

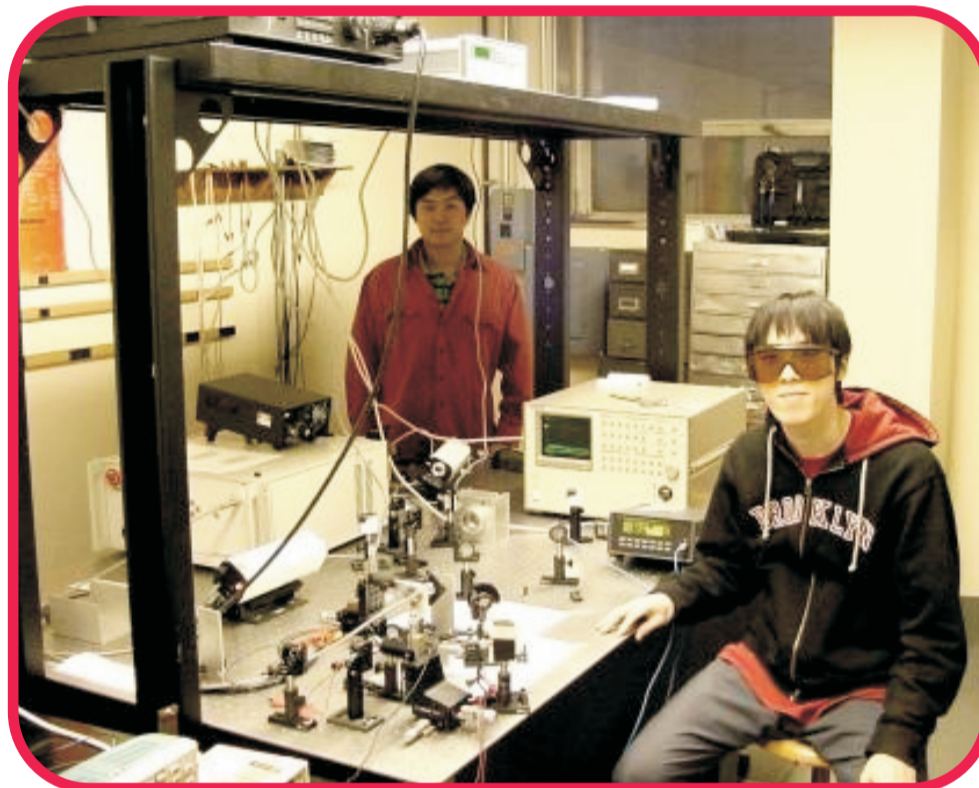
CITATION ANALYSIS OF SCIENCE DOCTORAL THESES IN PHYSICS SUBMITTED TO BANGALORE UNIVERSITY BANGALORE, KARNATAKA, INDIA.

Keywords:

Physics Theses, Citation analysis, Authorship Pattern, Journal ranking.

Abstract:-

The present paper addresses to research performance of Department of Physics, Bangalore University, Bangalore, Karnataka. This study covers 2485 citations. The study analyzed major part of citation is Journal citations 80.68 % followed by books 10.99% and 1.21 % is E-resources. In total Citations Collaborative authorship is the highest 72.39%. The Physics researcher highest cited between the years 1991-2000 (28.89%) and the cited citation of journal article publication journals are USA (849) 42.34%, UK 278 (13.87%) and India 163 (8.13%) are highest publication respectively.



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INTRODUCTION :-

Citation analysis is one of the techniques of bibliometrics. This study helps for identification of core journal in a subject field. It is a technique of listing of references append in articles. Citation study identification the significant periodical frequency and counting which periodicals are cited. This method emphasizes that most profusely cited journal can taken to be the most desirable ones in a library collection. Garfield (1979) defined about citation study, "Citation analysis provides a number of interesting and useful insights into the network of journals that function as the primary formal communication medium of science".

Citation analysis is the examination of the frequency, patterns, and graphs of citations in articles and books Garfield, (1979). Citation analysis is one of the well-known methods used in a university library environment. Naude, F. Rensleigh, C.W.& Du Toit, A.S.A. (2005) Explained the citation analysis "Citations and the composition of bibliographies reflect changes the information seeking behavior of academicians and researchers".

Citation study has been conducted in all most all fields of science, social science, education, and medicine disciplines. This paper studied on citations of Bangalore University Physics Doctoral theses between the years of 2006-2010. Present study analyses 2485 citations. Investigator defined citations subfield patterns of authorship, journals, Journals ranking, frequencies of citations and other useful pattern are analyzed. The application point of view citation analysis may be considered as a collaborative effort and promote the quality of scholarly publications.

