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Fifty Years (1970-2019) Journey of 'Journal of Documentation': A Scientometric Analysis of Research Productivity and Publication Trends

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STRUCTURED ABSTRACT

Purpose

In this study, we conducted quantitative analysis of 1706 scholarly literature published in *Journal of Documentation* during the period of 1970 to 2019 (fifty years) using a series of scientometric indicators. Annual scientific production, most local cited sources, the ranking of authors; profiles, contributions, correlation, collaboration and authorship pattern, most contributed countries, most cited articles, frequently used search terms/keywords, and the legend of historiographic mapping were analysed in detail to measure the impact of the source.

Design/methodology/approach

We used the Scopus database for retrieving the desired sample data. In total, 1,706 numbers of publications records were considered for the literature analysis considering their relevancy. Biblioshiny data visualization tool is used to create the various maps.

Findings

The present study found that annual scientific production and average citations constantly have had an uptrend. The journal's had tremendous impact with an h-index of 80, with a g-index of 148, total citations of 37,161 within the studied period. Although Bawden D contributed the highest number of research papers (n=78), the work published by Hjørland B received the highest citations. Lotka's Law reveals that about 75.04% of the authors (1319 authors) have one publication, and approximately 12.73% of the authors (225 authors) have two publications. The United Kingdom was the dominant country in terms of number of papers and citation count whereas University of Sheffield topped with 128 publications. The thematic map consists of eleven clusters and 'information retrieval' found to be the largest cluster comprehending 56 subthemes occurring 995 times. Co-citation network identified four clusters with revealing Wilson TD as the most cited authors. The study also indicates the most collaborative authors are from the United Kingdom.

Research limitations/implications

The study exclusively deals with 1732 published research literature indexed in the Scopus database covering a span of fifty years (from 1970 to 2019). Thus, documents which are not covered in Scopus are excluded from the purview of research. This study is significant in order to measure the impact of *Journal of Documentation* and useful to identify valuable research patterns from publications and of developments in the field of Information Science.

Keywords: *Scientometrics; Collaboration; Co-network; Trend analysis; Scopus; Biblioshiny.*

INTRODUCTION

The era of information and knowledge society has witnessed information overload and an explosion of data. Most of the research contributors, i.e., students, researchers, faculties, institutions, agencies, and departments, produce qualitative and quantitative research outcomes in applied, conceptual, theoretical, practical, empirical and analytical types of research in every discipline or subject. In the changing world, information seekers seek accurate, reliable and timely information for their academic needs. Thus, the information generator, aggregators, service providers and information agents of library professional are needed to analyze the productivity of research publication with using different information or content analysis metrics formulas, tools and techniques which were already initiated by information experts like the Alfred J. Lotka (1926), Ranganathan, S.R. (1930), Bradford (1934), Derek John de Solla Price (1961), Pritchard & Nalimov and Mulchenko (1969) and others, they have formulated different metrics for analysis of information or research productivity, i.e., altmetrics, bibliometric, biometrics, cybermetric, econometrics, educametrics, informetrics, librametry, psychometrics, scientometric, sociometrics, Technometrics, and webometric, etc., metrics were formulated to analyze and evaluate qualitative and quantitative research production irrespective all subjects. Therefore, the 21st century might be called the 'century of development of metric sciences' (Dutta, 2014).

In the present study, the bibliometric and Scientometric metric tools were used to analyse the research works published in the *Journal of Documentation* in the last five decades (from 1970 to 2019). Both the bibliometric and Scientometric tools were used to analyse the most contributing authors, author's affiliations, institutions/universities, most contributed countries and impact factors. Most-cited papers & citing articles, nature of citation, co-citation, co-authorship and co-occurrence of keywords and the Scopus, Web of Science, Google Scholar, journal archives/back issues and other scholarly databases have become essential sources to collect critical data for research studies. Bibliometric and Scientometric tools were used for further literature analysis. Some of the essential Bibliometric and Scientometric parameters applied in this study are mentioned as below:

- **Laws of bibliometrics:** Lotka's law of scientific production, Bradford's law of scattering contents, and Zipf's law of word count are commonly used in bibliometrics.
- **Co-citation coupling:** used to indicate a subject similarity between the two document publications.
- **Bibliographic coupling:** it operates on a similarity principle; it links two publications cited in the same publications.
- **Web application of bibliometric:** a new developing area in bibliometrics has emerged in webometrics/cyber metrics to study the relationship between the different sites on the WWW.
- **Citation analysis:** It is established to study the relationship between the authors and their produced research works.

Recently an American Physicist, Hirsch Jorge E proposed a new metric indicator for measuring the individual bibliometric community's research performance. The h-index is on both publication activity and citation impact. It has immediately found interest in the public and received positive reception in the physics community and in Scientometric literature (Hirsch, 2005). After several modifications, adjustments, improvements and developments on various literature metrics, methods and tools have been proposed by bibliometricians to change bibliometric methods, tools and applications towards micro-level and tools to Web resulted in the emergence of a new sub-discipline called Webometrics. Scientometrics 2.0 now exists with an outlined framework for the revised version of scientometrics (Priem & Hemminger, 2010). Ingwersen, Peter, Isidro, Aguillo, Thelwall Mike, Bar-Ilan, Judit,

Vaughan, Liwen and others are eminent personalities who proposed developed concepts in the field of bibliometrics and scientometrics.

JOURNAL PROFILE

Journal of Documentation is a double-blind peer-reviewed leading academic quarterly (1945-1996) journal but during 1997 to 1999, five issues were published each year. In the academic year 2000 onwards, it published articles on a bimonthly basis. All research contributions are published in the English language only. The journal is published by Emerald Group of Publishing, and David Bawden is present editor-in-chief of the journal. The journal covered and focused on new theories, concepts, models, framework, inventory practices and philosophical scholarly articles, documents, working papers, reports, reviews and critic works and record knowledge with novel methods or results of broad significance, in all information related subject disciplines such as pure science, science, social science, physical science, commerce & management, science & technology, education, communication media, psychology and cognitive science and other allied subjective research studies has been published in *Journal of Documentation*. The journal extensively covers articles on information sciences, incorporating all scholarly and professional disciplines that deal with recorded information. It also provides a link between research, scholarship and reflective professional practices and experiences. Authors need to submit their research contribution in word format only. Research works record words between 4000 to 10000, the author name, affiliation, and e-mail addresses were made mandatory for the submitter. The journal's primary audience and contributors are students, research scholars, teachers-educators, scientists, research associates, research project fellows and planners, and policymakers in respective disciplines. The submitting papers need to follow the article frame's outline, which includes structured abstract, the purpose of study, design/methodology/Approach, findings and originality of research work, limitation, practical implications, and social implications. It has an impact factor of 2.6 for 2020 and is indexed in many more databases like Scopus and Emerald databases. [Source: <https://www.emerald.com/> Accessed on 6th December 2021).

REVIEW OF LITERATURE

In recent years, with the enormous growth of scholarly literature in all fields, there have been several bibliometric/scientometric studies conducted to assess, analyze and evaluate the research productivity in different subject disciplines such as pure science, life science, social science, physical science, commerce & management, science & technology, education, health science and other allied subjects. In this section, authors consulted many full-text, indexing, citation and archival databases, then searched, browsed and retrieved some good number of relevant articles, books, reports, review and critics works which were reviewed and presented in this study. (Martinez Lopez et al., 2018) investigated the research productivity of the *European Journal of Marketing* found that the British authors and institutions are ranked as the most contributor in the journal. (Sigifredo et al., 2018) conducted a bibliometric analysis of the *journal of optimization theory and applications (JOTA)*, and demonstrated the impact it made on the domain of mathematics, science and engineering. A similar study was conducted to investigate the research performance of the journal 'Information Science' and significant growth of journal contributions from developed and under-developing countries are visualised (Merigó et al., 2018). (Modak et al., 2019) analyzed the research publications of *Transformation Research Journal (TRJ)* and indicated the multidimensional focus of economic, engineering, social science research. Dominance of multiple-authorship was observed in this study. (Milfont et al., 2019) analysed research productivity of '*Environment and Behaviour*' obtaining data from Web of Science core collection found that Evana, Gary E identified as most research contributors, along with Stern, Paul C. and Dietz, Thomas. Further, the study revealed that significant numbers of publications were contributed by the University of Michigan research community.

