric researchers are employing new tools and techniques to make these studies more effective. This study proposes and tests a new bibliometric method – the Q rank journal indicator. The motivation to conduct this study was to assess the focus and the topical evolution of journals published under different categories to provide insights for the researchers. We tested this method in the field of library and information sciences and have interesting insights.

1. The authors from USA, China, UK, Canada and Spain are the most published authors in the LIS Q1 journals and authors from USA, Brazil, Germany, Spain and Canada published most in LIS Q4 journals.

2. The top three journals of LIS Q1 are Scientometrics (TP = 3183), Journal of the American Medical Informatics Association (TP=1921) and International Journal of Geographical Information Science (TP =1132). While in LIS Q4 category, the top three journals are Information Research: An International Electronic Journal (TP = 762), Library Journal (TP=679) and Informacao & Sociedade-Estudos (TP = 443). The LIS Q1 and Q4 journals have significant different in number of total publications that also impact the ranking of journals.

3. The most productive authors of LIS Q1 category are Bornmann, L from Germany; Thelwall, M from UK and D'angelo, Ciriaco Andrea from Italy. The most prominent authors of LIS Q4 are Berry, Jn; Enis, M and Schwartz, M are all from USA.

4. Both the LIS Q1 and Q4 journals publish most of the articles, followed by proceedings papers and review documents.

5. There is a noticeable difference in the journals' research focus published in the Q1 and Q4 categories.

a. The technology-related topics are the most published research area both in Q1 and Q4 journals, which was expected. However, many technology-focused themes in the first cluster of Q4 journals appeared in clusters 3 and 4 of Q1 journals. A few examples of these research trends are ontology, records management, semantic web, social networks analysis, information retrieval.

b. This difference shows that Q1 journals lead the research trends driven by innovative practices, i.e. case studies.

c. Information seeking and information behaviour research is least important even in the Q4 journals and does not appear in Q1 LIS journals.

6. The topical evaluation presents worthwhile insights for the researchers to make conscious selection of emerging research topics. Some of the notable topics in Q1 journals are citation analysis, bibliometrics, social media, innovation and collaboration, while in Q4 journals, top research areas are academic libraries, information literacy, bibliometrics, information science and libraries.

7. A few topics are gradually evolving such as big data that was not mentioned in 2011 but since 2012 is gradually gaining research interest. Similarly, publications on some topics are gradually declining, such as collaboration, Facebook, privacy etc., in the Q1 journals. These examples show significance of this bibliometric method to help researchers to work in emerging research areas.

8. Bibliometrics studies are gaining reorganization both in Q1 and Q4 journals but mainly in the Q1 journals.

Implications

This study provides a holistic overview of topical evolution and emerging research foci for the LIS researchers. There are a few scholarly and practical implications of this research. First of all, the findings of this study are especially early career researchers and academicians, to make right decisions for research topic, selection of publication avenues,

potential collaborators, and areas of interest to attract research grants. Second, the LIS research students will gain insights form the study about the popular research areas and publication avenues. Third our method has practical impactions for the library practitioners as by comparing category-based research trends can assist library practitioners working for research support and information literacy to assist their users in the selection of topics for potential publications and publication avenues to create impact.

CONCLUSIONS and FUTURE RESEARCH DIRECTIONS

This study brings a new bibliometric analysis based on the Q rank index indicator. The aim of using this analysis is to provide a holistic overview of research trends to researchers and especially early career researchers and academicians of a specific field of study. In addition to this, a comparison of the topical evolution in journals of two differently ranked journal categories guides a selection of emerging topics that are potentially publishable in the high impact factor journals of quartile one category. Conducting research is a lengthy process that requires an in-depth understanding of the subject field and research methods. In addition to this, it requires extensive efforts, energy, time, and monetary investments. However, a piece of research gain acknowledgement only after it is published in quality journals. Therefore, the researchers need to analyzethe field of interest for novel research trends carefully. This proposed method of comparing journals published under different ranked categories can be enhanced for multiple dimensions. First, there is a need of replicating this method on other subject domains to test its validity and impact. Second, this bibliometrics method can compare journals of all four quartiles or compare Q1 and emerging source listjournals for a specific field. It is hoped that this method will bring new insights for the bibliometric researchers and LIS researchers.

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