LITERATURE REVIEW

Library and Information Science scholars have been conducted several concept of citation analysis. Major research of the pertinent studies were reviewed and comprehended.

Sangam S L (1986) did a citation analysis of social science theses. He pointed out social science researcher highly cited books (56.17%) followed by periodical (32.57%).

Nattar (2009) analyzed 829 articles published in the Indian journal of Physics during the period 2004-2008. The author studied the distribution of contributions authorship pattern, geographical distribution of contribution of the number of pages in each volume. Results indicated that highest numbers of paper were joint authors. The contributions in this journal from India are slightly more than those from other countries. The growth and popularity of this journal is found to show an upward trend. Sudhier (2010) studied five-year (2004-2008) data of journals cited by the physicists at the IISc, Bangalore, to examine the applicability of Bradford's law of scattering, which include 690 periodicals counting 11,319 references collected from 79 theses during the period 2004-08. The author has prepared a ranked list of journals; Physical Review-B with 9.53 % citation, followed by Physical Review-A with 7.69 %, and Astrophysical journal with 5.47 % citations were the most preferred journals. He noted that the journal distribution pattern of the Indian Institute of Science doctoral theses does not fit the Bradford's distribution pattern.

The main objective of the present study:

- To study the distribution of citations in different bibliographic forms;
- To study the authorship patterns in cited references.
- To determine country-wise distribution of journal citations in physics theses.
- To analyze chronological distribution of citations.
- To analyze the journal ranking of citations.
- To analyze the print materials and online resources.
- To establish a list of core journals in the fields of physics.

METHODOLOGY AND SAMPLES

Present study analysis of Physics theses between the years of 2006 to 2010 submitted to University of Bangalore were selected for source data. A total 2485 citations were analyzed. The data are references of each thesis (bibliographies) were photocopied and each reference was categorized according book, journal, report, conference proceedings, newspaper, theses/dissertation, and reference books. Data was compiled and entered in MS EXCEL work sheet for tabulation. Regarding Journal details for analysis purpose, the investigator data will collect from Ulrich's international periodical directory (<http://www.ulrichsweb.com>) and other online resources.

ANALYSIS AND DISCUSSIONS

Analysis of data is the ultimate step of research process. It is inspecting, cleaning, transforming, and modeling data with the goal of discovering useful information and suggesting conclusions. It is the link between raw data and conclusions.

4.1. Year wise distribution of awarded thesis citation.

Between the years 2006 to 2010 physics department awarded theses. The study traced and collected 14 theses from the library and department. Around 2485 citations are cited in their theses.

4.2. Number of citation for the study

Physics researchers around 2485 citations are cited in their thesis. An average 177 citations are cited in each thesis.

Table 1: Number of citations during the year 2006-2010

Sl. No	Year	Total theses	Citations	Cumulative of Citations	Percentage %
1	2006	01	163	163	6.56
2	2007	02	357	520	14.37
3	2008	02	407	927	16.38
4	2009	04	715	1642	28.77
5	2010	05	843	2485	33.92
6	Total	14	2485		100.00

Form wise distribution of citations in physics theses

The total numbers of 2485 citations are distributed in different sources as shown in Table 2.

Table 2 Distribution of cited literature in physics theses

Serial.no	Citation forms	Citations	Cumulative Citations	Percentage %	Cumulative of %
1	Books	273	273	10.99	10.99
2	E-resources	30	303	1.21	12.2
3	Journals	2005	2308	80.68	92.88
4	Conference & Seminar Proceedings	126	2434	5.07	97.95
5	Reports	19	2453	0.76	98.71
6	Theses	21	2474	0.85	99.56
7	Patents	2	2476	0.08	99.64
8	Others	9	2485	0.36	100
	Total	2485		100.00	

In above table 2 it was found that the journals are major form of media used with citation count, of 2005 (80.68%) of total cited documents followed books 273 (10.99%). Theses, 21 (0.85), E-resources, 30 (1.21%), Conference & Seminar proceedings, 126 (126 5.07%). This indicates that journals are the major documents cited in physics theses.

Difference between print citations and online information citations

Present days information are available in online version in table 3 it was observed that were total 2485 citations out of them 2455 (98.792 %) citation were print citations and only 30 (1.207%) citations were online or e-resources or e-resources.

