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Webometric Analysis of Management Institutes: A Case Study in West Bengal

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Abstract

An attempt has been made to find out the overall web ranking of all the All India Council for Technical Education (AICTE) approved management schools including the National Management Schools in West Bengal for the analysis of the link, rich files and scholars. Data which were collected through the web, Majestic SEO -a third party readymade software have been used to identify and measure inlinks and external links. For the webometric study it can be said that although webometric study have some limitations (such as commercial search engines are not valid for a foundation for qualitative webometric analysis), it is very useful in link analysis as well as to find out the overall web ranking of the institutes which is having their own domain. Based on the observations suitable suggestions have been proposed.

1 Introduction

The concept of ranking system for higher academic institutions has been grown up especially after 1990s due to the impact of globalization on higher education. The global ranking of higher educational institutions especially colleges, research institutes or university systems is a mammoth task. Besides, there exists no universally accepted methodology to be followed while ranking the universities or institutes. Previously, bibliometric indicators (like counting citations, number of published articles, and score of impact factor) and other related factors (student-teacher ratio, number of awards received, etc.) were used to be utilized to rank the universities or institutions or persons based on their achievements.

But, with the tremendous advancement in transformation of print media to digital media and the popularity of Internet paved way to generate the new methodologies for ranking universities or institutes. Some major international initiatives on ranking the colleges and universities are: (a) Academic Ranking of World Universities (ARWU), Shanghai; (b) Center for College Affordability & Productivity, USA; (c) Global Universities Ranking, Russia; (d) Macleans, Canada; (e) Ranking

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Forum of Swiss Universities; (f) Ranking Web of World Universities (RWWU) by Cybermetrics Lab (www.webometrics.info); (g) Times Higher Education (THE) Ranking etc.

Now-a-days, ranking based on website analysis or statistics is getting more and more popular because of reduced time involvement and easy access to data. Webometrics describes quantitatively and analyses statistically the organization, storage, distribution of information using mathematical and statistical techniques. Webometrics was triggered by the assumption that the web is an enormous document repository with many of these documents being academic. Moreover, the web has its own citation indexes in the form of commercial search engines can also deliver their results automatically to investigators' computer programs, allowing large-scale investigations. One of the most visible outputs of webometrics is the ranking of world universities based upon their web sites and online impact.

Webometrics includes link analysis, web citation analysis, search engine evaluation and purely descriptive studies of the web. These are reviewed hereafter, in addition to one recent application, e.g. : the analysis of the Web 2.0 phenomena. It is to be noted that there exists some research on developing web-based metrics for web sites to evaluate various aspects of their construction, such as usability and information content. According to Almind and Ingwersen(1997),"the study of web-based content with primarily quantitative methods for social science research goals using techniques that are not specific to one field of study". According to Björneborn and Ingwersen (2004), webometrics is "the study of quantitative aspects of the construction and use of information resources structure and technologies on the web drawing on Bibliometric and Informetric approaches". According to Thelwall, M. (2009)," webometrics is (a) a set of quantitative techniques for tracking and evaluating the impact of web sites and online ideas and (b) the information science research field that developed these ideas. Webometric techniques include link analysis, web mention analysis, blog analysis and search engine evaluation, but from the perspective of digital library evaluation the main method is link analysis."

1 Objectives

1. To find out the top ranking management institutes in West Bengal.
2. To rank management institutes/ universities/ colleges using WIF-inlinks.
3. To rank management institutes /universities/ colleges using Webometric Ranking.

3 Review of Related Literature

Peter Ingwersen investigates the results and meaningfulness of applying the *Social Science Citation Index* (SSCI, ISI, USA) to publication and citation studies of nine selected Social Science research areas in Scandinavia by analysing the international visibility, the research profiles, and relative citation impact (Ingwersen, 2010).

Gaby Haddow and Paul Genoni analyse citations for Australian social science journals to determine the differences between data drawn from Web of Science and Scopus. They suggest that the Scopus database provides higher number of citations for more of the journals. (Haddow and Genoni, 2010).

A.J. Nederhof and E. Van Wijk developed a method to identify and map the internationally most visible research topics occurring in the social and behavioral sciences, as well as the topics which changed most over a decade. They compared two periods: 1981–1985 and 1986–1990 (Nederhof and Wijk, 1997).

Amara, Nabil and Réjean Landry examine the research outputs of scholars in business schools and shows how their performance assessment is significantly affected when using data extracted either from the Thomson ISI Web of Science (*WoS*) or from Google Scholar (*GS*)(Nabil& Landry, 2012).

J. E. Hirsch proposes the index *h*, defined as the number of papers with citation number =*h*, as a useful index to characterize the scientific output of a researcher (Hirsch, 2005).

Liv Danman Fugl defines the most important rules in his thesis entitled" Fundamental methodologies and tools for the employment of webometric analyses" to keep in mind before performing webomertic analyses. (Fugl, 2001).

4 Methodology

4.1 Scope and Coverage

All the All India Council for Technical Education (AICTE) approved management schools including the National Management Schools in West Bengal have been covered for the analysis of the links, rich files and scholars to find out the overall web ranking. For webometric analysis the data were collected during October-December, 2013. All the management institutes of West Bengal have been considered for the purpose of ranking using webometric indicators (Vide table: 1).

1	ABS Academy of Science,Technology & Management	Durgapur	absacademy.com
2	Advanced College of Management	Kakinara	acmkolkata.org
3	Apex Management Institute	Kolkata	apexindia.org
4	Army Institute of Management	Kolkata	aim.ac.in
5	Aryabhatta Institute of Engineering and Management	Durgapur	aiemd.org
6	Bengal College of Engineering & Technology	Durgapur	bcetdgp.ac.in

7	Budge Budge Institute of Technology	Kolkata	bbit.edu.in
8	Calcutta Business School	Bisnhupur, 24pgs (S)	calcuttabusinessschool.org
9	Calcutta Institute of Engineering and Management	Kolkata	iemcal.com
10	Calcutta Institute of Technology	Kolkata	ciemcal.org
11	Department of Business Administration, The University of Burdwan	Burdwan	buruniv.ac.in
12	Department of Business Administration, University of Kalyani	Nodia	klyuniv.ac.in
13	Department of Business Management, University of Calcutta	Kolkata	bmcaluniv.org
14	Department of Management Studies, National Institute of Technology	Durgapur	nitdgp.ac.in
15	Dr. B.C. Roy Engineering College, Durgapur	Durgapur	bcrec.net.in
16	Durgapur Society of Management Science	Durgapur	dsmsindia.com
17	Future Business School	Kolkata	teamfuture.in
18	Future Institute of Engineering and Management	Kolkata	teamfuture.in
19	George College (Department of Management Studies)	Kolkata	georgecollege.org
20	Globsyn Business School	Kolkata	globsyn.edu.in
21	Goenka College of Commerce and Business Administration	Kolkata	goenkacollege.net
22	Gurunanak Institute of Technology	Kolkata	gnit.ac.in
23	Haldia Institute of Technology	Midnapur (E)	hit-haldia.net
24	ILEAD: Institute of Leadership, Entrepreneurship & Development	Kolkata	ilead.net.in
25	IMS Business School	Kolkata	imscal.org
26	Indian Institute of Management, Kolkata	Joka	iimcal.ac.in
27	Indian Institute of Social Welfare and Business Management	Kolkata	iiswbm.edu
28	Indian Institute of Technology, Kharagpur	Midnapur (W)	iitkgp.ernet.in/vgsom

