A STUDY OF RECENCY OF CITED ITEMS APPENDED IN THE ARTICLES PUBLISHED IN JOURNAL OF ALGEBRA AND DISCRETE MATHEMATICS

Nikhil Kumar Sardar,

Sonarpur Mahavidyalaya,
Kolkata, India.

ABSTRACT

The aim of this paper is to study recency, weighted recency and average weighted recency of the cited items in the articles published in the Journal of Algebra and Discrete Mathematics during the period from 2010 to 2012 by using statistical methods based on sampling. This study reveals that the average weighted recency of the citations of the articles published in 2011 are more than those of the other two years. (cf. the bar diagram is in the page 15). This indicates that the articles published in 2011 are of more recent origin than those of other two years.

Keywords: Citation analysis, Recnecy, Weighted recency, Average weighted recency, Recency Index, Citation pattern.

INTRODUCTION:

Citation analysis is one of the important and quite old branches of bibliometric study. It examines the different frequencies, their patterns and graphs of citations given in articles, review papers, technical communication, thesis and books. Citation analysis uses citations in scholarly works to establish links to other works or other researchers. Many different links can be ascertained, such as links between authors, between scholarly works, between journals, between fields, or even between countries. A number of such citation analyses have been proposed and citations have been analysed with their various aspects. For example, bibliographic coupling, co-citation, impact factor, citation impact, and citation index and so on are measures based on citation analysis. Recency of citation has not given adequate attention by the researchers. Recency not only reflects the origin, relevance in the present time or in recent past of the topic on which the paper is written but also gives an indication of the standard of the concerned journal.

SURVEY OF LITERATURE REVIEW:

Bibliometrics is now being vigorously pursued. It has been estimated that 25 percent of all the articles published in library and information science journals are on bibliometrics and related topics. Many of the social science journals also carry a good number of articles in bibliometrics. Several review articles and books on development of bibliometrics have been published. There is at least one journal—*Revue Francaise de Bibliometric* (French Journal of Bibliometrcs), which is published as a bulletin of the French Society of Bibliometric Application (SFBA) and Association for Development of Scientometrics and Technometrics (ADEST). Alan Pritchard collected comprehensive bibliography of bibliometric publications of many years. He together with Wittig edited one book [26] containing 600 items published during 1874-1959. Peritz[23] analysed the next period from 1960-1985. His study was based on the bibliographies prepared by Hjerppe [15] and Schubert. Peritz counted 3225 items of which 2675 were papers in journals and proceedings. Rest 550 were reports, dissertations, collected works, monographs etc.

The first review of bibliometric empirical laws was written by Fairthorne in 1969[10]. The second important one was by Hjerppe in 1980[14]. There are a number of publications describing and reviewing citation indexing including a number of books [11]. There are also a good number of collected works and special issues of journals. Narin and Moll's review of bibliometrics in ARIST, 1977 was a survey of publications [21]. In 1978 [22] Nicholas and Ritchie published the book 'Literature and bibliometrics' which is a collection of articles. Lawani wrote in 1981 'Bibliometrics: its theoretical foundations, methods and applications [18].' *Library Trends* published a special issue on bibliometrics in 1981 and *Czechoslovak Journal of Physics B* published a special issue on scoentometrics of physics [8], in which as many as 46 articles were on bibliometrics. During 1986 to 1990 *Scientometrics* has published several special issues each with contributions from a particular country. 70 percent of these articles are in bibliometrics. Ravichandra Rao has written an introductory text book on quantitative methods, second part of which deals with bibliometrics[27]. Egghe and Rousseau have written an Introduction to informetrics in 1990[9]. Sengupta has published a compilation of his articles and papers in bibliometrics in 1988[29].

The most comprehensive historical review so far has been published in 1987 (written in 1985) in the Encyclopaedia of Library and Information Science. Yet, this history written by Hertzel has some obvious lapses. It does not cite or discuss Campbell's work (1898) or does not discuss the status of the publications between 1874 and 1917 covered in Prichard's bibliography. The review does not also indicate that Estoup anticipated in 1916 the relation named after Zipf. This was noted in Fairthorne's 1969 article which has been listed as one of the important papers in the review but not as a seminal paper. Hertzel has selected and listed in this historical review seminal publications in bibliometrics between 1917 and 1973. They are Cole and Eales [5] History of comparative anatomy, Hulme's book [16] Statistical bibliography....., Lotka's paper [19] on scientific productivity, Gross & Gross's paper in 1927 [12] where citation count technique was used for the first, Garfield's paper 'citation indexes for science' in *'Science'* in 1955 for use of the term impact factor, Small's paper on Cited documents as concept symbols in 1978, Cronin's paper[7] 'The Need for a theory of citing in 1981, Cozzens's paper [6] 'Comparing the sciences: citation context analysis of paper from neuro-pharmacology and the sociology of science in 1985, Bandopadhya's paper [4] on Citation analysis of doctoral dissertations in mathematics using dbase III+ in 1996 , Singh's paper [32] on Styles of bibliographical citation in 2004, Pillai Rajan and Pillai Shudhier's paper[24] on Citations in the physics doctoral dissertations in 2007, Verma and Thakur's paper[35]' Citation analysis of doctoral dissertations in botany in 2010, Khan's paper [17] 'A Study of recency of cited items appended in the articles published in Journal of Documentation' in 2012.

