

Research output on ICT applications and digital commons in LIS field: A bibliometrics study

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***Abstract** - Research Output would be the instrumental procedure and part of routine activity of the researcher. Hence the measurement Tool, Laws and Principles for research output have become crucial functions for the academic organization. Bibliometrics is the discipline where quantitative methods were employed to probe scientific communication process by measuring and analysing different aspects of written documents by various indicators. A research of “Alan Pritchard” (1969) by title “the applications of mathematical and statistical methods to books and other media” is illustrative. The study was conducted with specific objectives related to measures research contributions regards “ICT Application” and “Digital Common”. Entirety 727(100%) contributions from the respective three journals are analysed. It is noticeable that the highest research output in the LIS field of the selective journal The Electronic Library has contributed 322 articles (Out of 727), DESIDOC Journal of Library and Information Technology has 281 (Out of 727) while Science and Technology Libraries has 124 (Out of 727) research output observed from 2014 to 2018. It is traceable that the two selected source journals has similar periodicity is “Bimonthly” while one The Science and Technology Libraries has quarterly; it has obviously effected of the total research output, highest collaboration, authorship pattern, etc on the analysis of this study.*

Keyword: Digital Commons, ICT Application, DJLIT (DESIDOC Journal of Library and Information Technology), STL (Science and Technology Libraries), TEL (The Electronic Library), CAGR (Compound Annual Growth Rate), Collaboration.

Introduction

ICT application and Digital commons both are vast disciplines itself. At the same time, the library and information science is a field where it has applied in the library services, administered, and academic purpose. The use of ICT and the digital object can be more visible for shows research outputs by visualization effect and be more accurate reports and results with quickness. Since, the researches show that all disciplines of knowledge world have to be gotten more exposure towards practices, enable to approach to inter and multi-disciplinary subject, and proverbial with useful matrices after be applicative the ICT and digital commons.

Bibliometrics is indicating the parameters regard authors' contribution, content variety, scattered level of specific theme, term, or subject, collaboration etc. Collaboration science includes different methods for the extent of author and authorship. Identification of items/subject/theme especially in article is a first application and others are finding out the rank of journal. This paper shows the research output related ICT Application and Digital

commons by using different parameters of bibliometrics i.e. source of journals, authorship pattern, collaboration, used citation, etc. It is perceptible that the CAGR is implicate in the study for calculate the rate for the term “ICT Application” and “Digital Commons”

Background of the Study

During the digital era, all service sectors has been using ICT and digital commons in services, production and management, for making it more visible, usable, and user friendly. The library has a service sector, since the 20th century, it explored the ICT to enable functions and services automatically. Therefore to know the approaches and interest of library professional, researcher and academicians toward responsibility for being a part of developing the field of LIS the study is to conduct.

Composition of Journals

This paper has studied the bibliometrics of following three journals, many similarities and differentiation to be seen on their composition which is showed on the below mentioned table.

Particulars	Parameters	DJLIT	STL	TEL
Establishment Year		1981		1983
Types of Source	Printed/Electronic	Both	Electronic	Electronic
Periodicity	Monthly/quarterly/Half Yearly/Yearly	Bimonthly	Quarterly	Bimonthly
Publishing House			Taylor & Francis, Inc.	Emerald Publishing
Variety of Articles	Research paper, case study, Analytical study,			
Content Variety	Papers, Poster, Book Chapter Abstract, Conference Theme Abstract, Editor Message/Paper	Research Paper		Research Paper, Case Study, Book Abstract
Accesses Policy	OPEN ACCESS	Open Access		Hybrid

DJLIT = DESIDOC Journal of Library & Information Technology

STL = Science and Technology Libraries, TEL = The Electronic Library

Reviews of Literature

During 2004 to 2015 Garg, K.C. and Sharma, Chetan conducted the study on the Indian Citation Index, here they describe the research output of library and information science most prolific institutions i.e. university of Mysore, university of Delhi, CSIR-NISCAIR, etc as well as prolific authors as Indian LIS researchers with them citation impact by most preferred journal i.e. DESIDOC, SRELS, KELPRO, Information studies, etc. (Garg, K.C. and Sharma, Chetan). In 2013 an unpublished doctoral thesis had been submitted to the cited university. The research has been conducted with analysis of 107 titles of the journals related to the library and information science, it also analysed with different attributes i.e. categories of articles, core subject of LIS, richness of electronic form i.e. pdf, pot, Doc, and Google scholars with citation numeric of all 107 titles (Statute, Dattatraya Tukaram, 2013). The denotation and impact of bibliometrics, the measuring scientific communication from bibliometrics to cybermetrics in way of transformation is gracefully described by Nicola de Bellis in the book titled Bibliometrics and citation analysis from the science citation index to cybermetrics (2009). In medical science PTJ has been published in maximum research work