29	Institute of Business Management	Kolkata	ibmnce.in
30	Institute of Business Management and Research	Kolkata	ibmrcal.org
31	Institute of Engineering & Management	Kolkata	iem.edu.in
32	International Institute of Management Sciences	Kolkata	iims-intledu.com
33	JIS College of Engineering	Kolkata	jisgroup.org
34	Jyotirmoy School of Business	Kolkata	jsb.org.in
35	Management Education Centre, Heritage Institute of Technology	Kolkata	hbs.edu.in
36	Management Institute of Durgapur	Durgapur	dims.ac.in
37	Meghnad Saha Institute of Technology	Kolkata	msitcollege.org
38	Netaji Subhash Engineering College	Kolkata	nsecollege.org
39	NSHM College of Management & Technology,Kolkata	Kolkata	nshm.com
40	Pailan College of Management & Technology (MBA Division)	Kolkata	pcmt-india.net
41	Regent Education & Research Foundation Group of Institutions	Kolkata	rerf.in
42	Sabita Devi Education Trust - Brainware Group of Institutions	Kolkata	brainwaretechnologies.org
43	School of Management Sciences, Bengal Engg and Science University	Howrah	becs.ac.in
44	Seacom Engineering College	Kolkata	seacomengineering.org
45	Siliguri Institute of Technology	Siliguri	iias.org.in
46	St. Mary's Technical Campus Kolkata	Kolkata	stmarystechcampus.org
47	St. Xaviers College	Kolkata	sxccal.edu
48	Supreme Knowledge Foundation Group of Institutions	Hoogly	skf.edu.in
49	Swami Vivekananda Institute of Science & Technology	Kolkata	svist.org
50	Techno India	Kolkata	technoindiagroup.com
51	The International Institute of Business Studies	Kolkata	iibsonline.com
52	University of Calcutta, Department of Commerce	Kolkata	caluniv.ac.in

4.2 Selection of Search Engines

Selection of search engines plays a vital role in webometric research. Commercial search engines like AltaVista, Yahoo!, Google and All The Web are usually used for collecting data in webometric research but recently most of the commercial search engines are not supporting the webometric research. Search engine 'Google' has been chosen to collect data on 'Number of webpages' and 'Rich Files'. Rich file consists of predominantly used four file types (.pdf, .doc, .docx and ppt). For collecting rich files, Google search engines have been used. The data have been collected during September-December, 2013. The syntax site: asci.org.in filetype:pdf is used to collect data. On the other hand, Google Scholar is used to collect data on scholar value. Search engines SEO tools like majestic SEO or ahref may be used to collect data on inlinks. In our study, inlinks i.e. external backlinks are collected using majestic SEO tool (www.majesticseo.com). On submission of domain name in the query box, data on external inlinks are obtained.

4.3 Choice of Indicators

Four indicators i.e Size (webpage), Visibility (inlinks), Rich Files and Scholar (Google scholar) as used in Ranking Web of Business Schools (http://business-schools.webometrics.info/) are used in the present study to rank management institutes in India.

Table 2—Indicators used

S.N	Indicators	Symbols	Descriptions	Weights
1.	Size	S	Total number of web pages indexed by search engines	40
2.	Visibility	V	Total number of inlinks indexed by search engines	50
3.	Rich Files	R	Total number of rich files comprising of .doc, .pdf, .ps, .ppt	5
4.	Scholar	Sc	Number of publications retrieved from Google Scholar for articles and patents	5
Total				**100**

4.4 Data Collection

The current study retrieves data on size and rich files during September-December, 2013 using Google search engine. Data on Rich Files **(.**pdf, .doc, .docx, and .ppt) were collected with the help of query like *site: caluniv.ac.in filetype:doc* (file type .doc and domain name for University of Calcutta).

In order to retrieve data from Google Scholar (*scholar.google.com),* university name were used in the exact query expression to get the precise results for each university under study. In the

study, Google scholar is being used to retrieve the institutions' publications data, which include articles and patents for all the period.

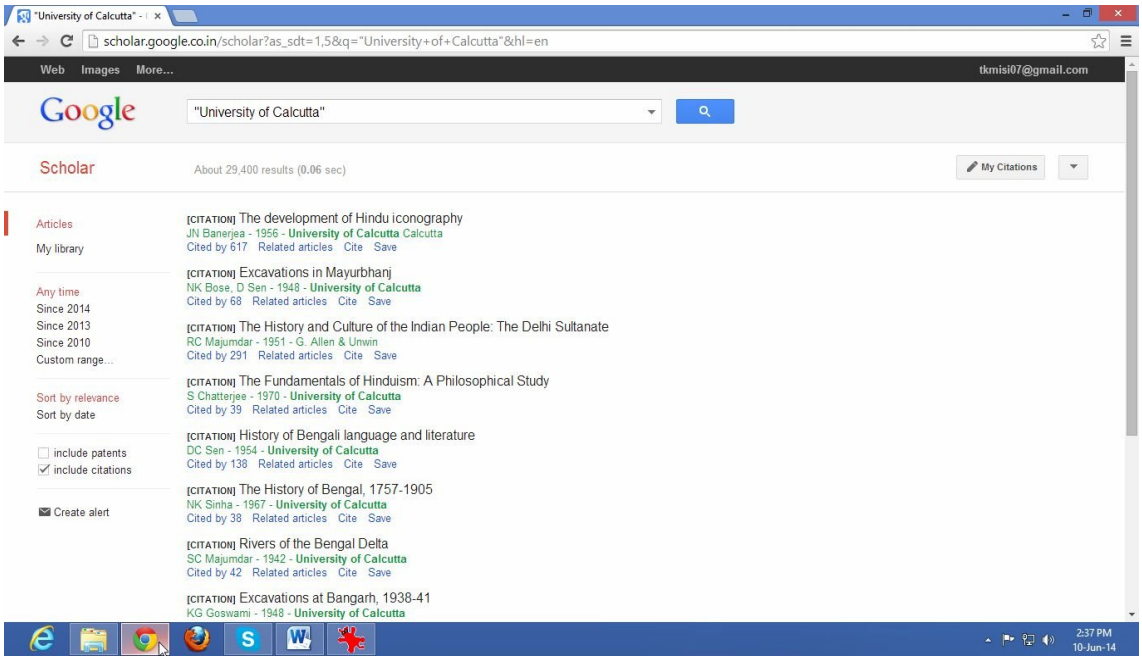

Figure 1: Search interface of Google Scholar

The most important indicator in webometric ranking is visibility, which may be determined through number of external backlinks or inlinks. The domain name may be entered in the query of following interface.

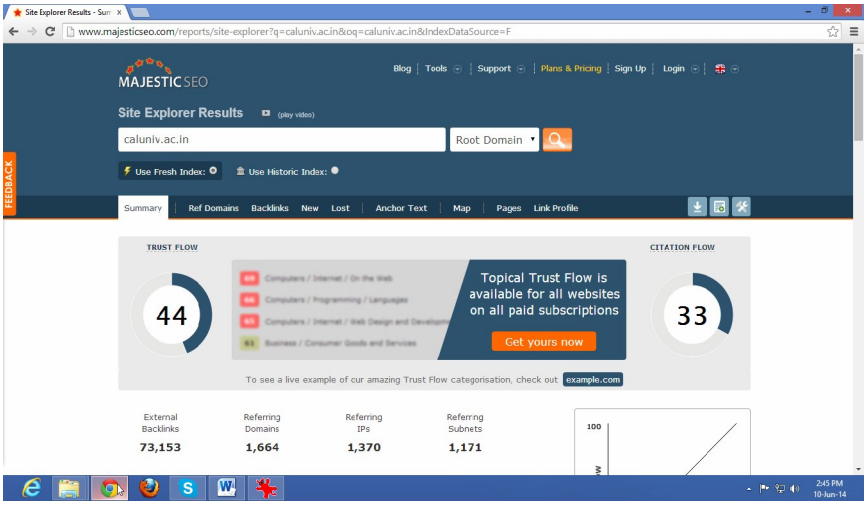

Figure 2: Search interface of Majestic SEO

4.5 Ranking Criteria and Weights

The success and popularity of any ranking method is based on right combination of indicators. Ranking of all the management institutes is made based on four indicators: size (40%), visibility (50%), rich files (5%) and scholar (5%). Methodology along with indicators with corresponding weights are followed as in Ranking Web of Business School (http://business-schools.webometrics.info/en/Methodology).

4.6 Scoring Procedure

The data for each institute as extracted through search engine is being plotted in the excel sheet; called master table (annex-I) against above mentioned 4 indicators. In order to normalize the data, all the institutes are arranged in descending order of magnitudes one by one using each indicators and assigned ranks to them.

Finally, the index score for each university/institute is calculated by multiplying the values of each variable (rank obtained by each indicator) with its corresponding weight using formula (2) as mentioned below.

Here, the webometric ranking function is described as follows:

$$WR = f(S, V, R, Sc, C, Wg, Ug, P, H, Pr) \quad \ldots\ldots(1)$$

For calculation,

$$\text{Value for } WR = (40\% * S + 50\% * V + 5\% * R + 5\% * Sc) \quad \ldots\ldots(2)$$

After obtaining final score using the above formula, institutes or universities are arranged in ascending order of magnitude to obtain the final rank against each universities/institutes.