These types of study are not done very much .It is a new aspects of worthwhile area of research in the field of library science. The list are obviously incomplete but sufficiently good enough for an indication of the trends. [30]

MOTIVATION FOR THE CHOICE OF THE JOURNAL UNDER STUDY:

Mathematics is a vast subject. Pure Mathematics and Applied Mathematics are two broad classifications. The journal under consideration is "Algebra and Discrete Mathematics". As the name suggests the journal publishes papers on Mathematics belonging to two topics viz. i) Algebra and ii) Discrete Mathematics. These two topics are closely related and very important branches in Pure Mathematics having wide applications. The Journal is published from Ukraine. Ukraine was a part of the then USSR. So it is natural that it inherits the high standard scientific legacy of USSR.

ORGANIZATION OF THE PAPER:

We first list the objective of our study. Then we give a brief description regarding the data collection. We then explain the meaning of recency and weighted recency. Then we present data in tabular form followed by its graphical representation and subsequent observation thereon. This is done year wise for the three years as mentioned in the title. Finally we obtain a bar diagram comparing the year wise average weighted recency.

OBJECTIVES OF THE STUDY:

The following are the objectives of the study:

1) To discover the number of cited documents of references per articles.
2) To identify the number of articles published in each year.
3) To identify the number of citations appeared in each year.
4) To identify the year wise collection of articles and citations.
5) To find out the recency of cited documents.
6) To find out the weighted recency of cited documents.
7) To find out the average weighted recency of references appeared in the articles published in the Journal of Algebra and Discrete Mathematics for a period of three years 2010-2012
8) To study the references critically to have some better insight.

DATA COLLECTION:

The articles published in Journal "Algebra and Discrete Mathematics" for the period from 2010 to 2012 has been taken into consideration. There are various types of cited items like books, thesis, dissertations, websites etc. in the references of articles. Here all types of cited items have been included for this study. The citations without publication year have been excluded and citations for reviews and editorials have not been considered here. On the other hand, self citations given by the author and co-citations all are included for the study. Total number of published articles and citations are respectively 112 and 1925 during the period mentioned. Due to complication of data analysis using this large number of population, a representative of sample size has been taken. Out of 112 articles, 23 articles which contain 923 citations have been selected using simple random sampling method. The detail descriptions of the collected data are given in a table below.

Table- 1: Year wise collection of articles and citations

Year	No. of articles		No. of Citations	
	Population size	Sample size	Population size	Sample size
2010	38	8	575	283
2011	32	7	518	226
2012	42	8	832	414
Total	**112**	**23**	**1925**	**923**

NUMERICAL EXPLANATION OF RECENCY AND WEIGHTED RECENCY:

In order to find out the recency of cited articles, each of the citation years (i.e., the years of publication of cited items) is subtracted from the article year (the year of publication of the article which contains cited items)

individually and then 1 is divided by each such difference. This formula for recency has the following implication. The more is the recency the larger is the recency value and vice-versa. On the other hand, the less is the recency the smaller is the recency value and vice-versa. Also the recency always lies between 0 and 1(except possibly for an exceptional case mentioned below).

What we have said about the definition of recency above is illustrated below by taking a particular case. If a citation year is 1998 with an article year 2012, then the difference is 14 years and the recency of the article for the citation is $\frac{1}{14}$ = 0.07. On the other hand if the recency, for a citation for article year 2012, is 0.2 then the difference between the citation and the article year is 5 years ($\frac{1}{0.2} = 5$).Thus one can easily determine the recency if the difference between the publication year and citation year are known & in the opposite direction one can easily determine the difference if the recency is known. But if the frequency of a particular citation year is taken into consideration then one obtains the weighted recency.