in different form i.e. research report, case report, technical, perspective, linkage evidence and practice, etc. Maximum work is published on collaboration, researcher also describe the details of subjects' variety in the Physiotherapy field i.e. musculoskeletal, rehabilitation, gynaecology, PT in education, standardized questionnaire, etc. (A.P, Minaxi, 2017).

Objectives

Research output can be showing the conceptual growth of the discipline, it's included concrete, procedures, place, tools, etc. ICT Application and Digital common are procedures simultaneously tools for the library and information science, hence it would be needed to know them research output with accepting some limitations. Here following objectives has to be consider with them different importance in the field of library and information science for the research.

- To determine the authorship pattern of selected journals from 2014 to 2018.
- To identify research outputs of the selected journal with the terms "ICT application" and "Digital Commons" in the discipline of LIS.
- To measures the collaboration by various level i.e. two author, three author, more than three for the selected journals.
- To measure the used citations of the selected journal for the period of 2014- 2018
- To calculate Compound Annual Growth Rate (CAGR) for the terms "ICT Application" and "Digital Commons" for known to scattering terms form 2014-2018 in selected journals.

Methodology

Comparative Bibliometrics has been applied in the methodology with detail bibliographical features of the articles and citations, analysis, pattern of authorship etc. A pertained data was taken from the following journals.

1. DESIDOC Journal of Library & Information Technology
2. Science & Technology Library
3. The Electronic Library

The period has been taken from 2014 to 2018. The SPSS software has been used for statistical analysis while tables and graphs forms are used for it presentation. A researcher has to be taken to calculate the Compound Annual Growth Rate (CAGR) for knowing the scattering rate of ICT Application and Digital Commons. It has to be used to know the growth rate of the investment in management discipline. A researcher can be convert the CAGR in the study for knowing year wise growth of the research output in term of "digital common" and "ICT Application" The primary equation of CAGR and converted it in for the two selective terms i.e. "ICT Application" and "Digital Commons" are as under.

CAGR = Ending Balance/Research output of "Digital Common

$$CAGR = \left(\frac{\text{Endingvalue}}{\text{beginingvalue}} \right)^{\left(\frac{1}{5} \right)} - 1$$

Convert the equation into LIS RESEARCH

$$\begin{aligned} \text{CAGR for Digital Common} \\ &= (\text{"digitalcommon" research output/total research output}) (1/5) \\ &- 1 \end{aligned}$$

$$\begin{aligned} \text{CAGR for ICT Application} \\ &= (\text{"ICT Application" research output/total research output}) (1/5) \\ &- 1 \end{aligned}$$

Data Analysis

Table 1. Research Output of the source journals

Name of the Journal	Year wise output					Total
	2014	2015	2016	2017	2018	
DESIDOC Journal of Library & Information Technology	60	53	49	58	61	281
%	21.35	18.86	17.44	20.64	21.71	100
Science and Technology Libraries	26	19	25	28	26	124
%	20.97	15.32	20.16	22.58	20.97	100
The Electronic Library	60	91	53	60	58	322
%	18.63	28.26	16.46	18.63	18.01	100
TOTAL	146	163	127	146	145	727
%	20.08	22.42	17.47	20.08	19.94	100

Table 1 shows the growth of the research output of selective three source journals for the period of 2014 to 2018. It seems from the data presented that the journal "Electronic Library" has 322 number of research output which is highest on the comparison with remain two journals. It also highlighted that the variation between the total research output of the tenure is dependence on the periodicity of the journal, i.e. Bimonthly, quarterly, yearly, and weekly.