Interestingly, there is an increasing trend in most women and international contributors to the journal. Another similarity study on research productivity bibliometric analysis of *IJSE transactions* journal publications published between 1969 to 2018 was published (Shuang, 2019). The study evaluates that the significant contributions of the leading authors, institutions, countries, most cited articles and current trends in productivity of research outcomes issues were identified, and the VOSviewer software was used to visualize the collaboration relations, co-citation, citation, co-authorship, co-occurrence, journal co-citation network and co-occurrence of high-frequency. (Zou et al., 2020) analyzed the '*Accident analysis & prevention (AA&P)*' journal using multi-dimensional statistical and visualization tools. Analysis of results reported that yearly publication production of AA&P had grown exponentially. Further, the study provides emerging research fields of boom frequency and boom injury severity modelling analyses were identified. In total, 3710 number of research publications published in *British Journal of Education Technology (BJET)* during 1971 to 2018 were analyzed and citation trends, research hotspots, topic modelling are identified to have better understanding of publishing patterns (Chen et al., 2020). The bibliometric analysis of fifty years' research productivity of the '*Financial Review*' publications published between 1969 to 2018. focused on the impact factor of journal, hotspot research areas/research themes, most prolific researchers and their research affiliations, most contributed countries, cited articles and most frequently discussed themes were analyzed and identified (Kent Baker et al., 2020). Further, in their study, (Li et al., 2020) conducted bibliometric analysis of '*bottleneck model research*' research journal productivity in the last five decades from 1969 to 2018. The demand-side, supply-side, joint strategies and supply sides strategies were used to classify the literature. The study has identified that the most influential research papers, most contributed authors, countries and top-ranked research areas, research trends, and potential directions for future/further study issues were highlighted and discussed in this study. The studies reviewed above analysed the research productivity of different journal publications published in the last five decades. Most of the studies used Scopus and Web of Science core collection databases to collect and analyse relevant data. It is identified that all studies were analysed on the basis of the parameters namely the most contributing authors and their affiliations, institutions/universities, most contributed countries, most cited papers and citing articles and graphical analysis of coupling, citation, co-citation, co-authorship and co-occurrence of keywords.

OBJECTIVES OF THE STUDY

The main objectives of the study are:

- To conduct a Scientometric assessment of *Journal of Documentation* during the period of (1970-2019)
- To analyze year-wise Growth of publications and average citations
- To find most relevant authors, most cited authors and top authors production over time
- To find most relevant affiliations, country-wise scientific production and most cited countries.
- To find most global cited documents, most local cited documents and Reference spectroscopy
- To evaluate the frequency distribution of scientific productivity by Lotka's law
- To assess WordCloud, TreeMap, Word Dynamics and Trend Topics in author keywords

METHODOLOGY

Scientometrics parameters were used in the present context of the study. The study period was restricted to the years 1970 to 2019. The study is based on the *Journal of Documentation* publications indexed by the Scopus database. The research data was retrieved from the Scopus citation database (<http://www.scopus.com/search/>) using search string SRCTITLE (journal AND of AND Documentation) AND DOCTYPE (ar OR re) AND PUBYEAR >1969 AND PUBYEAR <2020 AND (LIMIT-TO (EXACTSRCTITLE, "*Journal of Documentation*")) AND (LIMIT-TO (LANGUAGE,

"English")) on 2nd January 2021. The search strategy generated 1706 records, which was used for further analysis. Only the articles and review articles were the type of the publications selected for the analysis. The complete bibliographic data was retrieved from the Scopus database in comma-separated values file is a delimited text file (.csv) file format. Initially, the bibliometrix R package (Version Rx 64 4.0.3 released on 12-06-2020) was installed and Opened in Rstudio and then, in the console window, digit: install packages ("bibliometrix") enter the command to install the bibliometrix stable version from CRAN. Then, the biblioshiny app was started by entering the string digit 'biblioshiny' in the R console. The biblioshiny: The shiny app for bibliometrix from R Statistical Package (<https://bibliometrix.org/Biblioshiny.html>) was used to carry out the present bibliometric analysis. The summary of bibliographic statistics for analysis depicted in Table 1.

Table 1: Descriptive analysis: Main information regarding the Journal of Documentation

Description	Results
MAIN INFORMATION ABOUT DATA	
Timespan	1970:2019
Sources (<i>Journal of Documentation</i>)	1
Documents	1706
Average years from publication	18
Average citations per documents	21.78
Average citations per year per doc	1.317
References	60406
DOCUMENT TYPES	
Article	1033
Review	673
DOCUMENT CONTENTS	
Keywords Plus (ID)	217
Author's Keywords (DE)	2111
AUTHORS	
Authors	1759
Author Appearances	2936
Authors of single-authored documents	597
Authors of multi-authored documents	1162
AUTHORS COLLABORATION	
Single-authored documents	1010
Documents per Author	0.97
Authors per Document	1.03
Co-Authors per Documents	1.72
Collaboration Index	1.67

DATA INTERPRETATION

Table 2 and Fig. 1 (A & B) shows that annual scientific production and average citations during the fifty years of study in which articles initiated in 1970 and have had an uptrend till 2019, reaching 108 articles in 2019 and declining slightly in the year 1989 and 1993 with 13 articles followed by 1985 with 14 articles. The average article citations per year item peaked in around 1972 with 21 articles of 2013 citations, 2008 with 53 articles of 1700 citations and followed by 1999 with 25 articles of 1599 citations and an overall decline can be seen in 1988 with 30 articles of 104 citations and followed by 1983 with 17 articles. It can be seen from Fig. 1 (B) shows that rather than maintaining the same growth rate, the average citations per item in the field of land degradation experienced several fluctuations. Therefore, in this respect, the average citations per year of articles in the *Journal of Documentation* decreased and increased year by year with descending quality or influence. It

indicates that the *Journal of Documentation* research in Library Science has entered a tough period at this stage.

Table 2: Year-wise distribution of articles and citations

Year	No. Articles	TC	Mean TC per Article	Mean TC per Year	Citable Years
1970	19	324	17.05	0.34	50
1971	20	242	12.10	0.25	49
1972	21	2013	95.86	2.00	48
1973	17	703	41.35	0.88	47
1974	23	509	22.13	0.48	46
1975	21	171	8.14	0.18	45
1976	20	362	18.10	0.41	44
1977	18	1208	67.11	1.56	43
1978	21	362	17.24	0.41	42
1979	15	587	39.13	0.95	41
1980	15	361	24.07	0.60	40
1981	16	876	54.75	1.40	39
1982	18	1297	72.06	1.90	38
1983	17	163	9.59	0.26	37
1984	17	254	14.94	0.42	36
1985	14	225	16.07	0.46	35
1986	15	293	19.53	0.57	34
1987	18	249	13.83	0.42	33
1988	30	104	3.47	0.11	32
1989	13	717	55.15	1.78	31
1990	18	447	24.83	0.83	30
1991	18	372	20.67	0.71	29
1992	19	539	28.37	1.01	28
1993	13	1070	82.31	3.05	27
1994	16	187	11.69	0.45	26
1995	20	467	23.35	0.93	25
1996	17	724	42.59	1.77	24
1997	25	1444	57.76	2.51	23
1998	25	1046	41.84	1.90	22
1999	25	1599	63.96	3.05	21
2000	32	989	30.91	1.55	20
2001	32	1214	37.94	2.00	19
2002	46	1026	22.30	1.24	18
2003	42	1452	34.57	2.03	17
2004	48	1496	31.17	1.95	16
2005	84	1476	17.57	1.17	15
2006	58	1183	20.40	1.46	14
2007	51	1121	21.98	1.69	13
2008	53	1700	32.08	2.67	12
2009	59	913	15.47	1.41	11
2010	55	1016	18.47	1.85	10
2011	56	931	16.63	1.85	9
2012	49	680	13.88	1.73	8
2013	48	694	14.46	2.07	7
2014	55	523	9.51	1.58	6
2015	63	506	8.03	1.61	5
2016	59	439	7.44	1.86	4
2017	73	439	6.01	2.00	3

2018	71	284	4.00	2.00	2
2019	108	164	1.52	1.52	1

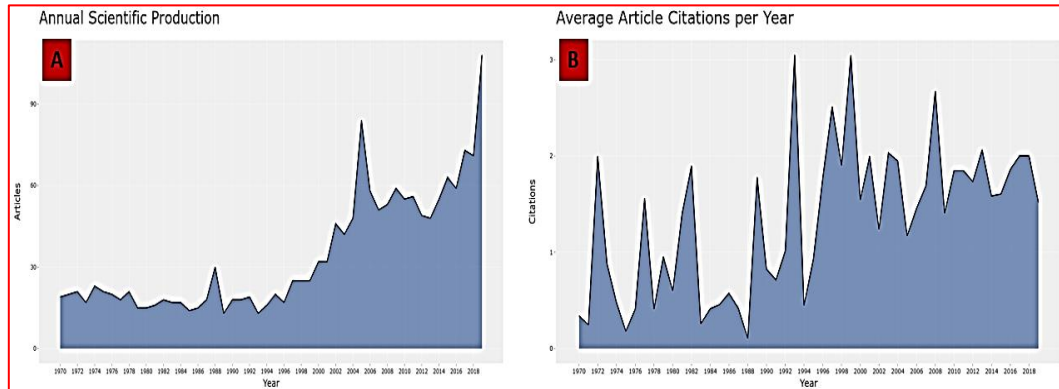


Fig. 1: A – Annual Scientific Production; B – Average Article Citations per Year

The most top twenty local cited sources (from Reference lists) in Fig. 2. This shows sources of journals included in at least one of the article's reference lists set from 1970-2019 in *Journal of Documentation*. The top-cited journals are *Journal of Documentation* with 2880 citations, *Journal of the American Society for Information Science and Technology* with 2507 citations, *Journal of Information Science* with 624 citations, *Information Research* with 561 and *Scientometrics* with 555 citations had more than 500 citations.