Weighted recency is defined as the product of recency and the frequency of the citation year. For a particular publication year if the weighted recency of a citation year is known then frequency of the citation year can be easily determined e.g. if the publication year 2012 and the citation year is 2010 the weighted recency for the year 2010 is w then the frequency of the citation is $\frac{w}{recency} = \frac{w}{0.5}$ ($0.5 = \frac{1}{2012-2010}$).

TABULAR AND GRAPHICAL REPRESENTATION OF DATA:

Now we present below in tabular form the year wise recency of the articles published in Journal Algebra and Discrete mathematics for three consecutive years (2010, 2011 and 2012) and draw the corresponding graphs.

Let us explain the meaning of some notations used in the following tables.

R_{cy} stands for the recency of citations for the year Y, Y_{a12} for the Article Year 2012, Y_c for the Citation Year and F_{c12} for the Frequency of citations.

Then Recency = $\frac{1}{Y_{a12} - Y_c}$, Weighted Recency = $F_{c12} \times \frac{1}{Y_{a12} - Y_c}$

Table-2: Showing recency of citation for the articles published in the year 2012

Y_c	F_{c12}	Y_{a12}-Y_c	$\frac{1}{Y_{a12} - Y_c}$	$F_{c12} \times \frac{1}{Y_{a12} - Y_c}$
1903	1	109	0.009174	0.009174
1924	2	88	0.011364	0.022727
1930	1	82	0.012195	0.012195
1932	1	80	0.0125	0.0125
1937	2	75	0.013333	0.026667
1938	2	74	0.013514	0.027027
1939	1	73	0.013699	0.013699
1940	5	72	0.013889	0.069444
1943	1	69	0.014493	0.014493
1946	2	66	0.015152	0.030303
1947	2	65	0.015385	0.030769
1948	6	64	0.015625	0.09375
1949	4	63	0.015873	0.063492
1950	4	62	0.016129	0.064516
1951	3	61	0.016393	0.04918
1952	2	60	0.016667	0.033333
1953	2	59	0.016949	0.033898
1954	3	58	0.017241	0.051724
1955	3	57	0.017544	0.052632

1956	4	56	0.017857	0.071429
1957	3	55	0.018182	0.054545
1958	7	54	0.018519	0.12963
1959	5	53	0.018868	0.09434
1960	3	52	0.019231	0.057692
1961	4	51	0.019608	0.078431
1962	5	50	0.02	0.1
1963	1	49	0.020408	0.020408
1964	7	48	0.020833	0.145833
1965	1	47	0.021277	0.021277
1966	6	46	0.021739	0.130435
1967	8	45	0.022222	0.177778
1968	9	44	0.022727	0.204545
1969	10	43	0.023256	0.232558
1970	3	42	0.02381	0.071429
1971	13	41	0.02439	0.317073
1972	9	40	0.025	0.225
1973	4	39	0.025641	0.102564
1974	5	38	0.026316	0.131579
1975	9	37	0.027027	0.243243
1976	2	36	0.027778	0.055556
1977	8	35	0.028571	0.228571
1978	8	34	0.029412	0.235294
1979	4	33	0.030303	0.121212
1980	6	32	0.03125	0.1875
1981	8	31	0.032258	0.258065
1982	10	30	0.033333	0.333333
1983	5	29	0.034483	0.172414
1984	5	28	0.035714	0.178571
1985	4	27	0.037037	0.148148
1986	3	26	0.038462	0.115385
1987	4	25	0.04	0.16
1988	4	24	0.041667	.166667
1989	3	23	0.043478	0.130435
1990	5	22	0.045455	0.227273
1991	4	21	0.047619	0.190476
1992	4	20	0.05	0.2
1993	3	19	0.052632	0.157895
1994	6	18	0.055556	0.333333
1995	5	17	0.058824	0.294118
1996	9	16	0.0625	0.5625
1997	2	15	0.066667	0.133333
1998	9	14	0.071429	0.642857
1999	8	13	0.076923	0.615385
2000	8	12	0.083333	0.666667