Table 3: Difference between printed citations and online information

Serial No.	Types of citations	Frequency	Percentage
1	Print Citations	2455	98.792
2	Online information Citations	30	1.207
	Total	2485	100.00

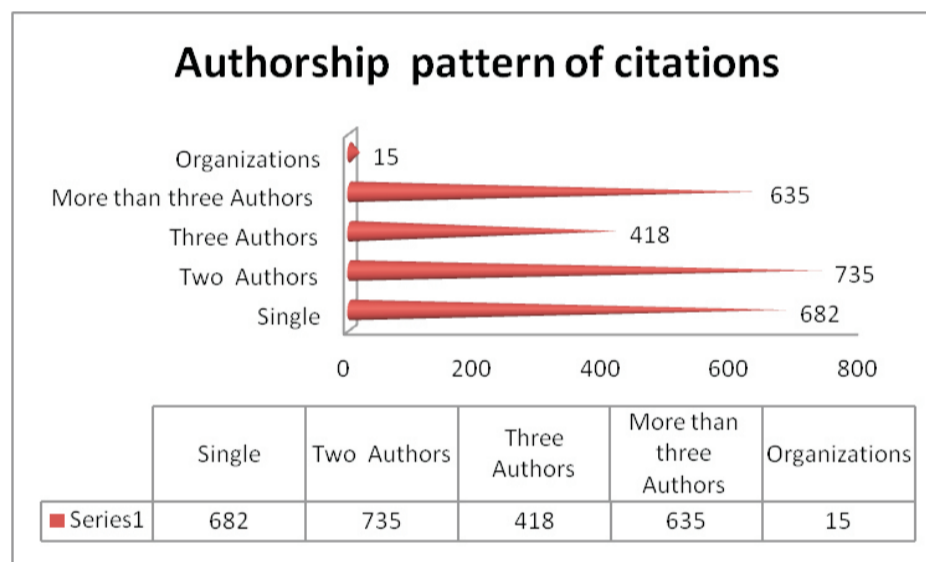
Authorship patterns in physics literature usage in theses

Authorship pattern of cited references in table 4 and figure 1 it indicates that the highest and lowest number of citations were two authors and three authors respectively. The number of citations with two authors 735 (29.58%), followed by single 682 (27.44%) citations and more than three authors is 635 (25.55%) citations. In total 72% of the citations are collaborative authorship works.

Table 4 Authorship pattern of cited references in physics theses

Serial no	Authorship	Citations	Cumulative Citations	Percentage	Cumulative %
1	Single	682	682	27.44	27.44
2	Two Authors	735	1417	29.58	57.02
3	Three Authors	418	1835	16.82	73.84
4	More than three Authors	635	2470	25.55	99.39
5	Organizations	15	2485	0.60	99.99
	Total	2485		100	100

Figure 1 Authorship pattern of cited references



Authorship Collaboration

The researcher observed that collaboration in research very common phenomenon in science and technology. In physics research, cited references were collaboration is highest in table 4 state that 1788 (72.39%) and single author 682 (27.61%). The degree of collaboration among authors is calculated a formula that given by K.Subramanyam.

Table 4 Authorship pattern and collaboration in total citations

Sl. No.	Authorship	No. Of Citations	Percentage	Degree of Collaborations
1	Single Author	682	27.61	0.27
2	Collaborative Authorship	1788	72.39	0.72
	Total	2470	100.00	

Degree of Collaboration (DC)

Degree of collaboration was formulated by K Subramanyam (1983). He given a formula according to that followed the mathematical formula which is $C = \frac{NM}{NM+NS}$

Where $C = \frac{NM}{NM+NS}$

C= Degree of collaboration
 NM = Number of multi authored papers
 NS= Number of single authored papers

According to Subramanyam formula, the present study value of Degree of collaboration is

$$\frac{1788}{1788 + 682} = \frac{1788}{2470} = 0.7238$$

Thus the overall degree of collaboration is 0.72

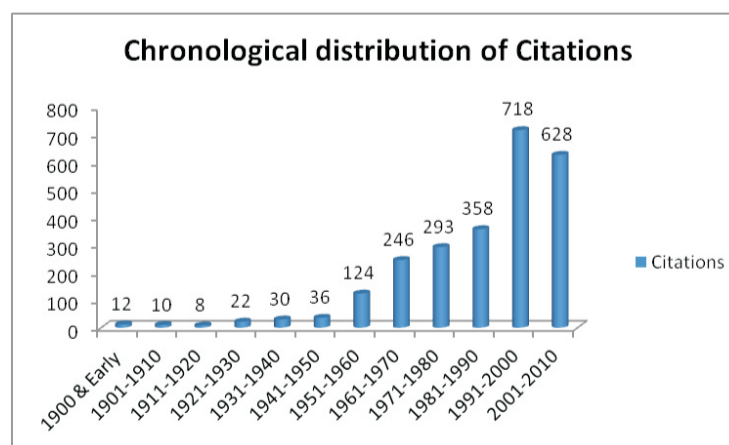
Chronological distribution of cited citations of physics theses

Chronological distribution of citation is explained in Table 5 and figure 2 it presents total citations chronology. The maximum number of citations years is 1991-2000 (with 718 citations 28.89%).