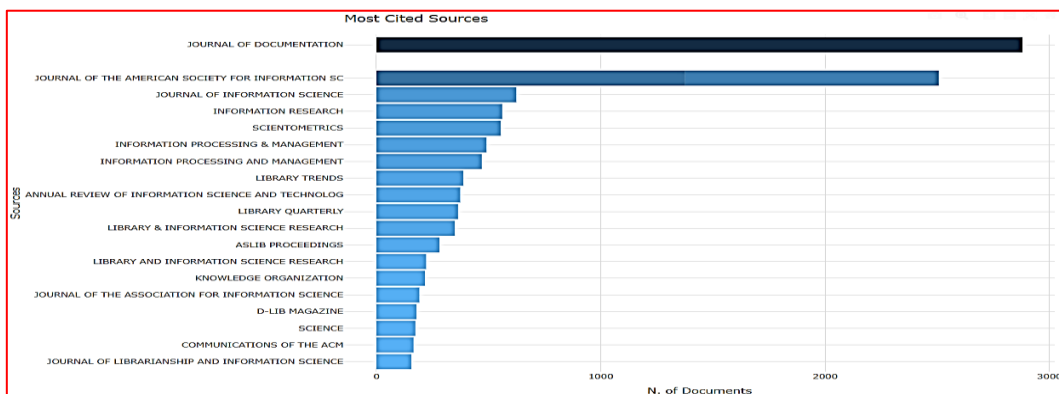


Fig. 2: Most Local Cited Sources in *Journal of Documentation* from (1970-2019)

Source local impact

A source of the *Journal of Documentation* in Table 3 shows the journal's impact with an h-index of 80, with a g-index of 148, having total citations of 37,161 with 1706 for the period of fifty years from 1970-2019.

Table 3: Source local impact

Source	h-index	g-index	m-index	TC	NP	Per Year start
<i>Journal of Documentation</i>	80	148	1.569	37161	1706	1971

*(TC: Total Citations; NP: Number of Publication)

Most Productive authors in the *Journal of Documentation*

Results found from the Table 4 and Fig. 3 (A & B) reveals that highest 78 research most relevant research articles with 76.00 fractionalized by the Authors Bawden D., but his works citation rank goes down to 10th ranking, in other hand the Hjørland B. have published only 16 relevant articles, but his works were highly cited with 389 times. Further, the author Oppenheim, C. and Savolainen R., are respectively published 22 (fractionalized per cent is 14.50) and 21 (fractionalized per cent is 17.25)

most relevant articles and the Sovolainen works citation rank is 3rd and no citations are not found for Oppenheim relevant works. Also, the table found that 19, 18, 14 and 11 number of most relevant articles were equally contributed by the authors, i.e., Ford, Vakkari, Cronin, Willett, Rebertaon, Urquhart, Huntington, Line, Marcella and Reusseau followed by Ford N and Vekkari relevant 19 cited works got 16th and 6th ranked in most local cited author and the authors, i.e., Rebertaon, Urquhart, Huntington, Line, Marcella and Reusseau works were cited by local research community.

Table 4: Prolific of Most relevant authors and most local cited authors

Top 20 Most Relevant Authors				Top 20 Most Local Cited Authors		
Rank	Authors	Articles	Articles Fractionalized	Rank	Authors	Citations
1	Bawden D	78	76.00	1	Hjørland B	389
2	Oppenheim C	22	14.50	2	Wilson TD	363
3	Savolainen R	21	17.25	3	Savolainen R	297
4	Ford N	19	9.52	4	Ingwersen P	268
5	Vakkari P	19	9.51	5	Vickery BC	266
6	Cronin B	18	11.83	6	Vakkari P	264
7	Willett P	18	7.44	7	BelkinNJ	254
8	Robertson SE	17	11.50	8	Ellis D	235
9	Hjørland B	16	13.17	9	Spink A	234
10	Robinson L	14	8.50	10	Bawden D	224
11	Urquhart C	14	10.09	11	Lloyd A	215
12	Thelwall M	13	9.33	12	Cronin B	205
13	Nicholas D	12	3.88	13	Garfield E	197
14	Huntington P	11	2.88	14	Salton G	197
15	Line MB	11	10.00	15	Dervin B	193
16	Marcella R	11	6.58	16	Ford N	191
17	Rousseau R	11	6.92	17	Saracevic T	190
18	Jones KS	10	9.00	18	Nicholas D	180
19	Baxter G	9	4.58	19	Talja S	177
20	Lloyd A	9	7.42	20	Järvelin K	159

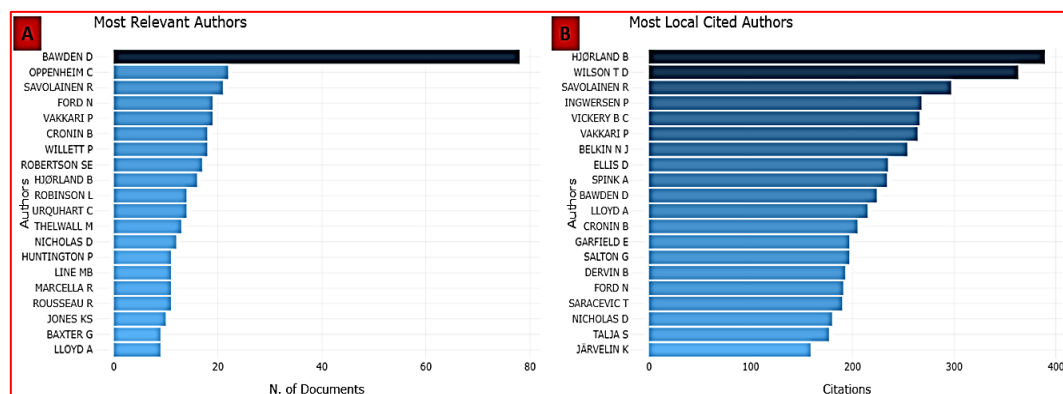


Fig. 3: (A)-Top 20 Most relevant authors and (B)-Top 20 most local cited authors

Author Productivity through Lotka's Law

Lotka's law of scientific productivity has been applied to the collected dataset and the results are indicated in Table 5. A total of 1759 authors published articles between the fifty years of 1970-2019. Fig.4 depicts Lotka's Law, which computes the frequency distribution of scientific productivity. Here, Lotka's Law reveals that about 75.04% of the authors (1319 authors) have one publication, and

approximately 12.73% of the authors (225 authors) have two publications. There are outliers, with very few authors with more than nine publications.