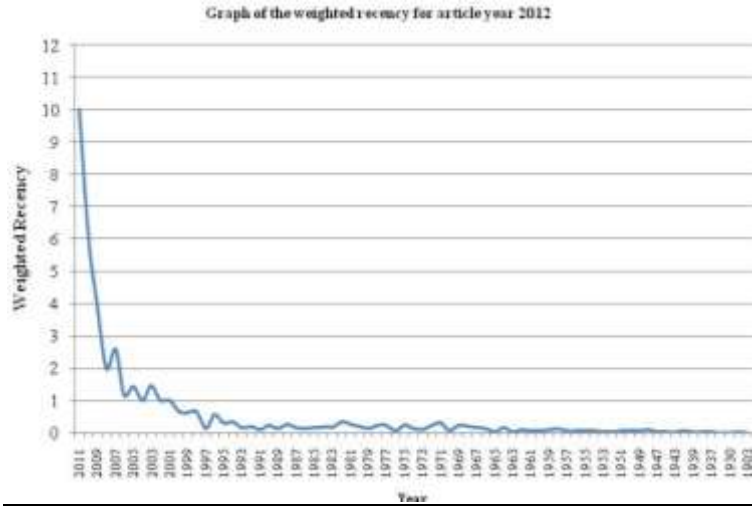
2001	11	11	0.090909	1
2002	10	10	0.1	1
2003	13	9	0.111111	1.444444
2004	8	8	0.125	1
2005	10	7	0.142857	1.428571
2006	7	6	0.166667	1.166667
2007	13	5	0.2	2.6
2008	8	4	0.25	2
2009	12	3	0.333333	4
2010	12	2	0.5	6
2011	10	1	1	10
	414			41.46408

Therefore, the Weighted Recency of Citation for the year 2012 WR_{c2012}

So, $WR_{c2012}=\sum F_{c12} \times \frac{1}{Y_{a12}-Y_c}$ =41.46408

Total number of citation (N) =414 (where N= ($\sum F_{c12}$)

Average Weighted Recency of Citation (AWR_{c2012}) =WR_{c2012}/N=41.46408/414=0.1002



FOR THE YEAR 2012:

The following have been observed from the table and the graph:

1) The oldest cited year is 1903
2) Till the year 1957 starting from the year 1903, the weighted recency is very small and from the graph it appears to be 0.The same observation for the year 1959-1960-1961-1963,1965,1970 and 1976 also weighted recency appears to be 0
3) 1958, 1962, 1964, 1966-1969, 1971- 1975 and 1977 onwards the weighted recency appears to take nonzero values.
4) From the year 2001 onwards the weighted recency crosses the value 1
5) From the year 2007 onwards the weighted recency crosses the value 2

From the graph it is clear that weighted recency is significant (≥1) from the year 2001 onwards. It is more or less steadily increasing. The highest value of weighted recency is 10, achieved in the year 2011 & the next highest weighted recency is little more than which is attained in the 2009 and 2010. Thus we can say that the authors have collected more information from this period. This indicates that the topics on which the articles are written in the journal under consideration in the year 2012 are very much of recent interest.

Table-3: Showing recency of citation for the articles published in the year 2011
(R_{c2011}=Recency of citations for2011, $Y_{a11=}$articles year, $Y_{c,=}$citation year Frequency of Citation=F_{c11})