5 Results and Discussion

Table 2: Institutes are arranged based on number of webpages

1	School of Management Sciences, Bengal Engg and Science University	Howrah	becs.ac.in	142097
2	University of Calcutta, Department of Commerce	Kolkata	caluniv.ac.in	19031
3	Indian Institute of Management,Kolkata	Joka	iimcal.ac.in	14668
4	Department of Business Administration, The University of Burdwan	Burdwan	buruniv.ac.in	11340
5	Apex Management Institute	Kolkata	apexindia.org	8621
6	Department of Management Studies, National Institute of Technology	Durgapur	nitdgp.ac.in	7127

7	Indian Institute of Technology, Kharagpur	Midnapur (W)	iitkgp.ernet.in/vgsom	6795
8	Institute of Engineering & Management	Kolkata	iem.edu.in	3312
9	St. Xaviers College	Kolkata	sxccal.edu	2695
10	Advanced College of Management	Kakinara	acmkolkata.org	1340
11	Department of Business Administration, University of Kalyani	Nodia	klyuniv.ac.in	1340
12	NSHM College of Management & Technology,Kolkata	Kolkata	nshm.com	1278
13	Sabita Devi Education Trust - Brainware Group of Institutions	Kolkata	brainwaretechnologies.org	1056
14	ILEAD: Institute of Leadership, Entrepreneurship & Development	Kolkata	ilead.net.in	1054
15	Bengal College of Engineering & Technology	Durgapur	bcetdgp.ac.in	673
16	Swami Vivekananda Institute of Science & Technology	Kolkata	svist.org	648
17	Calcutta Business School	Bisnhupur, 24pgs (S)	calcuttabusinessschool.org	645
18	Jyotirmoy School of Business	Kolkata	jsb.org.in	596
19	Regent Education & Research Foundation Group of Institutions	Kolkata	rerf.in	577
20	Institute of Business Management	Kolkata	ibmnce.in	536
21	Indian Institute of Social Welfare and Business Management	Kolkata	iiswbm.edu	489
22	Gurunanak Institute of Technology	Kolkata	gnit.ac.in	455
23	Aryabhatta Institute of Engineering and Management	Durgapur	aiemd.org	440
24	Future Business School	Kolkata	teamfuture.in	404
25	Future Institute of Engineering and Management	Kolkata	teamfuture.in	404
26	The International Institute of Business Studies	Kolkata	iibsonline.com	376
27	Supreme Knowledge Foundation Group of Institutions	Hoogly	skf.edu.in	367
28	Pailan College of Management & Technology (Mba Division)	Kolkata	pcmt-india.net	358
29	Siliguri Institute of Technology	Siliguri	iias.org.in	344
30	Haldia Institute of Technology	Midnapur (E)	hit-haldia.net	336
31	Calcutta Institute of Engineering and Management	Kolkata	iemcal.com	332

32	Budge Budge Institute of Technology	Kolkata	bbit.edu.in	257
33	Army Institute of Management	Kolkata	aim.ac.in	235
34	Department of Business Management, University of Calcutta	Kolkata	bmcaluniv.org	192
35	JIS College of Engineering	Kolkata	jisgroup.org	189
36	George College (Department of Management Studies)	Kolkata	georgecollege.org	158
37	Management Education Centre, Heritage Institute of Technology	Kolkata	hbs.edu.in	154
38	Goenka College of Commerce and Business Administration	Kolkata	goenkacollege.net	150
39	International Institute of Management Sciences	Kolkata	iims-intledu.com	131
40	Techno India	Kolkata	technoindiagroup.com	124
41	Seacom Engineering College	Kolkata	seacomengineering.org	122
42	ABSAcademy of Science,Technology & Management	Durgapur	absacademy.com	97
43	Management Institute of Durgapur	Durgapur	dims.ac.in	96
44	Globsyn Business School	Kolkata	globsyn.edu.in	95
45	Dr. B.C. Roy Engineering College, Durgapur	Durgapur	bcrec.net.in	79
46	Meghnad Saha Institute of Technology	Kolkata	msitcollege.org	71
47	Netaji Subhash Engineering College	Kolkata	nsecollege.org	70
48	IMS Business School	Kolkata	imscal.org	55
49	Durgapur Society of Management Science	Durgapur	dsmsindia.com	37
50	Calcutta Institute of Technology	Kolkata	ciemcal.org	22
51	St. Mary's Technical Campus Kolkata	Kolkata	stmarystechcampus.org	6
52	Institute of Business Management and Research	Kolkata	ibmrcal.org	1

Table 3: Institutes are arranged based on number of inlinks

Sl no	Institute	City	Domain	inlinks (V)
1	Indian Institute of Management,Kolkata	Joka	iimcal.ac.in	79972
2	University of Calcutta, Department of Commerce	Kolkata	caluniv.ac.in	79572
3	JIS College of Engineering	Kolkata	jisgroup.org	43765
4	Department of Management Studies, National Institute of Technology	Durgapur	nitdgp.ac.in	41471
5	Indian Institute of Technology, Kharagpur	Midnapur (W)	iitkgp.ernet.in/vgsom	28189

6	The International Institute of Business Studies	Kolkata	iibsonline.com	27935
7	Department of Business Administration, The University of Burdwan	Burdwan	buruniv.ac.in	18586
8	School of Management Sciences, Bengal Engg and Science University	Howrah	becs.ac.in	14088
9	St. Xaviers College	Kolkata	sxccal.edu	8674
10	Advanced College of Management	Kakinara	acmkolkata.org	5327
11	Department of Business Administration, University of Kalyani	Nodia	klyuniv.ac.in	5327
12	Calcutta Institute of Engineering and Management	Kolkata	iemcal.com	4643
13	Globsyn Business School	Kolkata	globsyn.edu.in	3286
14	Techno India	Kolkata	technoindiagroup.com	2825
15	Army Institute of Management	Kolkata	aim.ac.in	2805
16	ILEAD: Institute of Leadership, Entrepreneurship & Development	Kolkata	ilead.net.in	2609
17	NSHM College of Management & Technology,Kolkata	Kolkata	nshm.com	2604
18	Indian Institute of Social Welfare and Business Management	Kolkata	iiswbm.edu	2495
19	Aryabhatta Institute of Engineering and Management	Durgapur	aiemd.org	2162
20	Gurunanak Institute of Technology	Kolkata	gnit.ac.in	2024
21	Jyotirmoy School of Business	Kolkata	jsb.org.in	1944
22	Institute of Engineering & Management	Kolkata	iem.edu.in	1847
23	Calcutta Business School	Bisnhupur, 24pgs (S)	calcuttabusinessschool.org	1830
24	Calcutta Institute of Technology	Kolkata	ciemcal.org	1795
25	Siliguri Institute of Technology	Siliguri	iias.org.in	1183
26	Sabita Devi Education Trust - Brainware Group of Institutions	Kolkata	brainwaretechnologies.org	1075
27	Budge Budge Institute of Technology	Kolkata	bbit.edu.in	750
28	Durgapur Society of Management Science	Durgapur	dsmsindia.com	639
29	Bengal College of Engineering & Technology	Durgapur	bcetdgp.ac.in	549
30	Apex Management Institute	Kolkata	apexindia.org	546
31	George College (Department of Management Studies)	Kolkata	georgecollege.org	361
32	Department of Business Management, University of Calcutta	Kolkata	bmcaluniv.org	295