Table 5: Frequency distribution of scientific productivity applied by Lotka's Law

Articles written	No. of Authors	The proportion of Authors (%)
1	1319	75.04
2	225	12.73
3	92	5.23
4	51	2.90
5	19	1.08
6	11	0.63
7	10	0.57
8	12	0.68
9	3	0.17
10	1	0.06
11	4	0.23
12	1	0.06
13	1	0.06
14	2	0.11
16	1	0.06
17	1	0.06
18	2	0.11
19	2	0.11
21	1	0.06
22	1	0.06

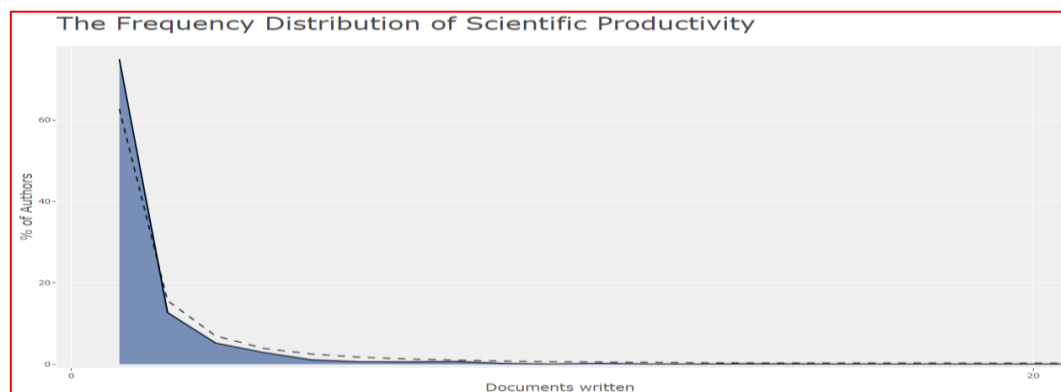


Fig. 4: Frequency distribution of scientific productivity shown through Lotka's Law

Top Twenty Prolific Authors

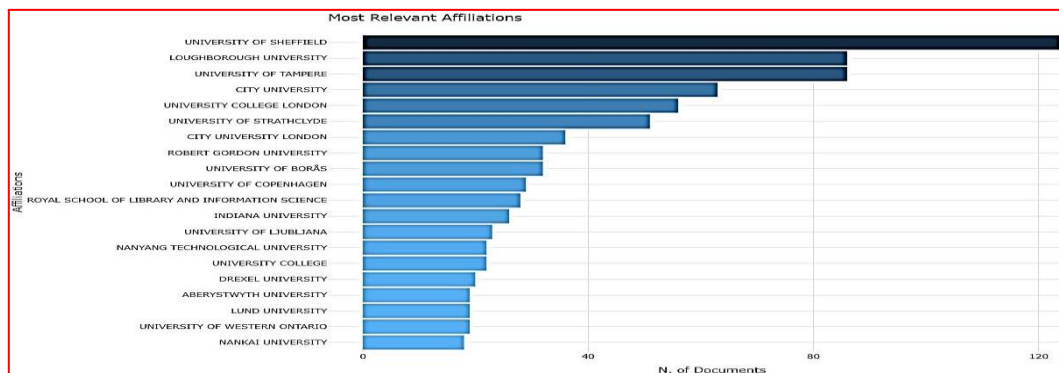
Table 6 lists the top 20 authors with the highest impact by H-index and lists the most relevant authors based on the number of articles they published. The Hirsh index generally referred to as H-index, indicates the minimum number of times an author or a journal has been cited. Cronin B has by far the highest 14 H-index and 18 number of articles with 630 citations followed by Ford N. the second place 13 H-index and 19 number of articles with 638 citations and Oppenheim C & Willett P ranked in the top 3 for both authors with the 12 H-index and (19 and 22) articles with (588 and 418) citations each. This suggests that these authors are the most productive authors with active and frequent publication in the *Journal of Documentation* for 1970-2019.

Table 6: Top Twenty Prolific Authors engaged in Journal of Documentation

Authors	h-index	g-index	m-index	TC	NP	Per Year start
Cronin B	14	18	0.350	630	18	1981
Ford N	13	19	0.317	638	19	1980
Oppenheim C	12	22	0.279	588	22	1978
Willett P	12	18	0.286	418	18	1979
Hjørland B	11	16	0.478	791	16	1998
Thelwall M	11	13	0.524	428	13	2000
Savolainen R	10	21	0.435	454	21	1998
Robertson SE	10	17	0.204	969	17	1972
Nicholas D	10	12	0.400	374	12	1996
Huntington P	10	11	0.526	357	11	2002
Vakkari P	9	19	0.375	568	19	1997
Rousseau R	9	11	0.265	182	11	1987
Robinson L	8	14	0.471	200	14	2004
Jones KS	8	10	0.157	2132	10	1970
Lloyd A	7	9	0.467	537	9	2006
Bawden D	6	22	0.240	527	78	1996
Line MB	6	11	0.118	276	11	1970
Marcella R	6	9	0.273	95	11	1999
Urquhart C	5	9	0.217	83	14	1998
Baxter G	5	8	0.227	72	9	1999
* (TC: Total Citations; NP: Number of Publication)						

Most Relevant Affiliations

Fig. 5 displays the top 20 relevant affiliations from which *Journal of Documentation* publications has been carried out. The United Kingdom was the dominant country in terms of number of papers and citation count, University of Sheffield situated in Sheffield has topped the list with maximum 128 publications followed by Loughborough University and University of Tampere with 86 publications each. The University of Strathclyde and Robert Gordon University from Scotland contributing 52 and 34 publications each, followed by University of Copenhagen and Royal School of Library and Information Science from Denmark contributing 28 and 29 publications each. It is interesting to see that seven institutions out of top 20 are from the United Kingdom that sand 2 institutes each are from Scotland, Sweden, Denmark and China respectively.

**Fig. 5: Top 20 most relevant affiliations**

Top-Authors' Production over the time

Fig. 6 shows the top twenty authors production (in terms of several publications, and total citations per year) of articles have published over a period, with the most elevated number of the article during the years, and how many citations each one article have retrieved (Gilani et al., 2019). Each circle's size demonstrates the quantity of articles and quantifies its intensity of the circles, which shows the number of citations of the author production over a time graph.

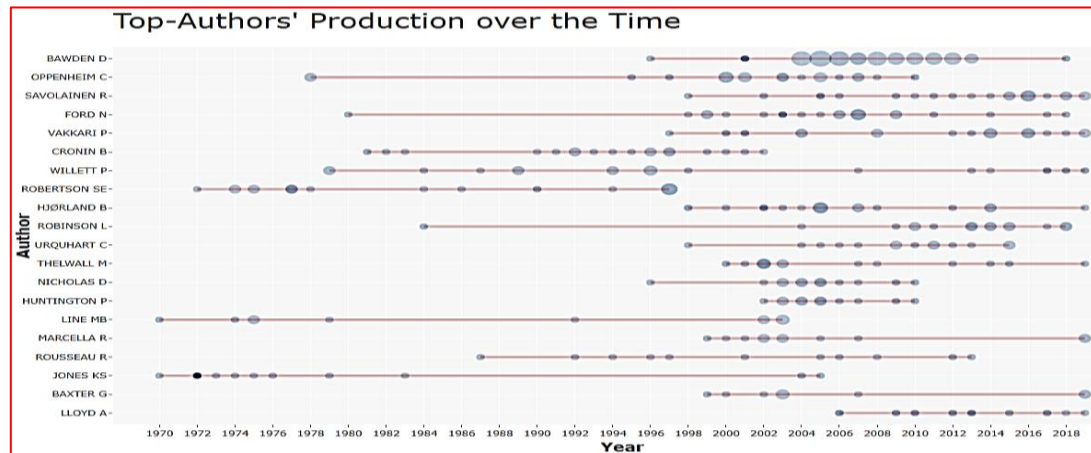


Fig. 6: Top twenty Author's production over time

Prolific of Most Corresponding Author's Country and most cited countries

Table 7 and Fig. 7 (A & B) show the number of articles produced by the authors of different countries and each country's authors' co-operation rate with other countries' authors. For instance, authors of the United Kingdom have produced 397 articles, but authorship co-authorship with other countries is about 10%. Subsequently, the UK authors ranked second with 62 papers, and the authorship rate for contributing articles to other authors with other countries is 27.4%. The total number of citations referenced to articles and the average citation of articles produced by each country's authors. For example, researchers from the United Kingdom have published 9,598 citations, followed by the USA with 3,702 citations and Denmark with 2,355 citations. The average article citation was published by researchers in Switzerland and Turkey (765 citations with ACC 255 and 219 citations with ACC 73) (Jho, 2018).