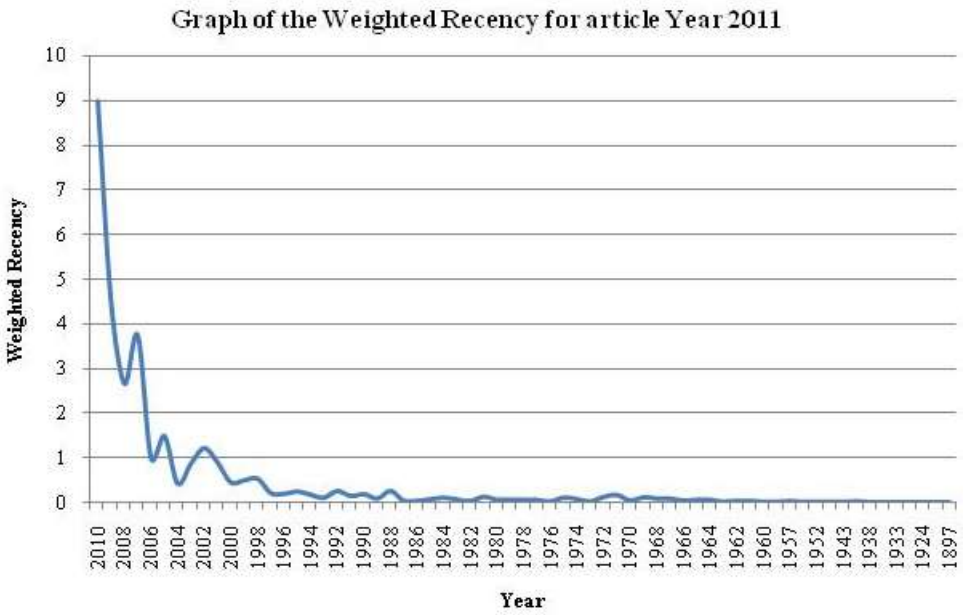
Y_c	F_{c11}	Y_{a11}-Y_c	$\frac{1}{Y_{a11}-Y_c}$	$F_{c11}\times\frac{1}{Y_{a11}-Y_c}$
1897	1	114	0.008772	0.008772
1903	1	108	0.009259	0.009259
1924	1	87	0.011494	0.011494
1926	1	85	0.011765	0.011765
1933	1	78	0.012821	0.012821
1937	1	74	0.013514	0.013514
1938	1	73	0.013699	0.013699
1942	2	69	0.014493	0.028986
1943	1	68	0.014706	0.014706
1948	1	63	0.015873	0.015873
1952	1	59	0.016949	0.016949
1953	1	58	0.017241	0.017241
1957	2	54	0.018519	0.037037
1959	1	52	0.019231	0.019231
1960	1	51	0.019608	0.019608
1961	2	50	0.02	0.04
1962	2	49	0.020408	0.040816
1963	1	48	0.020833	0.020833
1964	3	47	0.021277	0.06383
1965	3	46	0.021739	0.065217
1966	2	45	0.022222	0.044444
1967	4	44	0.022727	0.090909
1968	4	43	0.023256	0.093023
1969	5	42	0.02381	0.119048
1970	2	41	0.02439	0.04878
1971	7	40	0.025	0.175
1972	5	39	0.025641	0.128205
1973	1	38	0.026316	0.026316
1974	3	37	0.027027	0.081081
1975	4	36	0.027778	0.111111
1976	1	35	0.028571	0.028571
1977	2	34	0.029412	0.058824
1978	2	33	0.030303	0.060606
1979	2	32	0.03125	0.0625
1980	2	31	0.032258	0.064516
1981	4	30	0.033333	0.133333
1982	1	29	0.034483	0.034483
1983	2	28	0.035714	0.071429
1984	3	27	0.037037	0.111111
1985	2	26	0.038462	0.076923
1986	1	25	0.04	0.04
1987	1	24	0.041667	0.041667
1988	6	23	0.043478	0.26087
1989	2	22	0.045455	0.090909
1990	4	21	0.047619	0.190476
1991	3	20	0.05	0.15
1992	5	19	0.052632	0.263158
1993	2	18	0.055556	0.111111

1994	3	17	0.058824	0.176471
1995	4	16	0.0625	0.25
1996	3	15	0.066667	0.2
1997	3	14	0.071429	0.214286
1998	7	13	0.076923	0.538462
1999	6	12	0.083333	0.5
2000	5	11	0.090909	0.454545
2001	9	10	0.1	0.9
2002	11	9	0.111111	1.222222
2003	7	8	0.125	0.875
2004	3	7	0.142857	0.428571
2005	9	6	0.166667	1.5
2006	5	5	0.2	1
2007	15	4	0.25	3.75
2008	8	3	0.333333	2.666667
2009	9	2	0.5	4.5
2010	9	1	1	9
	226			**31.42628**

For the article year2011, $WR_{c2011}= \sum F_{c11} \times \frac{1}{Y_{a11} - Y_c}$ =31.42628

Total number of citation (N) =226 (where N = ($\sum F_{c11}$).

Average Weighted Recency of Citation (AWR_{c2011}) =WR_{c2011}/N=31.42628/226=0.1390



FOR THE YEAR 2011:

The following have been observed from the table and the graph:

1) The oldest cited year in 1897
2) Till the year 1968 starting from the 1897, the weighted recency is very low and from the graph it appears to be 0. The same observation for the year 1970, 1973-1974, 1976-1980, 1982-1983, 1985-1987, and 1989 also appear to be 0
3) 1969, 1971-1972, 1975,1981,1984,1988 and 1990 onwards the weighted recency appears to take nonzero values.
4) In 2002 and from 2005 onwards the weighted recency crosses the value 1
5) From the year 2007 to 2010 the weighted recency above 2

From the graph it is clear that weighted recency is significant (≥1) in 2002 from the year 2005 onwards. But it is not steadily increasing. The highest value of WR is 9 which is achieved in the year 2010 & the next highest WR is attained in the year 2009 and 2007. Thus we can say that the authors have collected more information from this period. This indicates that the topics on which the articles are written in the journal under consideration in the year 2011 are very much of recent interest. The following chart shows the tendency of seeking of information by the authors of 2011

Table-4: Showing recency of citation for the articles published in the year 2010
(**(**R_{c10}=Recency of Citations for 2010, Y_{a10}=Articles Year Y_c=Citation Year)