Table 5 Chronological distribution of citations in physics

Serial No.	Years	Citations	Cumulative citations	Percentage	Cumulative Percentage
1	1900 & Early	12	12	0.48	0.48
2	1901-1910	10	22	0.40	0.88
3	1911-1920	8	30	0.32	1.20
4	1921-1930	22	52	0.89	2.09
5	1931-1940	30	82	1.21	3.30
6	1941-1950	36	118	1.45	4.75
7	1951-1960	124	242	4.99	9.74
8	1961-1970	246	488	9.90	19.64
9	1971-1980	293	781	11.79	31.43
10	1981-1990	358	1139	14.41	45.84
11	1991-2000	718	1857	28.89	74.73
12	2001-2010	628	2485	25.27	100.00
Total		2485		100.00	

Figure 2 Chronological distributions of physics theses citations



Analysis of Journal citations

The investigator analyzed the journal article citations of physics theses. Around 2005 citations are journal article citations. The Journal article citations are highest that analyses of authorship pattern, Geographical publication places, Chronological distribution, and Ranking of journals are explained.

Authorship pattern in journals article citations

Journal article citation authorship stated in table 6 it reveal that highest number of citations found under more than three authors 623 (31.07%) followed by two authors 587(29.28 %) and Single author 575 (24.4 %). It is observed that major share is collaboration authorship journal article cited in physics references.

Table 6 Authorship pattern in Journal article citations

Sl. No.	Authorship	No. Of Citations	Percentage
1	Single Author	486	24.24
2	Two authorship	587	29.28
3	Three authorship	309	15.41
4	More than three authorship	623	31.07
	Total	2005	100

Geographical distribution of citations Country wise journal citations

Geographical distribution of journal citations stated in table 7. The data based on place of journal publication. For this data collected from Ulrich Periodical directory and other online information resources.

Table 7: Geographical Country wise distribution of journal citations

Sl. No	Country	No. of Citations	Percentage
1	United States of America (USA)	849	42.34
2	United Kingdom (UK)	278	13.87
3	India	163	8.13
4	China	14	0.70
5	Africa	6	0.30
6	Netherland	192	9.58
8	Canada	8	0.40
9	Germany	41	2.04
10	Japan	9	0.45
11	Korea	3	0.15
12	Pakistan	2	0.10
13	Russia	6	0.30
14	France	5	0.25
15	Italy	2	0.10
16	Denmark	7	0.35
17	Singapore	9	0.45
18	Turkey	3	0.15
19	New Zealand	5	0.25
20	Australia	8	0.40
21	Switzerland	6	0.30
22	Holland	2	0.10
23	Not available	387	19.30
	Total	2005	100.00

Above table 7 reveals that United States of America USA country publication is the largest number of citations cited by physics researcher 849 (42.34%) citations followed by United Kingdom UK

278 (13.87%), Netherland 192 (9.58) and India 163 (8.13%) citation respectively.

6.3 Indian and Foreign distribution of journal citations

Physics researcher cited journal references covered geographical distribute India and foreign countries. The table 9 state that out of 2005 citations Indian citations are 163 (8.12%) and 1842 (91.87 %) citations are foreign citations. This indicates that, researchers mostly prefer foreign journal publications.

Table 8 Indian and Foreign distribution of journal citations

Serial no	Geographical distribution	Citations	Percentage
1	India	163	8.12%
2	Foreign Countries	1842	91.87%
	Total	2005	100

Ranked list of cited Journals

The ranking of journals based on the number of citations appeared in Ph.D theses in the field of Physics. The data were collected and summarized and presented in the table 9.