Table 7: Prolific of Most Corresponding Author's Country and most cited countries

Corresponding Author's Country						Most Cited Countries		
Country	Articles	Freq.	SCP	MCP	MCP Ratio	Country	TC	AAC
UK	397	0.44	388	9	0.02	UK	9598	24.18
USA	167	0.19	163	4	0.02	USA	3702	22.17
Denmark	42	0.05	40	2	0.05	Denmark	2355	56.07
Canada	38	0.04	35	3	0.08	Finland	1431	42.09
Finland	34	0.04	32	2	0.06	Canada	1246	32.79
Australia	29	0.03	28	1	0.04	Australia	915	31.55
Sweden	24	0.03	22	2	0.08	Switzerland	765	255.00
Belgium	18	0.02	13	5	0.28	Sweden	422	17.58
China	14	0.02	10	4	0.29	Netherlands	364	40.44
Spain	14	0.02	13	1	0.07	Belgium	249	13.83
Slovenia	11	0.01	9	2	0.18	Norway	237	29.62
Netherlands	9	0.01	8	1	0.11	Turkey	219	73.00
Germany	8	0.01	7	1	0.13	Spain	189	13.50

Norway	8	0.01	6	2	0.25	New Zealand	182	30.33
New Zealand	6	0.01	6	0	0.00	China	163	11.64
France	5	0.01	5	0	0.00	India	135	27.00
India	5	0.01	5	0	0.00	Germany	129	16.12
Lithuania	5	0.01	5	0	0.00	Slovenia	129	11.73
Singapore	5	0.01	5	0	0.00	Iran	82	20.50
Iran	4	0.00	0	4	1.00	Singapore	76	15.20

*(SCP: Single Country Publication; MCP: Multiple Country Publication;
TC: Total Citations; AAC: Average Article Citation)

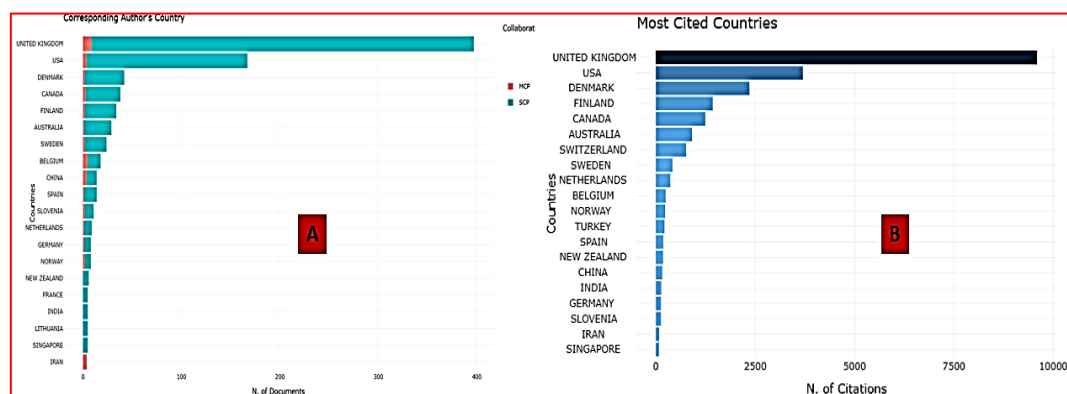


Fig. 7: (A)-Top 20 Corresponding Authors Country and (B)-Most Cited Countries

Reference Publication Year Spectroscopy (RPYS) is a quantitative method for identifying the historical origins of research fields and topics (Baek & Doleck, 2020). RPYS creates a temporal profile of cited references for a set of articles that emphasizes years where relatively significant findings were published. RPYS allows identifying the temporal roots of a discipline. The Reference Publication Year Spectroscopy shows that the journal articles tend to cite references from the more recent period Fig. 8. There seem to be three noticeable peaks before 2005: a peak in 2004 and another peak in 2003 and a rise in 1999. After the peak in 2008, it is evident in the spectroscopy that the number of cited references decrease drastically as the years go up, which again suggests that the articles cite the most recent references over the older ones (Baek & Doleck, 2020). The total number of citations to articles related to the *Journal of Documentation* gradually increased over time from the 1940s. Since 2005, the growth slope has been markedly decreased and could not exceed the peak after 2005. Still, in 2012 it has fallen quickly (Gilani et al., 2019).

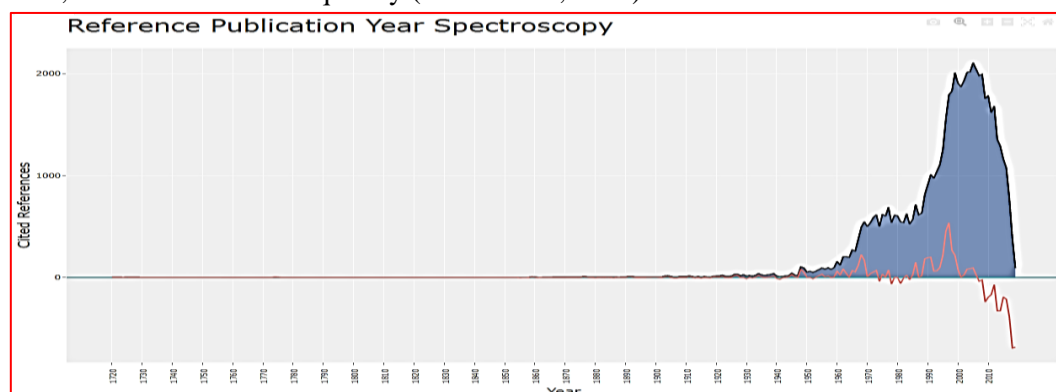


Fig. 8: Reference Publication Year Spectroscopy (RPYS)

Global citations measure the number of citations an article has received from articles in the entire database, in our case, the Scopus database. Precisely, international citations measure the impact of an article on the whole bibliographic database. Table 8 shows that the most global cited article was

written by Jones KS in 1972, followed by Wilson TD in 1999. TC per year indicates the yearly average number of times each document has been cited. It is notable that the article by Bornmann L, published in 2008, received the highest total TC per year and followed by Wilson TD in 1999 (Baek & Doleck, 2020).

Table 8: Top 20 most cited articles

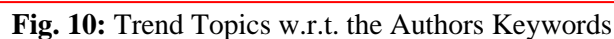
Rank	Articles	DOI	TC	TC per Year
1	Jones KS, 1972	10.1108/eb026526	1793	36.59
2	Wilson TD, 1999	10.1108/EUM0000000007145	1019	46.32
3	Wilson TD, 1981	10.1108/eb026702	689	17.23
4	Bornmann L, 2008	10.1108/00220410810844150	665	51.15
5	Robertson S, 2004	10.1108/00220410410560582	664	39.06
6	Belkin NJ, 1982	10.1108/eb026722	649	16.64
7	Ellis D, 1989	10.1108/eb026843	502	15.69
8	Ingwersen P, 1996	10.1108/eb026960	447	17.88
9	Robertson SE, 1977	10.1108/eb026647	443	10.07
10	Bawden D, 2001	10.1108/EUM0000000007083	388	19.4
11	Almind TC, 1997	10.1108/EUM0000000007205	371	15.46
12	Salton G, 1973	10.1108/eb026562	362	7.54
13	Kuhlthau CC, 1993	10.1108/eb026918	352	12.57
14	Ingwersen P, 1998	10.1108/EUM0000000007167	331	14.39
15	Liu Z, 2005	10.1108/00220410510632040	325	20.31
16	Ellis D, 1997	10.1108/EUM0000000007204	304	12.67
17	Van R CJ, 1977	10.1108/eb026637	296	6.73
18	Ellis D, 1993	10.1108/eb026919	283	10.11
19	Hjørland B, 2002	10.1108/00220410210431136	279	14.68
20	Foster A, 2003	10.1108/00220410310472518	273	15.17

Local citations measure the number of citations an article has received from articles included in the analyzed collection. Table 9 show the local citations measure the impact of an article in the analyzed collection, in our case, the 1,706 research articles and review articles in the *Journal of Documentation* from 1970-2019. With 56 and 45 citations, the most local cited articles are both first-authored by Wilson TD, published in 1999 and 1981. Another article with 34 citations was by Kuhlthau CC, published in 1993, followed by 27 citations was by Mckenzie PJ, published in 2003 (Baek & Doleck, 2020).

Table 9: Top 20 most local cited documents

Rank	Document	DOI	Year	LC	GC	LC (%)
1	Wilson TD, 1999	10.1108/EUM0000000007145	1999	56	1019	5.5
2	Wilson TD, 1981	10.1108/eb026702	1981	45	689	6.53
3	Kuhlthau CC, 1993	10.1108/eb026918	1993	34	352	9.66
4	Mckenzie PJ, 2003	10.1108/00220410310457993	2003	27	238	11.34
5	Ingwersen P, 1996	10.1108/eb026960	1996	25	447	5.59
6	Ellis D, 1989	10.1108/eb026843	1989	23	502	4.58
7	Bawden D, 2001	10.1108/EUM0000000007083	2001	21	388	5.41
8	Foster A, 2003	10.1108/00220410310472518	2003	21	273	7.69
9	Lloyd A, 2006	10.1108/00220410610688723	2006	18	135	13.33
10	Lloyd A, 2010	10.1108/00220411011023643	2010	18	97	18.56
11	Frohmann B, 1992	10.1108/eb026904	1992	16	102	15.69
12	Ellis D, 1992	10.1108/eb026889	1992	16	87	18.39
13	Ellis D, 1993	10.1108/eb026919	1993	16	283	5.65
14	Vakkari P, 2000	10.1108/EUM0000000007127	2000	16	159	10.06
15	Belkin NJ, 1982	10.1108/eb026722	1982	15	649	2.31

Topic trends are also part of this research, where Fig. 10 shows an overview of the development of topics from time to time with a division per year so that it is known what topics have been used for a long time and what topics have been recently used. The emergence of topics is also adjusted to the frequency of the word's quantity appearing in this study; the higher it indicates, the more words are used, and then to the right, the more recent the word is used. The development of the topic began to experience a significant increase since 2002.