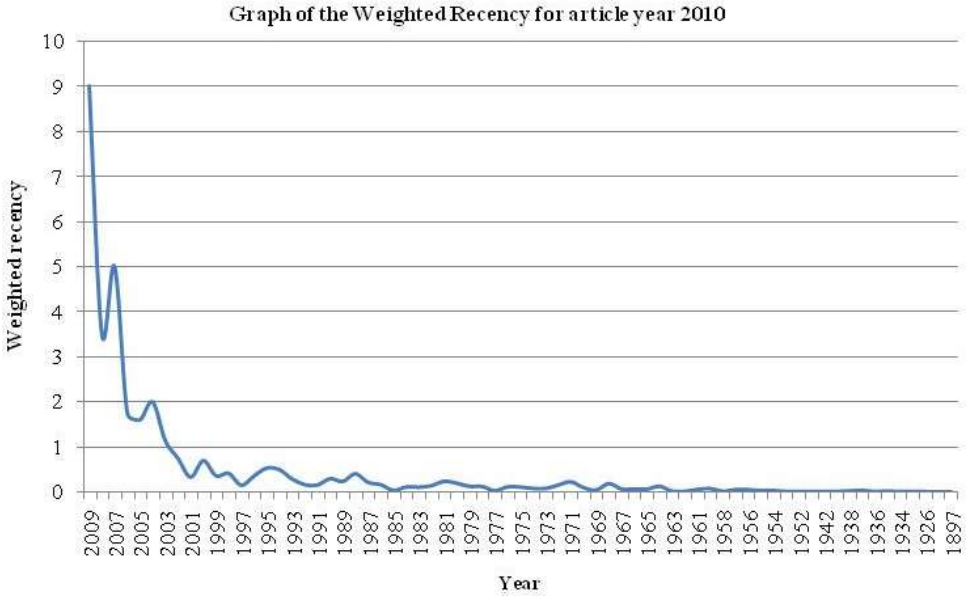
Y_c	F_{c10}	Y_{a10}-Y_c	$\frac{1}{Y_{a10}-Y_c}$	$F_{c10}\times\frac{1}{Y_{a10}-Y_c}$
1897	1	113	0.00885	0.00885
1903	1	107	0.009346	0.009346
1926	1	84	0.011905	0.011905
1933	1	77	0.012987	0.012987
1934	1	76	0.013158	0.013158
1935	2	75	0.013333	0.026667
1936	1	74	0.013514	0.013514
1937	3	73	0.013699	0.041096
1938	2	72	0.013889	0.027778
1939	1	71	0.014085	0.014085
1942	1	68	0.014706	0.014706
1951	1	59	0.016949	0.016949
1952	1	58	0.017241	0.017241
1953	1	57	0.017544	0.017544
1954	2	56	0.017857	0.035714
1955	2	55	0.018182	0.036364
1956	3	54	0.018519	0.055556
1957	3	53	0.018868	0.056604
1958	1	52	0.019231	0.019231
1960	4	50	0.02	0.08
1961	3	49	0.020408	0.061224
1962	1	48	0.020833	0.020833
1963	1	47	0.021277	0.021277
1964	6	46	0.021739	0.130435
1965	3	45	0.022222	0.066667
1966	3	44	0.022727	0.068182
1967	3	43	0.023256	0.069767
1968	8	42	0.02381	0.190476
1969	2	41	0.02439	0.04878
1970	4	40	0.025	0.1
1971	9	39	0.025641	0.230769
1972	6	38	0.026316	0.157895
1973	3	37	0.027027	0.081081
1974	3	36	0.027778	0.083333
1975	4	35	0.028571	0.114286

1976	4	34	0.029412	0.117647
1977	4	33	0.030303	0.121212
1978	4	32	0.03125	0.125
1979	4	31	0.032258	0.129032
1980	6	30	0.033333	0.2
1981	4	29	0.034483	0.137932
1982	4	28	0.035714	0.142857
1983	3	27	0.037037	0.111111
1984	3	26	0.038462	0.115385
1985	3	25	0.04	0.12
1986	4	24	0.041667	0.166667
1987	5	23	0.043478	0.217391
1988	7	22	0.045455	0.318185
1989	5	21	0.047619	0.238095
1990	6	20	0.05	0.3
1991	3	19	0.052632	0.157895
1992	3	18	0.055556	0.166667
1993	5	17	0.058824	0.294118
1994	8	16	0.0625	0.5
1995	8	15	0.066667	0.533333
1996	5	14	0.071429	0.357143
1997	2	13	0.076923	0.153846
1998	5	12	0.083333	0.416667
1999	4	11	0.090909	0.363636
2000	7	10	0.1	0.7
2001	3	9	0.111111	0.333333
2002	6	8	0.125	0.75
2003	8	7	0.142857	1.142857
2004	12	6	0.166667	2
2005	8	5	0.2	1.6
2006	7	4	0.25	1.75
2007	15	3	0.333333	5
2008	7	2	0.5	3.5
2009	9	1	1	9
	283			33.25431