33	Goenka College of Commerce and Business Administration	Kolkata	goenkacollege.net	295
34	Institute of Business Management	Kolkata	ibmnce.in	273
35	Supreme Knowledge Foundation Group of Institutions	Hoogly	skf.edu.in	187
36	Pailan College of Management & Technology (MBA Division)	Kolkata	pcmt-india.net	183
37	Swami Vivekananda Institute of Science & Technology	Kolkata	svist.org	180
38	Meghnad Saha Institute of Technology	Kolkata	msitcollege.org	166
39	Future Business School	Kolkata	teamfuture.in	140
40	Future Institute of Engineering and Management	Kolkata	teamfuture.in	140
41	IMS Business School	Kolkata	imscal.org	138
42	Haldia Institute of Technology	Midnapur (E)	hit-haldia.net	131
43	Netaji Subhash Engineering College	Kolkata	nsecollege.org	104
44	Management Institute of Durgapur	Durgapur	dims.ac.in	70
45	Seacom Engineering College	Kolkata	seacomengineering.org	65
46	ABSAcademy of Science,Technology & Management	Durgapur	absacademy.com	59
47	Dr. B.C. Roy Engineering College, Durgapur	Durgapur	bcrec.net.in	57
48	Institute of Business Management and Research	Kolkata	ibmrcal.org	54
49	International Institute of Management Sciences	Kolkata	iims-intledu.com	37
50	St. Mary's Technical Campus Kolkata	Kolkata	stmarystechcampus.org	25
51	Management Education Centre, Heritage Institute of Technology	Kolkata	hbs.edu.in	14
52	Regent Education & Research Foundation Group of Institutions	Kolkata	rerf.in	13

Table 4: Institutes are arranged based on number of WIF_R

Sl no	Institute	City	Domain	webpage (S)	inlinks (V)	WIF
1	JIS College of Engineering	Kolkata	jisgroup.org	189	43765	231.6
2	Calcutta Institute of Technology	Kolkata	ciemcal.org	22	1795	81.6
3	The International Institute of Business Studies	Kolkata	iibsonline.com	376	27935	74.3
4	Institute of Business Management and Research	Kolkata	ibmrcal.org	1	54	54.0
5	Globsyn Business School	Kolkata	globsyn.edu.in	95	3286	34.6
6	Techno India	Kolkata	technoindiagroup.com	124	2825	22.8
7	Durgapur Society of Management Science	Durgapur	dsmsindia.com	37	639	17.3
8	Calcutta Institute of Engineering and Management	Kolkata	iemcal.com	332	4643	14.0
9	Army Institute of Management	Kolkata	aim.ac.in	235	2805	11.9
10	Department of Management Studies, National Institute of Technology	Durgapur	nitdgp.ac.in	7127	41471	5.8
11	Indian Institute of Management,Kolkata	Joka	iimcal.ac.in	14668	79972	5.5
12	Indian Institute of Social Welfare and Business Management	Kolkata	iiswbm.edu	489	2495	5.1
13	Aryabhatta Institute of Engineering and Management	Durgapur	aiemd.org	440	2162	4.9
14	Gurunanak Institute of Technology	Kolkata	gnit.ac.in	455	2024	4.4
15	University of Calcutta, Department of Commerce	Kolkata	caluniv.ac.in	19031	79572	4.2
16	St. Mary's Technical Campus Kolkata	Kolkata	stmarystechcampus.org	6	25	4.2
17	Indian Institute of Technology, Kharagpur-721 302	Midnapur (W)	iitkgp.ernet.in/vgsom	6795	28189	4.1
18	Advanced College of Management	Kakinara	acmkolkata.org	1340	5327	4.0
19	Department of Business Administration, University of Kalyani	Nodia	klyuniv.ac.in	1340	5327	4.0
20	Siliguri Institute of Technology	Siliguri	iias.org.in	344	1183	3.4
21	Jyotirmoy School of Business	Kolkata	jsb.org.in	596	1944	3.3
22	St. Xaviers College	Kolkata	sxccal.edu	2695	8674	3.2
23	Budge Budge Institute of Technology	Kolkata	bbit.edu.in	257	750	2.9

24	Calcutta Business School	Bisnhupur, 24pgs (S)	calcuttabusinessschool.org	645	1830	2.8
25	Ims Business School	Kolkata	imscal.org	55	138	2.5
26	ILEAD: Institute of Leadership, Entrepreneurship & Development	Kolkata	ilead.net.in	1054	2609	2.5
27	Meghnad Saha Institute of Technology	Kolkata	msitcollege.org	71	166	2.3
28	George College (Department of Management Studies)	Kolkata	georgecollege.org	158	361	2.3
29	NSHM College of Management & Technology,Kolkata	Kolkata	nshm.com	1278	2604	2.0
30	Goenka College of Commerce and Business Administration	Kolkata	goenkacollege.net	150	295	2.0
31	Department of Business Administration, The University of Burdwan	Burdwan	buruniv.ac.in	11340	18586	1.6
32	Department of Business Management, University of Calcutta	Kolkata	bmcaluniv.org	192	295	1.5
33	Netaji Subhash Engineering College	Kolkata	nsecollege.org	70	104	1.5
34	Sabita Devi Education Trust - Brainware Group of Institutions	Kolkata	brainwaretechnologies.org	1056	1075	1.0
35	Bengal College of Engineering & Technology	Durgapur	bcetdgp.ac.in	673	549	0.8
36	Management Institute of Durgapur	Durgapur	dims.ac.in	96	70	0.7
37	Dr. B.C. Roy Engineering College, Durgapur	Durgapur	bcrec.net.in	79	57	0.7
38	ABS Academy of Science, Technology & Management	Durgapur	absacademy.com	97	59	0.6
39	Institute of Engineering & Management	Kolkata	iem.edu.in	3312	1847	0.6
40	Seacom Engineering College	Kolkata	seacomengineering.org	122	65	0.5
41	Pailan College of Management & Technology (MBA Division)	Kolkata	pcmt-india.net	358	183	0.5
42	Supreme Knowledge Foundation Group of Institutions	Hoogly	skf.edu.in	367	187	0.5
43	Institute of Business Management	Kolkata	ibmnce.in	536	273	0.5
44	Haldia Institute of Technology	Midnapur (E)	hit-haldia.net	336	131	0.4
45	Future Business School	Kolkata	teamfuture.in	404	140	0.3
46	Future Institute of Engineering and Management	Kolkata	teamfuture.in	404	140	0.3

47	International Institute of Management Sciences	Kolkata	iims-intledu.com	131	37	0.3
48	Swami Vivekananda Institute of Science & Technology	Kolkata	svist.org	648	180	0.3
49	School of Management Sciences, Bengal Engg and Science University	Howrah	becs.ac.in	142097	14088	0.1
50	Management Education Centre, Heritage Institute of Technology	Kolkata	hbs.edu.in	154	14	0.1
51	Apex Management Institute	Kolkata	apexindia.org	8621	546	0.1
52	Regent Education & Research Foundation Group of Institutions	Kolkata	rerf.in	577	13	0.0

Ranking the institutes based on WIF may not be the good indicators because the overall results are highly influenced by either high value of webpages or low value of inlinks.

6 Overall Ranking

Following table reflects the ranking of the institutes using the methodology adopted by Ranking Web of Business Schools (http://business-schools.webometrics.info/)

Table 5: Overall Ranking of the Management Institutes

Rank	Institute	City	Domain	Rank Score
1	Indian Institute of Management,Kolkata	Kolkata	iimcal.ac.in	3.0
2	University of Calcutta, Department of Commerce	Kolkata	caluniv.ac.in	4.4
3	School of Management Sciences, Bengal Engg and Science University	Howrah	becs.ac.in	4.9
4	Department of Management Studies, National Institute of Technology	Durgapur	nitdgp.ac.in	5.4
5	Department of Business Administration, The University of Burdwan	Burdwan	buruniv.ac.in	6.2
6	St. Xaviers College	Kolkata	sxccal.edu	9.2
7	Indian Institute of Technology, Kharagpur	Midnapur (W)	iitkgp.ernet.in/vgsom	9.3
8	Department of Business Administration, University of Kalyani	Nodia	klyuniv.ac.in	9.9
9	Advanced College of Management	Kakinara	acmkolkata.org	15.0
10	NSHM College of Management & Technology, Kolkata	Kolkata	nshm.com	17.1