Table -9: Ranked list of cited journals

Serial no.	Journal title	Rank	No. of citations	Cumulative	Percentage	Country
1	Physical Review	1	116	116	5.79	USA
2	Physical Review Letters	2	102	218	5.09	USA
3	Physical Review C	3	98	316	4.89	USA
4	Nuclear Instruments and Methods in Physics Research Section B:	4	65	381	3.24	Netherland
5	Spine	5	60	441	2.99	USA
6	Physical Review A	6	51	492	2.54	USA
7	Journal of Applied Physics	7	47	539	2.34	USA
8	Astrophysical Journal	8	44	583	2.19	UK
9	Indian journal of Pure & Applied Physics	9	41	624	2.04	India
10	Nuclear Physics A	10	40	664	2.00	Netherland
11	Current Science	10	40	704	2.00	India
12	Nature	11	39	743	1.95	UK
13	Physical Review D	11	39	782	1.95	USA
14	Science	12	38	820	1.90	USA
15	Physics Letter B	13	32	852	1.60	Holland
16	Biophysical Journal	14	28	880	1.40	USA
17	Nuclear Physics B	14	28	908	1.40	Netherland
18	Nucleic Acids Research	15	27	935	1.35	UK
19	Applied Journal	16	26	961	1.30	India
20	Radiation Measurements	16	26	987	1.30	Netherland
21	Physica Status Solidi A	17	22	1009	1.10	USA
22	Astronomy and Astrophysics	17	22	1031	1.10	France
23	Journal of Chemical Physics	18	21	1052	1.05	USA
24	Physics Letters B	18	21	1073	1.05	Netherland
25	Radiation Protection Dosimetry	19	19	1092	0.95	UK
26	Journal of Molecular Biology	20	18	1110	0.90	USA
27	Astrophysics Journal Letter	21	17	1127	0.85	UK
28	Nuclear Instruments and Methods in Physics Research Section A	22	16	1143	0.80	Netherland
29	Journal of Physics G Nuclear Particle Physics	23	15	1158	0.75	UK
30	Aviation Space Environment Medicine	24	14	1172	0.70	USA

31	Journal of Physics D : Applied Physics	25	13	1185	0.65	UK
32	IEEE Transaction Nuclear Science	26	12	1197	0.60	USA
33	Journal of Applied Crystallography	27	11	1208	0.55	Denmark
34	Journal of Applied Physiology	28	10	1218	0.50	USA
35	Journal of Biomechanics	28	10	1228	0.50	Netherland
36	8 Journals with 9 citations	29	72	1300	3.59	
37	7 Journals with 8 citations	30	56	1356	2.79	
38	7 Journals with 6 citations	31	42	1398	2.09	
39	11 Journals with 6 citations	32	66	1464	3.29	
40	12 Journals with 5 citations	33	60	1524	2.99	
41	21 Journals with 4 citations	34	84	1608	4.19	
42	27 journals with 3 citations	35	81	1689	4.04	
43	39 journals with 2 citations	36	78	1767	3.89	
44	238 journals with 1 citations	37	238	2005	11.87	
			2005		100.00	

Table nine demonstrates ranking of journal. In 2005 journal article references were scattered in 405 journal titles. However, the top twenty journals covered more than half of the citations. The journal Physical Review (USA) top ranked in the list with 116 citations followed by Physical Review letters (102) and Physical Review C (USA) with 98 citations respectively

Indian and Foreign distribution of journal citations

The physics researcher cited journal references covered geographical distribute India and foreign countries. The table 9 state that out of 2005 citations Indian citations are 158 (7.88%) and 1847 (92.11 %) citations are foreign citations. This indicates that, researchers mostly prefer foreign journal publications.

Serial no	Geographical distribution	Citations	Percentage
1	India	158	7.88%
2	Foreign Countries	1847	92.11%
	Total	2005	100

FINDINGS OF THE STUDY

The analysis of data on the basis of the different variables considered helped in reaching some important findings

- 1.Important given to Journal article are the first source information of physics researcher. That is 2005 (80.08%) citations of the total citations
- 2.In authorship pattern most of the citations belong to Collaborative authorship (Two, Three and more authors) is predominated in citations.
- 3.The researcher depend print references not online resources, out of 2485 citations only 30 (1.207%) citations are online resources.
- 4.Maximum number of citations is covered during the period of 1991-2000. It is 718 (28.89%).
- 5.It is observed that journal article authorship is collaboration 76% is highest in cited references.
- 6.The Physics researcher cited highest references are United States of American publications.
- 7.The geographical distribution of journal citations shows that 158 (7.88%) minimum citation are from India and 1847 (92.11%) maximum citations are from foreign countries.
- 8.Physical Review (USA) top ranked in the list with 116 citations followed by Physical Review letters (102) and Physical Review C (USA) with 98 citations. These are core journals cited in physics theses.
- 9.Bangalore university physics researcher cited scientific journals are Nature (39) Science (38), and Indian journal is Current Science (40).

CONCLUSIONS

The study covers 2485 citations of Bangalore university physics doctoral theses. The researcher most of the cited sources were journals (2005) followed by books (273) and very few of online information resources (30) are cited. The study of citation analysis provide guidance to librarians and researchers to take decisions in collection development policy and where knowledge is growing exponentially and extensive scatter of information are guided in this study.

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