A keywords co-occurrence network focuses on understanding the knowledge components and knowledge structure of a scientific/technical field by examining the links between keywords in the literature. Fig. 11 focuses on the analysis methods based on KCNs, used in theoretical and empirical studies to explore research topics and their relationships in selecting scientific fields. If keywords are grouped into the same cluster, they are more likely to reflect similar topics. Each cluster has a different number of the subject keyword.

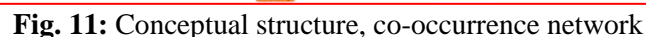


Fig. 12 shows the thematic quadrant of the articles published in the *Journal of Documentation* bounded by two halfaxes and used for visualizing a specific topic and the concept used in the article by choosing “author’s keywords” (Kondaveeti et al., 2020). The first quadrant indicates motor themes, the second quadrant shows highly developed themes, the third quadrant symbolizes emerging, and declining themes and the fourth quadrant contains basic and transversal themes. The importance

of the research themes can be measured through centrality while density traces the evolution of themes (Aria & Cuccurullo, 2017).

The thematic map consists of eleven clusters of the label ‘information retrieval’ largest cluster comprehending 56 subthemes occurring 995 times. The prominent themes in this cluster are information retrieval (138), user studies (57) and internet (55), information management (48). ‘Information science’ has been the second-largest cluster which consisted of 18 subthemes occurring 371 times wherein information science (80), libraries (61), classification (53) and epistemology (28). The third-largest cluster is denoted by the themes ‘information literacy’, which included 28 subthemes in it, getting noted for occurring 291 times. Information literacy (56), information behaviour (46), information seeking (24) and information practices (13). ‘Documentation’ reflects the fourth largest cluster, embedded with 26 subthemes in-it with, occurring 285 times. The prominent subthemes have been Documentation (26), archives (26), documents (26) and history (26). The label ‘public libraries’ represented the fifth cluster with 21 subthemes of 200 times. Public libraries (37), library users (19), librarians (16) and books (14) were the centre point of study in this cluster. The sixth cluster of ‘information includes 14 subthemes with 173 occurrences leading with information (42), communication (29), learning (15) and literacy (15) each. The seventh cluster is of ‘modelling’, which contains 16 sub-themes in itself, occurring 129 times. Modelling (18), cataloguing (14), bibliographic systems (12) and metadata (11). ‘Knowledge management’ as the eighth cluster, which has seven subthemes with 83 times occurrence. Knowledge management (34), phenomenology (14), knowledge processes (10) and knowledge organizations (9). Ninth cluster ‘research methods’, which is portrayed three subthemes with 38 times occurring, research methods (22), qualitative research (11) and content analysis (5). The tenth and eleventh clusters containing 4 and 1 subthemes, with 28 and 5 times occurring (Bapte, 2020).

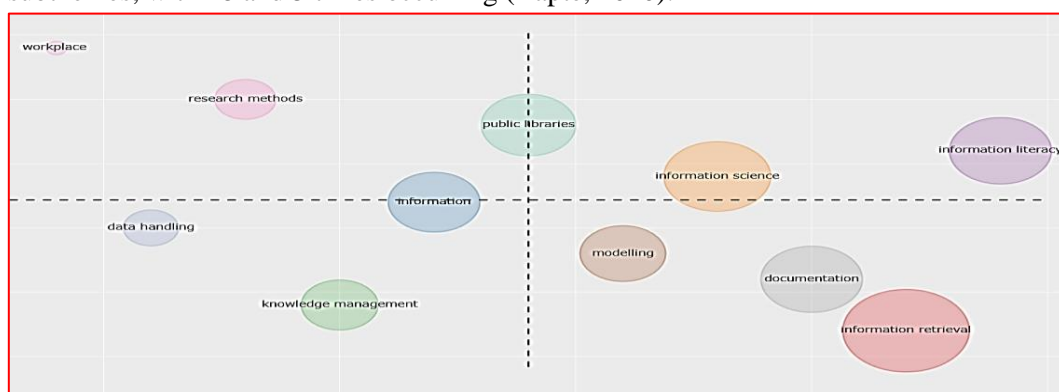


Fig. 12: Thematic map in Journal of Documentation

Two-Plot diagram for the Evolution of Author’s Keywords over the years

Table 11 and Fig. 13 portrays the distribution and diversity of topics on the thematic evolution of the author’s keywords over the years in the given time. In all the topics have started uniquely and topics such as ‘knowledge workers’, ‘digital libraries’, ‘information management’, ‘information science’, ‘research’, ‘internet’, ‘information systems’, ‘information retrieval’, ‘worldwide web’, ‘libraries’ and ‘modelling’ have diverged into various fields. In Occurrences from information retrieval-1970-2006, to information retrieval-2007-2019, ‘information retrieval’, ‘United Kingdom’, ‘search engines’ and ‘information searches’ were words in thematic evolution analysis with 49 times. In weighted inclusion index from worldwide web-1970-2006, to information retrieval-2007-2019, words by searching; worldwide Web is leading the index table with 1.00. In inclusion index from research-1970-2006, to information management-2007-2019, words by research with 0.05. Instability index from modelling-1970-2006, to libraries-2007-2019, public libraries as words with 0.06.

Table 11: Thematic Evolution of Author's Keywords

[illegible]

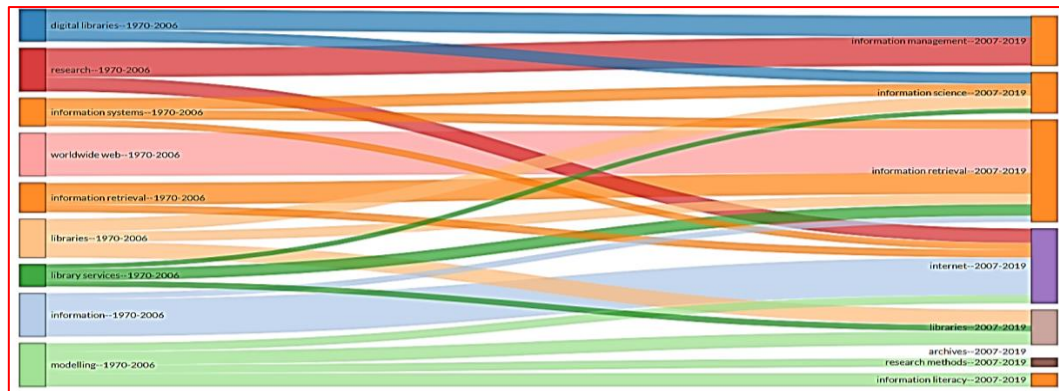


Fig. 13: 2-Plot diagram for the Evolution of Author's Keywords over the years

Conceptual Structure Analysis of author's keywords

A. Conceptual Structure Map of multi-dimensional scaling in *Journal of Documentation*

Conceptual structure analysis determines the main themes and trends that have been studied and explained in the *Journal of Documentation*. It represents themes based on the relationship between the keywords. To inform the research community regarding the most relevant concepts, a co-word analysis has been performed and explained, and it is used to study the structure of a field (Sharma et al., 2020). Author keywords analysis identified two clusters representing different themes from Fig. 14. The result is interpreted based on the relative position of the point. Keywords closer to each other, represent a large portion of the article taken together; they are distant. A small proportion of the article treats these keywords together.

Cluster 1 (red colour) comprises articles regarding learning and study abroad in the *Journal of Documentation*. The most significant cluster consists of 47 keywords: information retrieval, information science, libraries, user studies, information literacy, internet, classification, information management, information behaviour, and information research. Cluster 2 (blue colour) focuses on the studies based on 'students', 'literacy', and 'learning' which is the smallest cluster with three authors keywords.