11	JIS College of Engineering	Kolkata	jisgroup.org	17.8
12	Institute of Engineering & Management	Kolkata	iem.edu.in	17.9
15	ILEAD: Institute of Leadership, Entrepreneurship & Development	Kolkata	ilead.net.in	19.2
16	The International Institute of Business Studies	Kolkata	iibsonline.com	19.4
17	Indian Institute of Social Welfare and Business Management	Kolkata	iiswbm.edu	21.0
18	Apex Management Institute	Kolkata	apexindia.org	22.7
19	Calcutta Institute of Engineering and Management	Kolkata	iemcal.com	23.1
20	Jyotirmoy School of Business	Kolkata	jsb.org.in	23.4
21	Calcutta Business School	Bisnhupur , 24pgs (S)	calcuttabusinessschool.org	24.2
22	Aryabhatta Institute of Engineering and Management	Durgapur	aiemd.org	24.5
23	Army Institute of Management	Kolkata	aim.ac.in	24.8
24	Sabita Devi Education Trust - Brainware Group of Institutions	Kolkata	brainwaretechnologies.org	24.8
25	Gurunanak Institute of Technology	Kolkata	gnit.ac.in	24.9
26	Bengal College of Engineering & Technology	Durgapur	bcetdgp.ac.in	27.2
27	Techno India	Kolkata	technoindiagroup.com	27.9
28	Globsyn Business School	Kolkata	globsyn.edu.in	28.6
29	Siliguri Institute of Technology	Siliguri	iias.org.in	29.8
30	Swami Vivekananda Institute of Science & Technology	Kolkata	svist.org	30.5
31	Institute of Business Management	Kolkata	ibmnce.in	30.6
32	Budge Budge Institute of Technology	Kolkata	bbit.edu.in	32.6
33	Supreme Knowledge Foundation Group of Institutions	Hoogly	skf.edu.in	33.5
34	Pailan College of Management & Technology (MBA Division)	Kolkata	pcmt-india.net	34.3

35	Future Institute of Engineering and Management	Kolkata	teamfuture.in	35.4
36	Department of Business Management, University of Calcutta	Kolkata	bmcaluniv.org	36.2
37	Haldia Institute of Technology	Midnapur (E)	hit-haldia.net	36.6
38	George College (Department of Management Studies)	Kolkata	georgecollege.org	36.9
39	Calcutta Institute of Technology	Kolkata	ciemcal.org	37.4
40	Future Business School	Kolkata	teamfuture.in	37.5
41	Goenka College of Commerce and Business Administration	Kolkata	goenkacollege.net	38.5
42	Regent Education & Research Foundation Group of Institutions	Kolkata	rerf.in	40.3
43	Durgapur Society of Management Science	Durgapur	dsmsindia.com	41.3
44	Meghnad Saha Institute of Technology	Kolkata	msitcollege.org	43.8
45	Netaji Subhash Engineering College	Kolkata	nsecollege.org	44.1
46	Seacom Engineering College	Kolkata	seacomengineering.org	45.0
47	Management Institute of Durgapur	Durgapur	dims.ac.in	45.3
48	Dr. B.C. Roy Engineering College, Durgapur	Durgapur	bcrec.net.in	45.5
49	International Institute of Management Sciences	Kolkata	iims-intledu.com	47.0
50	IMS Business School	Kolkata	imscal.org	47.2
51	ABS Academy of Science,Technology & Management	Durgapur	absacademy.com	47.4
52	Management Education Centre, Heritage Institute of Technology	Kolkata	hbs.edu.in	47.6
53	Institute of Business Management and Research	Kolkata	ibmrcal.org	51.7
54	St. Mary's Technical Campus Kolkata	Kolkata	stmarystechcampus.org	54.4

7 Analysis of Data and Findings

Data which was collected through the web, third party readymade software Majestic SEO have been used to measure inlinks and external links. Four variables are used to find out the overall web-ranking of all AICTE approved management schools and overall ranking of management schools.

Table 6: 20 Top Ranking Management Institutes in West Bengal

Rank	Institute	City	Domain	Rank Score
1	Indian Institute of Management,Kolkata	Joka	iimcal.ac.in	3.0
2	University of Calcutta, Department of Commerce	Kolkata	caluniv.ac.in	4.4
3	School of Management Sciences, Bengal Engg and Science University	Howrah	becs.ac.in	4.9
4	Department of Management Studies, National Institute of Technology	Durgapur	nitdgp.ac.in	
5	Department of Business Administration, The University of Burdwan	Burdwan	buruniv.ac.in	6.2
6	St. Xaviers College	Kolkata	sxccal.edu	9.2
7	Indian Institute of Technology, Kharagpur	Midnapur (W)	iitkgp.ernet.in/vgsom	9.3
8	Department of Business Administration, University of Kalyani	Nodia	klyuniv.ac.in	9.9
9	Advanced College of Management	Kakinara	acmkolkata.org	15.0
10	NSHM College of Management & Technology,Kolkata	Kolkata	nshm.com	17.1
11	JIS College of Engineering	Kolkata	jisgroup.org	17.8
12	Institute of Engineering & Management	Kolkata	iem.edu.in	17.9
15	ILEAD: Institute of Leadership, Entrepreneurship & Development	Kolkata	ilead.net.in	19.2
16	The International Institute of Business Studies	Kolkata	iibsonline.com	19.4
17	Indian Institute of Social Welfare and Business Management	Kolkata	iiswbm.edu	21.0
18	Apex Management Institute	Kolkata	apexindia.org	22.7
19	Calcutta Institute of Engineering and Management	Kolkata	iemcal.com	23.1
20	Jyotirmoy School of Business	Kolkata	jsb.org.in	23.4

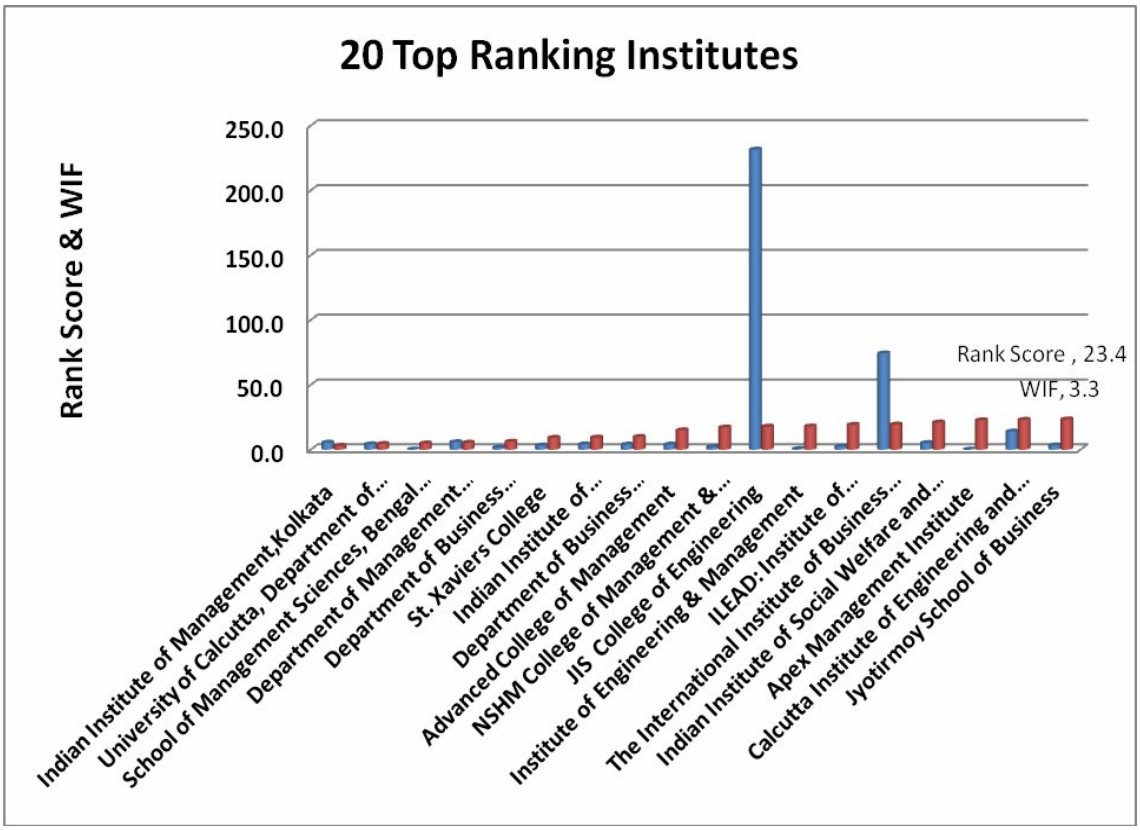

Figure 3: 20 Top Ranking Management Institutes

8 Observations

From the table 2, it may easily be observed that the rankings differs when the institutions are arranged according to the decreasing order of their web pages , positions are quite randomly changed when they are re-arranged according to the decreasing order of their inlinks. While calculating the Web impact factors (table.2) i.e. inlinks/webpages and arranged in decreasing order, it may be noticed that the same institute occupies different position.