For the article year2010, $WR_{c2010}=\sum F_{c10}\times\frac{1}{Y_{a10}-Y_c}$

Total no. of citation (N) =283 (where N= ($\sum F_{c10}$)

Average Weighted Recency of Citation=WR_{c2010}/N=33.25431/283=0.1175



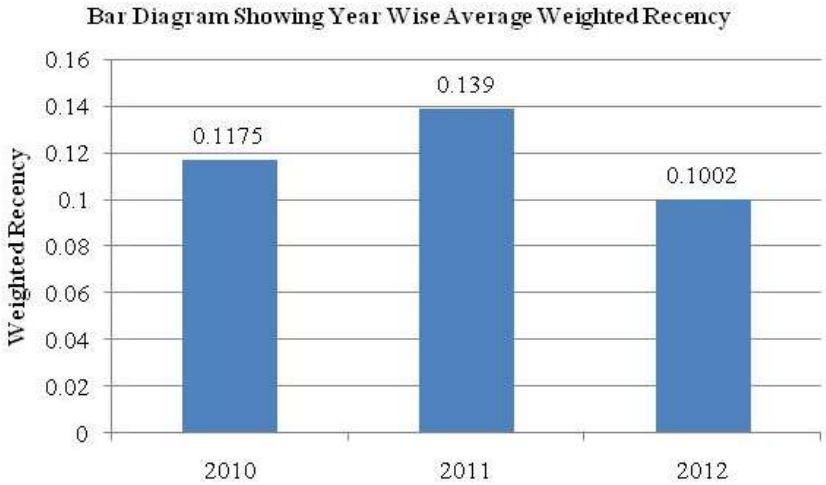
For the year2010:

The following have been observed from the table and the graph:
1) The oldest cited year is 1897
2)Till the year 1963 starting from the year 1897, the weighted recency is very low and from the graph it appears to be 0.The same observation for the year 1965-1967, 1969, 1973-1974 also weighted recency appears to be 0
3)1964, 1968, 1970-1972, and the year 1975 onwards the weighted recency appears to take nonzero values.

From the year 2003 onwards the weighted recency crosses the value 1
The highest value of weighted recency is 9, achieved in the year 2009 & the next highest WR is attained during 2007-2008. Thus we can say that the authors have collected large number of information from that period. The graph demonstrates the propensity of seeking of information by the researchers of 2010.

Table-5: Year wise total citation and average weighted recency

Year	No. of Citations(N)	WR_{cy}	AWR_{cy}
2010	283	33.25431	0.1175
2011	226	31.42628	0.1390
2012	414	41.46408	0.1002



The above diagram gives a comparative picture of average weighted recency for the 3 years (2010, 2011 &2012)
Total number of citations (N) is more in 2012 than other two years. As total weighted recency (WRcy) is directly dependent on N, the average weighted recency (AWRcy) is the best tool to compare year wise recency of citation. Average Weighted Recency is high in 2011 which means the citations of the articles published in

2011 are of more recent origin than those of other two years.

CONCLUDING REMARK:

Citation analysis covers many aspects of the citing and cited items. The present study has covered one of the aspects of it namely recency. Recency can be viewed as an indicator to project:

1) Information seeking behaviour of researchers.
2) Availability and accessibility of the used documents.
3) Nature of the discipline.
4) Currentness of the subjects/topics on which articles are written.

One can make similar studies to foresee some more new things from citation pattern in different journals.

There is a scope to make recency index by taking all the recency point of the published articles in a journal. This recency index will be useful to measure recency of articles, year-wise impact of an article, comparison among articles, author's impact in recency or authors rank and so on. Recency index of all journals on a particular subject can also be used for alternative journal ranking.

ACKNOWLEDGEMENT:

The author is grateful to Prof. S. K. Chatterjee of the Department of Library and Information Science, Jadavpur University for active guidance and constant encouragement throughout the preparation of the paper.