Table 2. Year wise Authorship Pattern

Name of the Journal	Authorship Pattern	2014	2015	2016	2017	2018	Total
DESIDOC Journal of Library & Information Technology	One Author	21	17	18	16	15	87
	%	24.14	19.54	20.69	18.39	17.24	100
	Two Author	28	25	21	34	28	136
	%	20.59	18.38	15.44	25	20.59	100
	Three Author	9	10	9	6	13	47
	%	19.15	21.28	19.15	12.77	27.66	100
	More than Three Author	5	2	3	3	5	18
	%	27.78	11.11	16.67	16.67	27.78	100
	Total	60	53	49	58	61	281
	%	21.35	18.86	17.44	20.64	21.71	100
Science and Technology Libraries	One Author	22	2	14	13	17	68
	%	32.35	2.94	20.59	19.12	25	100
	Two Author	3	7	6	7	4	27
	%	11.11	25.93	22.22	25.93	14.81	100
	Three Author		6	3	5	2	16
	%		37.5	18.75	31.25	12.5	100
	More than Three Author	1	4	2	3	3	13
	%	7.69	30.77	15.38	23.08	23.08	100
	Total	26	19	25	28	26	124
	%	20.97	15.32	20.16	22.58	20.97	100

The Electronic Library	One Author	34	66	24	25	35	184
	%	18.48	35.87	13.04	13.59	19.02	100
	Two Author	14	13	17	19	14	77
	%	18.18	16.88	22.08	24.68	18.18	100
	Three Author	8	8	7	9	5	37
	%	21.622	21.622	18.919	24.324	13.514	100
	More than Three Author	4	4	5	7	4	24
	%	16.67	16.67	20.83	29.17	16.67	100
	Total	60	91	53	60	58	322
	%	18.63	28.26	16.46	18.63	18.01	100

Above table revealed the authorship pattern for the researches tenure 2014 to 2018 for the selective source journals. It comes to the notice during data collection that the slot of more than three authors of researches include more than three authors' paper i.e. 5 authors, 7 up to 10 authors. It also found from the table that in slot of three authors contributions for the tenure of 2018 the DESIDOCJLIT has highest 13 contributions (27.66%) for the said slot, while TEL has 9 contributions (24.324%) STL has only 2 contributions (12.5%). It is much less in compared of other journal; it is also noticeable that STL do not have an contribution for three authors slot on year 2014.

Table-3 Strength of Collaboration

Authorship Pattern	2014 to 2018			Total
	DJLIT	STL	TEL	
Two Author	136	27	77	240
%	56.67	11.3	32.1	100
Three Author	47	16	37	100
%	47	16	37	100
More than Three Author	18	13	24	55
%	32.73	23.6	43.6	100

Table no. 3 shows the status of collaboration from 2014 to 2018 for all three source journals are as under.

- DJLIT journal have highest number of researches in three range of authorship pattern, due to the periodicity in compared of STL and TEL.
- It is noted that the TEL have maximum researches on the third range, with 24 papers (43.64%) out of 55 analyses, while STL have 13 papers (23.64%) and DJLIT 18 articles (32.73%). It seems here the total number of papers in the third range of collaboration for all selective journals is not more than 25. Hence, TEL has 24 the highest researches (43.64%) in compare with DJLIT and STL.
- STL have quarterly periodicity; hence, the contributions could not come out by equal and at least 25% of the level in compare to the DJLIT while it is not double by the first collaboration range of TEL.

Table-4 Used Citations in source journals

Range of Used citation	Up to 14				15≤25				More than 25			
	DJLIT	STL	TEL	Total	DJLIT	STL	TEL	Total	DJLIT	STL	TEL	Total
2014	27	17	42	86	9	11	29	49	7	11	26	44
%	31.4	19.8	48.8	100	18.37	22.5	59.2	100	15.91	25	59.1	100
2015	29	18	43	90	7	10	30	47	6	10	27	43
%	32.22	20	47.8	100	14.89	21.3	63.8	100	13.95	23.3	62.8	100
2016	20	19	61	100	8	11	47	66	7	9	44	60
%	20	19	61	100	12.12	16.7	71.2	100	11.67	15	73.3	100
2017	31	23	45	99	15	12	37	64	13	12	36	61
%	31.31	23.2	45.5	100	23.44	18.8	57.8	100	21.31	19.7	59	100
2018	39	21	38	98	24	11	30	65	19	11	27	57
%	39.8	21.4	38.8	100	36.92	16.9	46.2	100	33.33	19.3	47.4	100

Above table describe measures of used citations in researches from 2014 to 2018. It is bifurcate in three range i.e. up to 15, >15≤25, and More than 25 references from each research paper from all three journals. The data presentation highlighted amazing truth that the journal who has less research output for the selective tenure, has utilized less references in compared journals. For the first range a DJLIT have 27 references (31.40%), TEL have 42 references (48.84%), while STL has 17 (19.77%). The year wise total references columns on comparative mode of each range has showing fluctuation; while the year wise total references of first two slot is gradually increasing, and last one shows the fluctuation.