Overall ranking (table.3) has been calculated on the basis of the formula as mentioned earlier i.e. Rank= (40% of the positional value of web pages (S) + 50% of the positional value of the inlinks (V) + 5% of the positional value of Rich-texts (R)+ 5% of the positional value of Scholar (G).

In table.4 first column shows the rank of the institute and sixth column is showing the rank value of the institute where it is seen that the top position is occupied by Indian Institute of Management, Ahmedabad, followed by Indian Institute of Management (IIIMK), Jawaharlal Nehru Technological University, Shri Mata Vaishno Devi University, Indian Institute of Management, Lucknow, Indian School of Business, Hyderabad, Indian Institute of Management, Indore, Administrative

Staff College of India, Hyderabad, Indian Institute of Management, Kolkata, respectively.

9 Inferences, Suggestions and Limitations

It has been observed that some institutes are having same domain as compared to the other institutions from the same group as it has been seen in case of Narula Institute of Technology and JIS group of Kolkata. In these cases it has been taken as only one domain of the first institute as per the alphabetical order. It has also been observed that some institutes don't have their own domain, so they are not included in the present study. While studying web pages several peculiarities had been noticed as mentioned above. Some management schools are having the same domain in respect of their parent institutions, i.e. management schools are the departments of their main institutes. For example, Vinod Gupta School of Management is one of the departments of Indian Institute of Technology, Kharagpur, So the researcher had to take the IITKGP domain for their web pages and inlinks, scholars, rich text counting. Same is the case for University of Calcutta. It has a department of Business Administration which does not have separate domain, so the researcher has to consider the domain of Calcutta University itself. And for this reason the positional value has became much higher compared to other stand alone institutes having their own domain with less web pages, inlinks, scholars as well as rich text and which ultimately effects the overall ranking also.

Limitations: For the webometric study it can be said that although webometric study have some limitations (such as commercial search engines are not valid for a foundation for qualitative webometric analysis), it is very useful in link analysis as well as to find out the overall web ranking of the institutes which is having their own domain. While conducting webometric analysis, one has to be aware of the specific nature of motivations for making hyperlinks within different types of websites, and the other aspect is that of making oneself aware of the quality of search engines and other data collection tools that are being used (Fugl, 2001).

Based on the proceeding observations it may be proposed for further study to be done within the domain as :

- to launch more qualitative research about the motivations for hyper linking, and
- to initiate better tools which are to be used within the informetric domain, it may be much more sure about the precision in defining boundaries and limitations for the research, when performing webometric studies.

Apppendix I: Ranked List of Management Institutes in W.B.

Rank	Domain	Webpage (S)	Inlinks (V)	WIF	.pdf	.doc	.docx	.ppt	Richfiles [R]	Scholar (G)	S	V	R	G	Rank Score
1	iimcal.ac.in	14668	79972	5.5	573	23	8	1	605	170	3	1	10	16	3.0
2	caluniv.ac.in	19031	79572	4.2	2940	30	0	0	2970	1	2	2	4	48	4.4
3	becs.ac.in	142097	14088	0.1	5600	941	56	751	7348	592	1	8	2	7	4.9
4	nitdgp.ac.in	7127	41471	5.8	885	427	56	2	1370	1880	7	4	8	3	5.4
5	buruniv.ac.in	11340	18586	1.6	603	6	156	153	918	1370	5	7	9	5	6.2
6	sxccal.edu	2695	8674	3.2	2110	1050	161	473	3794	342	10	9	3	10	9.2
7	iitkgp.ernet.in/vgsom	6795	28189	4.1	7	3	0	0	10	10	8	5	32	40	9.3
8	klyuniv.ac.in	1340	5327	4.0	2460	113	43	0	2616	1700	11	10	5	4	9.9
9	acmkolkata.org	1340	5327	4.0	1	0	0	0	1	1	12	11	44	50	15.0
10	nshm.com	1278	2604	2.0	105	0	0	0	105	12	13	18	19	39	17.1
11	jisgroup.org	189	43765	231.6	111	73	29	39	252	394	38	3	14	8	17.8
12	iem.edu.in	3312	1847	0.6	103	53	2	1	159	68	9	25	15	21	17.9
13	ilead.net.in	1054	2609	2.5	43	4	0	0	47	0	17	17	24	54	19.2
14	iibsonline.com	376	27935	74.3	3	0	0	0	3	2	29	6	39	57	19.4
15	iiswbm.edu	489	2495	5.1	1500	585	57	402	2544	212	24	21	6	12	21.0
16	apexindia.org	8621	546	0.1	18	0	0	0	18	2	6	33	30	46	22.7
17	iemcal.com	332	4643	14.0	0	0	0	0	0	113	34	12	49	20	23.1
18	jsb.org.in	596	1944	3.3	1	0	0	0	1	158	21	24	42	17	23.4
19	calcuttabusinessschool.org	645	1830	2.8	18	0	0	0	18	17	20	26	29	34	24.2
20	aiemd.org	440	2162	4.9	25	0	0	0	25	15	26	22	27	35	24.5
21	aim.ac.in	235	2805	11.9	45	40	12	12	62	12	36	16	45	2	24.8
22	brainwaretechnologies.org	1056	1075	1.0	31	1	0	0	32	1	16	29	26	52	24.8
23	gnit.ac.in	455	2024	4.4	0	0	0	0	0	128	25	23	48	19	24.9
24	bcetdgp.ac.in	673	549	0.8	0	0	0	0	0	33	18	32	52	28	27.2

25	technoindiagroup.com	124	2825	22.8	14	0	0	0	14	52	44	15	31	25	27.9
26	globsyn.edu.in	95	3286	34.6	74	0	0	0	74	39	48	14	21	27	28.6
27	iias.org.in	344	1183	3.4	0	0	0	0	0	181	32	28	46	14	29.8
28	svist.org	648	180	0.3	228	80	21	0	329	3	19	40	13	45	30.5
29	ibmnce.in	536	273	0.5	123	2	0	0	125	5	23	37	16	42	30.6
30	bbit.edu.in	257	750	2.9	1	0	0	0	1	30	35	30	43	29	32.6
31	skf.edu.in	367	187	0.5	119	1	0	0	120	20	30	38	17	33	33.5
32	pcmt-india.net	358	183	0.5	5	0	0	1	6	175	31	39	33	15	34.3
33	teamfuture.in	404	140	0.3	0	0	0	0	0	67	27	42	50	22	35.4
34	bmcaluniv.org	192	295	1.5	0	0	0	0	0	42	37	35	51	26	36.2
35	hit-haldia.net	336	131	0.4	131	260	8	131	530	726	33	45	12	6	36.6
36	georgecollege.org	158	361	2.3	4	0	0	0	4	4	40	34	34	43	36.9
37	ciemcal.org	22	1795	81.6	71	0	0	0	71	56	54	27	22	24	37.4
38	teamfuture.in	404	140	0.3	0	0	0	0	0	6	28	43	55	41	37.5
39	goenkacollege.net	150	295	2.0	3	0	0	0	3	15	42	36	37	36	38.5
40	rerf.in	577	13	0.0	58	0	0	0	58	0	22	55	23	56	40.3
41	dsmsindia.com	37	639	17.3	0	0	0	0	0	13	53	31	54	38	41.3
42	msitcollege.org	71	166	2.3	0	0	0	0	0	135	50	41	47	18	43.8
43	nsecollege.org	70	104	1.5	13400	2810	74	160	16444	187	51	46	1	13	44.1
44	seacomengineering.org	122	65	0.5	3	0	0	0	3	59	45	48	36	23	45.0
45	dims.ac.in	96	70	0.7	19	1	0	0	20	21	47	47	28	31	45.3
46	bcrec.net.in	79	57	0.7	1170	467	56	227	1920	262	49	50	7	11	45.5
47	iims-intledu.com	131	37	0.3	2	1	0	0	3	14	43	52	38	37	47.0
48	imscal.org	55	138	2.5	2	0	0	0	2	2	52	44	41	47	47.2
49	absacademy.com	97	59	0.6	4	0	0	0	4	0	46	49	35	55	47.4

50	hbs.edu.in	154	14	0.1	2	0	0	0	2	4	41	54	40	44	47.6
51	ibmrcal.org	1	54	54.0	0	0	0	0	0	24	55	51	53	30	51.7
52	stmarystechcampus.org	6	25	4.2	0	0	0	0	0	1	56	53	56	53	54.4

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Measuring Customers Satisfaction in Library and Information Centre (LIC) in Service Economy-Methods and Processes – An Approach for Development

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Abstract

This paper intends to describe an integrated view of knowledge economy and service economy. The role of library service providers to cater the demand of information seekers is also highlighted here. As quality is a key ingredient towards the measurement of users' satisfaction, different parameters have been evolved to measure the quality of the library services. Inconsistencies in the system of developing manpower have been stressed in this discussion.