REFERENCES:

[1] Algebra and Discrete Mathematics. Vol.9 (NO.1, NO.2) and Vol.10 (NO.1, NO.2) 2010
[2] Algebra and Discrete Mathematics. Vol.11 (NO.1, NO.2) and Vol.12 (No.1, No.2) 2011.
[3] Algebra and Discrete Mathematics. Vol.13 (NO.1, NO.2) and Vol.14 (No.1, No.2) 2012.
[4] Bandopadhya, A. K. (1996). Citation analysis of doctoral dissertations in mathematics using dbase III+. Annals of Library Science and Documentation, 43(3): 81-107
[5] Cole, F. J. and Eales, N. B. (1917). The History of comparative anatomy. Science Progress, 11 : 578-596
[6] Cozzens, S. E. (1985). Comparing the sciences: citation context analysis of papers from neuropharmacology and the sociology of science. Social studies of Science, 15(1):127-153
[7] Cronin, B. (1981). The Need for a theory of citing. Journal of Documentation, 37:16-24
[8] Czechoslovak Journal of Physics B 36 (1) 1986
[9] Egghe, L. and Rousseau, R. (1990). Introduction to informetrics. Amsterdam: Elservier.
[10] Farthorne, R. A. (1969). Empirical hyperbolic distributions (Bradford-Zipf-manelbrot) for bibliometric description and prediction. Journal of Documentation, 25(4): 319-343.
[11] Garfied, E. (1979). Citation indexing: Its Theory and application in science, technology and humanities. New York: Wiley
[12] Gross, P. L. K. and Gross, E.M. (1927). College libraries and chemical education. Science, 66:385-389.
[13] Gupta, S.P. (1997). Statistical methods .New Delhi: Sultan Chand & Sons.
[14] Hjerppe, R. (1980). An outline of bibliometrics and citation analysis: Stockholm papers in library and information science. Stockholm: The Royal Institute of Technology Library.
[15] Hjerppe, R. (1980). A Bibliography of bibliometrics and citation indexing and analysis: Stockholm papers in library and information science. Stockholm: The Royal Institute of Technology Library.
[16] Hulme, F. W. (1923). Statistical bibliography in relation to the growth of modern civilization. London: Grafton.
[17] Khan, Swapan.(2012). A Study of recency of cited items appended in the articles published in Journal of Documentation .Librarian, 19:88-96.
[18] Lawani, S. M. (1981). Bibliometrics: its theoretical foundations, methods and applications. Libri, 31 :294-315
[19] Lotka, A. J. (1926). The Frequency distribution of scientific productivity. Journal of Washington Academy of Science,16: 317-323
[20] Mahapatra, Gayatri.(2009). Bibliometric studies in internet era. New Delhi: Indiana Publishing House.
[21] Narin, F. and Moll, J. K. (1977). Bibliometrics. ARIST, 12 : 35-58
[22] Nicholas, D. and Ritchie, M. (1978). Literature on bibliometrics. London: Clive Bingley.
[23] Peritz, B. C. (1988). Bibliometrics literature: a quantitative analysis. *In* Egghe, L and Rousseau, R, *Eds*. Informetrics 87/88, Amsterdam: Elsevier Science Publishers. pp. 165-173

[24] Pillai Rajan, C. V. and Pillai Sudhier, K. G. (2007). Citations in the physics doctoral dissertations of Indian Institute of Science: an obsolescence study. IASLIC Bulletin , 52(3):168-179
[25] Pritchard, Alan. (1969). Statistical bibliography or bibliometrics. Journal of documentation, 24:348-349
[26] Pritchard, Alan. and Wittig, G. R. (1981). Bibliometrics: a bibliography and index, vol.1:1874-1959. Watford: ALLM Books.
[27] Ravichandra Rao, I. K. (1983). Quantitative methods for library and information science. New Delhi: Wiley-Eastern.
[28] Sehgal, R.L. (1998). Statistical techniques for librarians. New Delhi: Ess Ess Publications ,pp.1-410
[29] Sengupta, I. N. (1988). Bibliometrics Research; growth of biomedical literature.vol.1.Kolkata: SBA Publications.
[30] Sen, S. K. and Chatterjee, S. K. (1990). An introduction to research in bibliometrics. IASLIC Bulletin, 35(3):105-117.
[31] Simpson, I.S. (1988). Basic statistics for librarians. London: Library Association Publishing , pp.1-242
[32] Singh, S. P. (2004). Styles of bibliographical citation. Journal of Library and Information Science, 29(1-2): 94-108
[33] Small, H.G. (1978). Cited documents as concept symbols. Social Studies of Science ,8(3): 327-340
[34] Todorov, R .and Glanzel, W. (1988). Journal citation measures: a concise review. Journal of Information Science, 14: 47-56
[35] Verma, M and Thukar, K. (2010). Citation analysis of doctoral dissertation in botany submitted to Pt. Ravishankar Shukla University. IASLIC Bulletin, 55(3): 176-181