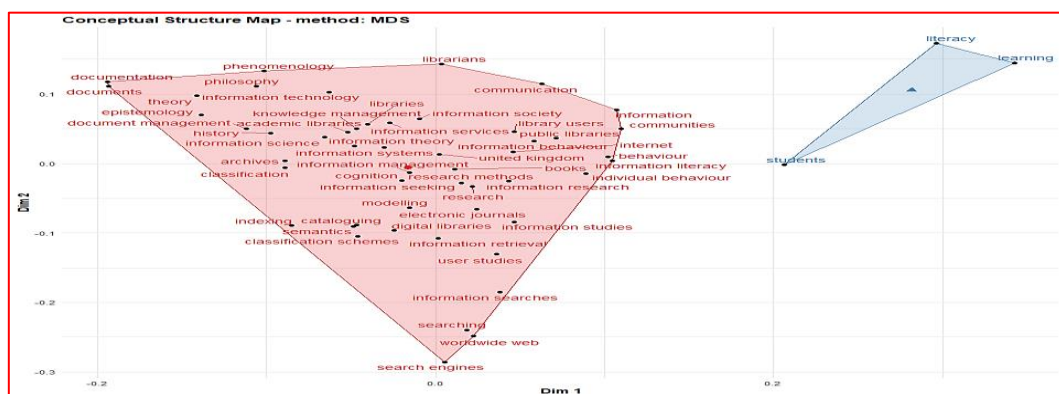
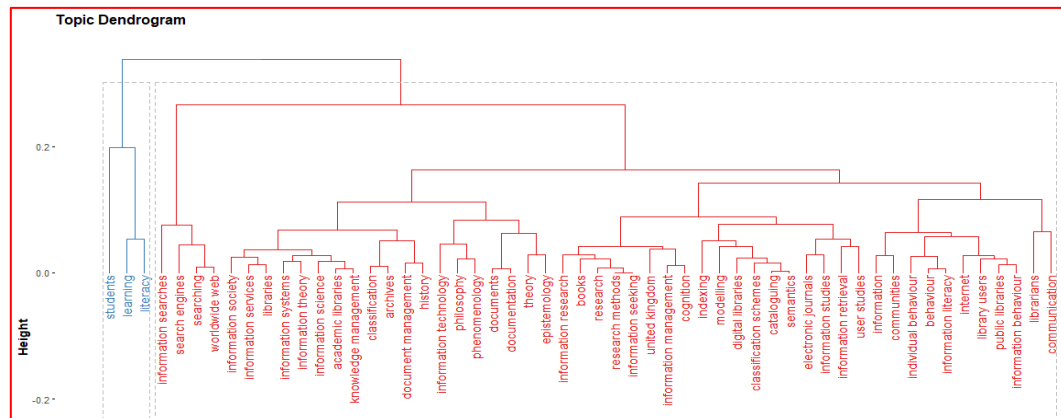


Fig. 14: Conceptual structure Map of Multi-dimensional scaling of authors keywords

B. Tree dendrogram of hierarchical cluster analysis in *Journal of Documentation*

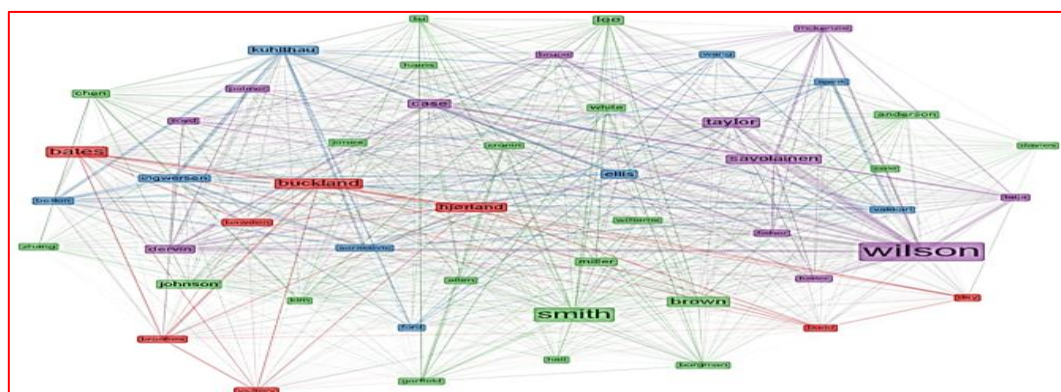
A dendrogram is a tree diagram frequently used to illustrate the clusters produced by hierarchical clustering. Dendrograms are widely utilized in specific subject classification and their connection to other topics as the order of these themes portrayed in different colours. The portrayal of the dendrogram diagram is frequently utilized in various sets; for instance, in a chain of command of collection, this outline depicts the dissemination of connections between components in grouping resulting from software analysis. This grouping is also arranged in such a way as to take into account the height of the coordination line between topics and between clusters.



The dendrogram shows two groupings of topics, specific points in red and blue themes, which offers the connection between points in the dark blue arrangement and subjects in red characterization. Each of them is also separated into a few clusters. Each group is further partitioned into a few sub-clusters and so on until the topic is used. Several topics are part of one cluster, indicating a relationship between the clusters (Rusydiaana & Nailah, 2020). In hierarchical agglomerative grouping prompts the dendrogram, which recommends yielding three clusters. To validate these suggestions, we execute silhouette analysis which gives a graphical portrayal of how well each object has been grouped and classified. Three clusters present: higher average silhouette width than 4 and 5 clusters; none observation assigned to the wrong cluster and very few borderline observations. Therefore three clusters are the optimal choice. The silhouette plot Fig.15 shows the cluster size (Izzo & Camminatiello, 2020) (Firdaus et al., 2019).

Co-citation Networks

A Co-citation network considered bibliographic coupling is a semantic similarity to measure the documents that utilize reference connections/relationships. Co-citation is the frequency with which two or more documents are cited together by other documents (Aria & Cuccurullo, 2017). Co-citation network structure reveals the most cited authors are Wilson TD. The network structure consists of clusters in which each colour represents a component. Fig.16 represents four clusters in four various colours.



As shown in Fig. 17, the co-citation network identified four clusters in four different colours. Cluster 1 (red) identifies papers that explain applying the social cognitive framework for learning in tourism and hospitality education (Bandura, 1986; Lent et al., 1994). The document published by Bandura

(1986) seems to play a key role in this cluster with a between the centrality of 20.93 and the connection between this work, and that of Lent et al. (1994) and Hsu and Wolfe (2003) are incredibly insightful. Cluster 2 (purple) mainly focuses on the vital skill to produce quality manpower (Raybould& Wilkins, 2006) and the disciplinary dilemma of tourism (Bloom, 1956; Echtner& Jamal, 1997).

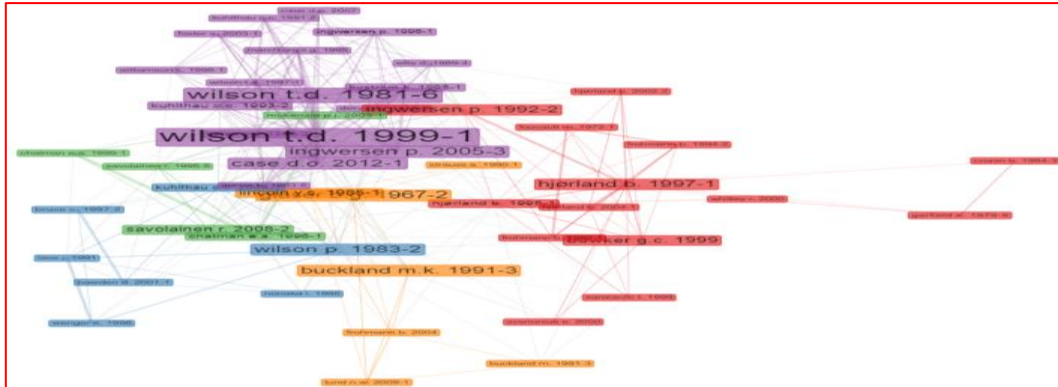


Fig. 17: Co-citation network

The article (Tribe, 1997) takes a pivotal role in this cluster, which describes tourism studies that can be conceptualized in two fields: business and non-business aspects of tourism. Along with this, the works of Echtner and Jamal (1997) and Bloom (1956) also play an essential role. Cluster 3 (blue) emphasizes the significance of internship and training in the tourism and hospitality curriculum and student perception towards working in the tourism industry (M. Cho, 2006; Kuslivan & Kuslivan, 2000). Kuslivan and Kuslivan (2000) and Lam and Ching (2007) are the most influential article in this cluster. Cluster 4 (green) highlights the importance of information technology in learning and the future direction and perspective of travel and tourism education (Conrad & Bill, 2005; P. P. Sheldon et al., 2007). This cluster also presents the curriculum for tourism education and experiential learning value (Tribe, 2002).

Country collaboration network

In the interest of detecting the countries that were actively collaborating, Fig. 18 provides a record of networking circles of collaboration. Collaboration is a network that will indicate how the authors are linked to the network due to their co-authorships (Glänzel and Schubert 2004). As shown in the figure, the coloured circle noted in each node of the network represents the total number of articles. The figure depicts that the Authors from UK has greater collaboration rate with others countries. (Firdaus et al., 2019).