1 Introduction

Libraries and information centre are social organizations entailing social responsibilities. Libraries are involved with social culture and social economic activities of the society. Its responsibilities to the society are immense, its involvement with the human development is linked with the development of the civilization, an achieved state of organized social life. These organized social lives are sequenced with the value of human development in different ages. All libraries impart knowledge. Such a social institution has to be managed with equal care and importance as is done in case of other social units. Management of libraries is incumbent on the government or parent body or any other funding agencies.

1.1 Library Management and Customers

Management of a library should be reasonably synchronized with the management of a corporate unit with the same methods and managerial practices despite the fact that the libraries do posses some special features which are unlike those of business units. But both of them being social organizations have to depend upon the customers / consumers who directly or indirectly buy and use the products or services to enjoy its benefits. Customers / consumers being the prime factor measuring the degree or extent of satisfaction have become the cardinal task for its sustenance.

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1.2 Library and Knowledge Economy

In these days of multifaceted diversities and knowledge economy, the libraries, whatever may be its type, size and characteristic, feature, have become the most indispensable and key centres to provide knowledge. More emphatically it can be said that rapid advancement of information and communication technology (ICT), keeping pace with the globalization of economy, has brought about knowledge. Ideation, innovation, creation, dissemination and use of new knowledge have become imperative for, knowledge economy is not confined to the growth of high-tech and ICT, but on the creation of new concepts, new thought, ideas and knowledge.

1.3 Knowledge Economy and Service Economy: An Integrated View

Service economy is an offshoot of knowledge economy. Knowledge economy envisages the state of a society which embraces all phases of development. Productivity of the knowledge work and that of the knowledge worker are the primary elements of the knowledge economy. OECD views it as a development of the high and medium manufacturing and knowledge intensive service industries followed by development of the business / industry, education and health. The transition from manufacturing industry to service industry is also a distinctive step for the society's moving into the service economy. Certain characteristics of service economy would clarify the coalescence of the knowledge economy and service economy. Firstly, all services offer expertise to support economic activities. Such expertise may be treated as knowledge and experience and managerial support, financial avenues, technology etc. Secondly, the fundamental orientation of services means their economic contribution can be measured in relation to the benefits they bestow. Thirdly, services are small, single unit activities. The service units are of different nature and grow in different sectors of the economy and finally services are performed. Obviously, qualitative performance of any service is a must. Services are in fact engines and vehicles of growth.

2 Services, Quality, Customer Satisfaction: The Fulcrum for the L&IC

No library can be a service unit without having any user to serve. These users or the customers of the library services indirectly pay the cost of services they consume and also the cost of maintenance of the library. The customers use the library services only when it meets their needs and purpose and obviously the question of meeting their satisfaction comes.

2.1 Customers Satisfaction

A customer is satisfied when its précised needs are met. The perception of the customers varies. To understand the customers need, it is imperative to understand their perceived needs. It will be relevant to say that quality, service and satisfaction are interrelated. Services are performed. So, quality of the services is prerequisite for creating data perception of the service. Therefore,

providing high quality and superior customer service should be the motto of the library. Again, quality is based on the perception of the customer. Therefore quality should be defined as the perception what a customer perceives.

2.2 Customer's Mental Process for Perceiving the Quality or the Judging Value

Customers are interested to consume the benefits and the values of the service they receive from the library. They make a mental estimate of the worth they would get. No doubt, it is difficult to access the intangible benefits a library renders. But despite the difficulties, a library professional has to make out or device ways and means to permeate into the customer's mindset to evaluate the quality of the services. Relevantly, the cost of poor quality of the service needs to be gauged. Following points may be discussed to this regard.

- **Cost of Performance**

The cost of performing right thing at the right time is associated with the art and expertise of doing things that error free and will not have to be done again.

- **Failure Cost**

The cost of doing something again or reworking will be damaging the quality of service.

- **Detection Cost**

The cost of detecting or to find quality problems tells badly upon a library's performance.

- **Cost of Prevention**

Cost of prevention of making bad image of any library needs be seriously thought over. Since service is performance the quality of the services can be ensured only when the library professionals perform their professional activities qualitatively. For this purpose adequate care should be taken to enhance their competency and expertise by way of providing them with continuous education primarily for the updatation and up gradation of knowledge.

3 Need for Developing Customer Service System for Measuring Satisfaction

With a view to measuring customer's satisfaction in libraries, it is essential to evolve a customer's service system for which the following parameters need be taken into consideration.

- **Goal Setting and Library's Commitments**

All the libraries cannot have the same goal even in the case of public libraries notwithstanding the UNECO manifesto for public libraries 1994. The public libraries are to grow in different places in different socio-economic, political and socio-cultural environment. Being a social organization it has to meet both expressed and potential need, demand and requirement of the customers of the area where it is situated. No library is comprehensive enough to meet all the demands of its

customers. It is therefore an utmost requirement of a library to make its customers clearly known what resources it does possess and what services it can exactly extend to its customers.

- **To have a Clear Understanding Regarding the Customers / Users of the Libraries**

Serious attempts should be made to know the customers / consumers of the library services and to understand them totally. These can be ensured by knowing their likes and dislikes of the services, the library renders. The changes of their interest / need for their pursuit of knowledge, their expectations now and in future, what motivates them to cling to the services of the library and what exactly to be done to satisfy them to be gauged. For this purpose some distinctive methods to be taken into consideration. (1) Survey by questionnaire method. (2) By interviewing them personally with interview schedule duly prepared or by chit-chatting with them informally on various issues of the library and by having meeting with them in the libraries at regular frequencies, say one's a week or twice a month on a particular fixed date. This will enable the library to build up the resources up to the satisfaction of its customers and to design the service products according to their changing needs.

- **Standardization of the Quality Performance of the Service**

Services are performed and so the quality of performance will ensure satisfaction of the customers / consumers of the services of a library. Quality of service is intangible as it is based on one's perception. However this intangibility can be transformed to tangibility or visibility by observing the customer's dislikes, reluctance in the delay in delivery of the services not making available to him what exactly he wants, unbecoming communication and in compatible dealing with him etc.

- **Inconsistencies in the LIS Manpower Development Programs**

Superior service and its quality performance are incumbent upon the appropriately developed LIS professionals in the LIS schools most of which give more attention to technical skill, emphasizing more on digitization and ICT overlooking the utmost need for interpersonal skill, soft skill and communication skill, the most important prerequisites to ensure quality in the performance of services in a library. Unfortunately the Continuing Education Programmes (CEP) also do not give importance to this regard. Hence it has become imperative for any library to import, immediately after appointment, both induction and orientation training emphasizing more on the interpersonal skill, soft skill, communication skill, in the same manner as any Finishing School does.

- **The Need for Invocation of Reward System for Quality Service**

Recalling Abraham Maslow's hierarchy of human needs "Social" and "Esteem / Ego" needs should be taken into consideration and accomplishment of quality performance of the library services be rewarded financially and / or by conferring Memento / Certificate of Honor / Appreciation etc. we should not overlook the fact that the human psychology is always keen to receive

affection, love, regards and respects. No human being perhaps is prepared to sacrifice his self prestige. So the library professionals should be made to till that they are valuables to the libraries. Similarly, identified highly satisfied customers also should be rewarded and publicized for general information.

- **Going in for Continuous Improvement Programme**

The quality of any service / performance cannot remain static / fixed for all time to come. Its change is absolute and perennial. Keeping these in view the task is to indulge in the programme of activities to detect the lapses and short comings of the library. All out attempts should be made to improve the library services continuously by doing away with its lapses and short comings.