Table-5 Compound Annual Growth Rate

Name of the Journal	Digital Commons	Total Research Output	2014-2018	CAGR	ICT Application	Total Research Output	Year	Growth Ratio
DESIDOC Journal of Library & Information Technology	49	281	5	0.4	71	281	5	0.3
Science and Technology Libraries	7	124	5	0.8	4	124	5	1
The Electronic Library	111	322	5	0.2	104	322	5	0.3
Total	167	727	5	0.3	179	727	5	0.3

Table 5 show the Compound Annual Growth Rate of selected journals. The calculation of CAGR has to be done for knowing the scattered level of selective subjects are Digital Commons and ICT Application only for the period of 2014 to 2018.

CAGR for Digital Commons:

Table no. 5 shows the CAGR for “Digital Common” is cooperatively 0.34 for all three sources of journal. While split CAGR as per the total research outputs of all selected journal on ascending order is highest 0.78 for STL, 0.42 for DJLIT and 0.24 for TEL.

CAGR for ICT Application

A CAGR for “ICT Application” cooperatively 0.32, while Arranged split CAGR on ascending order is 0.32 to DJLIT, 0.99 to STL and 0.25 to ETL. It is explained from the analysis that where the numbers of contributions is decreases the CAGR is increase while it reciprocates when contributions of source journal is increase.

Findings

- First objective of the study is to determine the authorship pattern for the selected source journal from 2014 to 2018. Table. No.2 data is show the authorship pattern i.e. one, two, three and more than it. On the basis of the data a researcher get first, second and third rank to the source journal. It is finding out that for the selected five year DJLIT journal has contribute 136 highest with two author while 47 with three authors. ELT comes on second with respectively 77, 37 and 24 contributions. The STL comes third with 27, 16 and 13 contributions.
- As per the second objective of the study, it is find out that the term digital commons get 17.43% contribution from DJLIT, 5.66% from STL and 34.47% from the TEL. A term ICT Application gets 25.27% from DJLIT, 3.23% from STL and 32.30 from ETL.
- Third objective of the study is to measure the collaboration by various levels. As per entire study table no. 2 named year wise authorship pattern and table no. 4 named strength of collaboration describe the detail about the objective. It is seeming that two authors collaboration rate of DJLIT is highest with 56.67% in comparison of remain two. While TEL journal has 32.08% and STL has 11.25%. It is noticeable that the Electronic Library journal and DJLIT has similar periodicity, and it's highly contributes in both terms.
- As per the fourth objective of the study is to determine the cited references in source journals. Table no. 4 named Cited references in source journal. A researcher has split the cited references in three zones i.e. Up to 14, 15≤25 and more than 25. It shows that a TEL source journal has highest cited references due to them periodicity in compare of remain two sources. Journals.
- Fifth objective of the study is to calculate CAGR for both terms from 2014 to 2018. It is determine that both terms scattering gradually on LIS field. Table no. 5 named annual growth rate shows the calculation of CAGR. It is revealed from the table 5 that CAGR is highest for the source journals; has low contribution, while lower when highest contribution. It meant by the low CAGR is define highest scattering of the term or discipline. The data revealed that the Electronic Library journal has highest rate scatter.

Suggestions

All three journals are available on different platform on internet, with different presentation and service style. Here it is suggested by the researcher that all references used in each research paper should be highlighted by exact number on the content page. Therefore,

detailed bibliometric study will be possible. Users and scholars have to be understood the importance of references and their styles. Through the bibliometrics analysis by variables of references, may find out the variety of references by form of documents i.e. books, articles, thesis, newspaper, etc hence it will be helpful to educators to increase the variety of forms in the references.

Persistence research is the foundation of growth of all discipline. It seems from the analysis of this study that a researcher has to continue research at least toward one core subject; hence the rate of growth will be visible on discipline level as well as authorship pattern. Hence it needs to increase the collaboration on the research for more values, implication and applications of research.

Conclusion

Bibliometrics has many indicators i.e. publication, science and technology, authors, etc., all are using for determining the scattering level of contributions, disciplines, forms of research, etc. Its strength of research helps to recognise the related literature of subjects and an area of knowledge world where it is spread on relevant areas i.e. interdisciplinary, multidisciplinary and its own field. Here the study reveals that total 727 articles have been published in LIS field it's included the term "Digital commons" and "ICT Application".

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