Fig. 18: Country-wise Collaboration Network

Affiliation collaboration network

The colored node in the network, as shown in Fig. 19, represents the collaboration of the network between universities and colleagues from different countries. The University College London from the United Kingdom collaborates with the London School of Economics. The purple colour node represents five institutes that collaborate between Air Force Research Laboratory, Tennessee State University, Old Dominion University from the United States of America, Institute of Information Engineering and University of Chinese Academy of Sciences from China. The red colour node represents the collaboration between the National University of Defense Technology, Qingdao Academy of Intelligent Industries from China and Institute of Automation from Jerman. This figure reveals that China's universities preferred to collaborate with their own country compared to others.

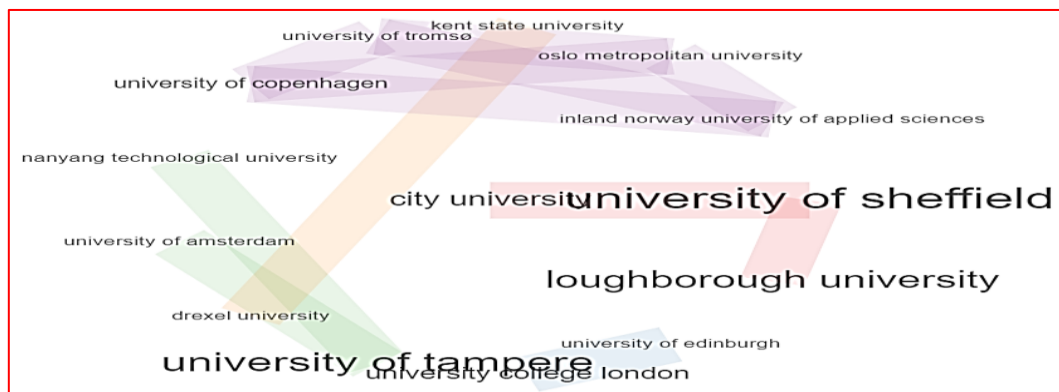


Fig. 19: Affiliation collaboration network

Legend of historiographic mapping

Historiographic analysis, also known as a historiograph or historiographic mapping, represents a chronological mapping of the most relevant citations (Aria & Cuccurullo, 2017). With the *histNetwork* function, this study generated a plot with the most productive 25 articles, as shown in Fig. 20. The list of the top ten articles is shown in Table 12. The direction of the arrows in Fig. 20 explains the chronological change of research trends from the past. For example, Jones KS published an article in 1972 on “A statistical interpretation of term specificity and its application in retrieval”, and then Van Rijsbergen, CJ published an article in 1977 on “A theoretical basis for the use of co-occurrence data in information retrieval”. This kind of contribution was promoting the research community to deal with “statistical application”, “information retrieval”, and “user studies and information needs” and most of the studies finally brought about teacher, experts (instructor) education in Library and Information Science (Jho, 2018).

Table 12: Legend of historiographic mapping

First Author	Title	Year	LC	GC
Jones KS	A statistical interpretation of term specificity and its application in retrieval	1972	9	1793
Van Rijsbergen CJ	A theoretical basis for the use of co-occurrence data in information retrieval	1977	8	296
Oddy RN	Information retrieval through man-machine dialogue	1977	7	137
Burrell Q	A simple stochastic model for library loans	1980	9	85
Wilson TD	On user studies and information needs	1981	45	689
Belkin NJ	Ask for information retrieval: Part I. Background and theory	1982	15	649
Ellis D	A behavioural approach to information retrieval system design	1989	23	502
Frohmann B	Rules of indexing: A critique of mentalism in information	1990	8	56

	retrieval theory			
Frohmann B	The power of images: A discourse analysis of the cognitive viewpoint	1992	16	102
Ellis D	The physical and cognitive paradigms in information retrieval research	1992	16	87
*(LC: Local Citations; GC: Global Citations)				

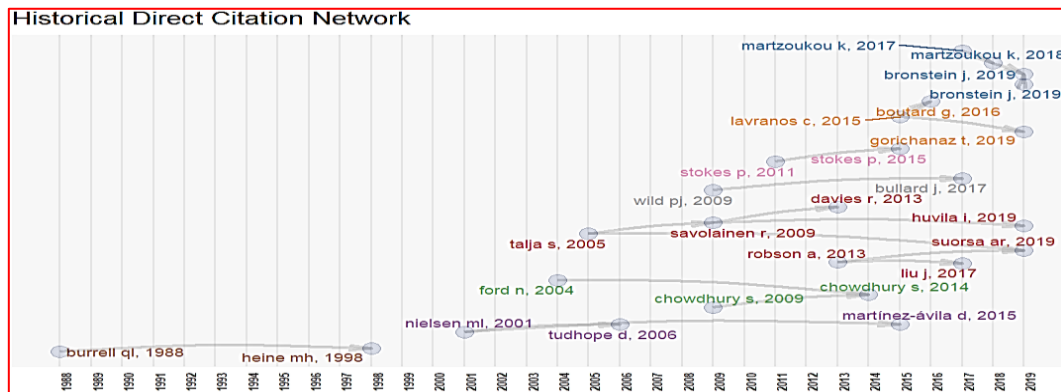


Fig. 20: Legend of historiographic mapping

Collaboration WorldMap

Fig. 21 shows that most collaborations have been co-authored by authors from the United Kingdom to 29 countries in frequency by leading USA (10), Australia and China (6), Iran (5), Canada (4), Denmark, Greece, Ireland, Italy, Saudi Arabia, and Switzerland with three frequency each. Belgium, Finland, Germany, Mexico, Netherlands and Spain with two frequency each. Austria, Bahrain, Egypt, France, Israel, Korea, Kuwait, and Namibia, one frequency.

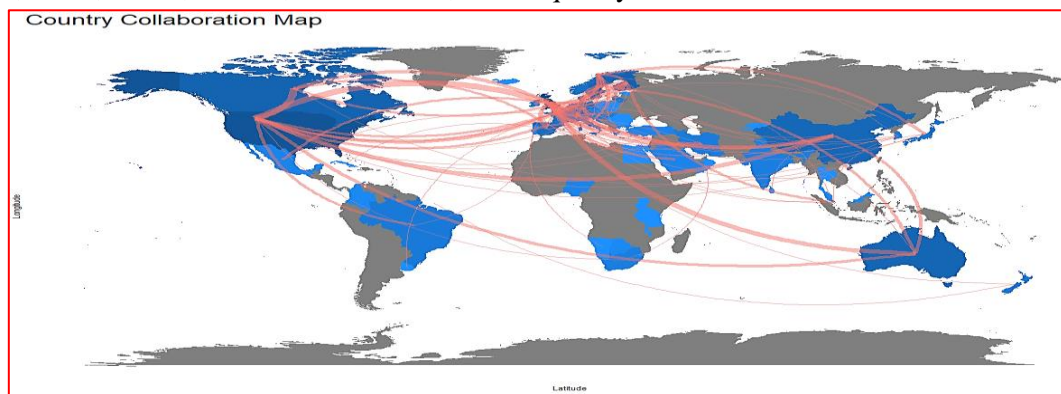


Fig. 21: Country-wise Collaboration map

CONCLUSIONS AND IMPLICATIONS

This study aimed to provide an overview of the *Journal of Documentation* internationally published journal using bibliometric analysis with R software. One thousand seven hundred six articles were extracted using the Scopus database. The collected referential information followed descriptive and network analysis. The descriptive study showed a gradual growth of publications since the 1997s and increasing distribution of research publications. The purpose of using thematic evolution for the analysis is to discover if any topics have emerged into any other quadrants and more so to understand the topic's evolution over some time. The span of years is divided into two parts, and the cutting point emerged annual scientific production and average citations during the fifty years of study in which articles initiated in 1970 and have had an uptrend till 2019, reaching 108 articles in 2019 and declining slightly in the year 1989 and 1993 with 13 articles followed by 1985 with 14 articles. The

Journal has an impact with an h-index of 80, with a g-index of 148, having total citations of 37,161 with 1706 for the period of fifty years from 1970-2019. The thematic map consists of eleven clusters of the label ‘information retrieval’ largest cluster comprehending 56 subthemes occurring 995 times. Cronin B has the highest 14 H-index and 18 numbers of articles with 630 citations followed by Ford N. In the second place is Oppenheim C with 13 H-index and 19 numbers of articles and 638 citations followed by Willett P ranked 3rd with the 12 H-index and 19 and 22 articles with 588 and 418 citations. This suggests that these authors are the most productive authors with active and frequent publication in the *Journal of Documentation* during 1970-2019. The study implies “*Journal of Documentation*” to be a productive and an impactful research journal promoting multidisciplinary research, publishing original, innovative, cutting-edge and state-of-the-art research works of eminent educationist, scholars and practicing information science professionals encompassing all academic and professional’s disciplines dealing with recorded information.

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