- **Customers Complaints and its Management**

Complaints are the most important instruments to measure the customer's satisfaction in library and in any organization. In reality, most of the customers in library particularly, although may have grievances, do not feel like expressing it in writing which creates retardation in the library performance. Most of the consumers may hesitate to disclose their names as complainants or perhaps do not find essay language to complain. It will be better therefore to design a **"Complaint form"** which should include all possible grievances a library customer may have, with clearly stated answer "Yes / No" to help the customers to tick mark. Besides the management of complaints, a **"Feedback"** form may also be designed and used. A sample of such form is shown below:

Name of the Library				
We are interested to know your opinion regarding the services we render to you. Please by putting the number in the blank space before each statement below express your opinion.				
1	2	3	4	5
Never	Once	Half the time	Often	Very Often
---------- 1) Telephone is answered by the third ring.				
---------- 2) The person answering the telephone is courteous.				
---------- 3) The library is conveniently located, easy to reach.				
---------- 4) The ambiance of the library is warm and inviting.				
---------- 5) The library hours are convenient to me.				
---------- 6) The library staff greets me immediately.				
Many other relevant statements, suitable to library may be added.				

4 Conclusion

Transformation of the economy, from the archaic to globalised, has been first making a compelling situation for frequent use of libraries whatever may be its types, sizes and characteristics. The chased situation has also been forcing the libraries to induct new technologies, new methods and

process. Fortunately or unfortunately these methods and process are technology oriented in other words technologies have outweighed the human approaches and efforts to improve the services singularly. For organization, manipulation and monitoring the library resources and for retrieval of services technology is essential; but more essential is the human approaches, efforts, attitudes and longs for extending the services to the best satisfaction of the library customers. The time is now adequately appropriate for taking care for the customers of the library services. The LIS courses should also be reviewed and re-designed accordingly.

Collection of Vidyasagar University Central Library: A Bibliometric Study

*Pijush Kanti Jana**
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Abstract

Implementation of sampling procedure and selection of random sampling technique are the key concepts in this study. Systematic sampling method has been followed for the collection of data with a sample size of 1000 books in Vidyasagar University Central Library. This paper shows different aspects of books eg., distribution of library collection by their subjects, price, year of publication, edition, language, country of publication, authorship pattern etc. Analysis of average cost of books in different subject fields and average cost per page of a book in different page limits are also another feature of this study.

1 Introduction

The Vidyasagar University started its academic activities in the year 1985 with just 6 post graduate departments but now it has 27 postgraduate departments with other diploma courses. In the month of July, 1996 the Central Library, Vidyasagar University started its functioning from the Administrative Building officially. From the beginning of the establishment of the library it has been suffering from both staff and funds. Still during the last three decades its performance is quite satisfactory in all respect. Therefore, about after 30 years of its journey it needs to know the nature of its collection development. But it is not easy to find out the nature of its collection when its total stock exceeds one lac. Therefore, a moderate sample size has been chosen irrespective of analysis the whole collection. Again, a systematic sampling technique has been followed for selection of books in the sample.

2 Objectives

The objectives of this study are to find out nature and characteristics of books collected in Vidyasagar University Central Library and particularly with a view to examine the following aspects:

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1) To find out subject-wise distribution of books.
2) To see language-wise distribution of books.
3) To know country-wise publication of books.
4) To observe authorship pattern of the collection.
5) To find out subject-wise average price and average pages per book.
6) To help the authority to take decision for selection of books.
7) To help the authority to take decision for allocation of funds.

3 Methodology

At present there are 1,02,048 books in the Central Library, Vidyasagar University. To fulfill the objectives of the study, it is not possible to study all books in the collection. Therefore, a random sampling method has been adopted for collection of books. Here, at the first stage, a sample size of 1000 books has been chosen for collection of data. In this case, as a complete list of the books from which sample is to be drawn is available, so the systematic sampling for collection of data is selected. A systematic sampling is formed by selecting one unit at random and then selecting additional units at evenly- spaced intervals until the sample has been formed. The first item is selected at random generally by following the lottery method. Subsequent items are selected by taking every k-th item from the list where 'k' refers to the sampling interval or sampling ratio i.e., the ratio of population size to the size of the sample. Symbolically,

$K = (N/n)$ Where, K = Sampling interval,

N= size of the universe,

n= sample size.

The universe size of this study is first 100000 books in the library and the sample size is 1000 books. So, value of K is (100000/1000) = 100. The first book (i.e., first sample unit) has been selected from the first hundred books by lottery method and the accession number of that book is 82.Then the sampling interval 100 has been added to each sample unit to get the accession number of the book of the next sample until to form the sample. Hence, the accession number of the books of the sample units are 82, 182, 282, 382 . . . 99982.

Again, to collect necessary information from the sample units, following steps have been followed:

- Required information has been collected directly from Online Public Access Catalogue (OPAC) of the Central Library, Vidyasagar University. Sometimes to collect data Accession Register of the organization has also been consulted and in few cases relevant information has also been collected directly from books.

- As initial page numbers of many books are not available in OPAC, so this study is based only on the textual pages of the books.
- The data so collected are systematically arranged in various tables and which are subsequently analyzed.
- First emphasis is to classify the books according to the department existed in Vidyasagar University. Then some other important subjects are also selected separately.
- Diagrammatic representation has also been made in many cases for better presentation of data.
- Recommendation and conclusions have been made on the basis of analysis of the data.

4 Analysis of Data

The data collected through systematic sampling are systematically arranged in different tables and those tables are then analyzed to fulfill the objectives of this study.

4.1 Subject-wise Distribution of Books

The books collected through systematic sampling are basically grouped into subjects associated with different departments. However, books are also grouped into subjects like Research Methodology, Operations Research or Computer which are generalia in nature. Some books are also grouped into other category which includes books on Bibliography, General Dictionary, General Encyclopedia, Theory of Natural Sciences, Medical Science, Agriculture, Arts, Philosophy & Theory of Literature, Germanic Literature, Greek Literature, Assamese Literature, Marathi Literature, Biography etc. Due to very nature of the subjects associated with each department it is hard enough to isolate books on each Department rather it is better to group the collection on different subjects. In many cases book on a subject does not represent the book on that department.

Sl. No.	Subject	No. of books	Percentage of books
1	Research Methodology	4	0.4
2	Operation Research	6	0.6
3	Computer	79	7.9
4	Library and Information Science	29	2.9
5	Philosophy	35	3.5
6	Religion	22	2.2
7	Sociology	96	9.6
8	Political Science	49	4.9
9	Economics	86	8.6
10	Law	10	1.0
11	Education	8	0.8
12	Mathematics	48	4.8
13	Physics	60	6.0
14	Chemistry	23	2.3
15	Anthropology	7	0.7
16	Microbiology	12	1.2
17	Botany	8	0.8
18	Zoology	11	1.1
19	Human Physiology	16	1.6
20	Accounting & Management	60	6.0
21	English language & literature	57	5.7
22	Sanskrit language & literature	24	2.4
23	Hindi language & literature	7	0.7
24	Bengali language & literature	134	13.4
25	Santali language & literature	7	0.7
26	Geography	19	1.9
27	History	41	4.1
28	Others	42	4.2
	Total	1000	100.00

Table 1: Distribution of books by Subjects

It is evident from Table- 1 that the library has a giant collection of books on Bengali Language and Literature (13.4%). Collection of books on Sociology (9.6%), Economics (8.6%) and Computer (7.9%) are also remarkable. Good collection of books are also found on Physics (6.0%), Accounting & Management (6.0%), English Language and Literature (5.7%), Political Science (4.9%), Mathematics (4.8%) and History (4.1%). General collection (4.2%) in the library is also satisfied.

4.2 Distribution of Books According to their Price and on Broad Classes

Subject wise distribution of books related with different departments has been shown in Table - 1. But the bivariate frequency distribution table showing the distribution of books according to their broad classes of division along with their price has been given in Table – 2.

Broad class/ Price (Rs.)	000	100	200	300	400& 800	500	600	700	900	Total	Percentage
Up to 500	106	29	17	178	226	127	75	4	49	811	81.1
501-1000	9	3	4	52	11	21	11	1	14	126	12.6
1001-2000	3	2	0	17	1	14	2	0	1	40	4.0
2001-3000	0	1	0	1	2	5	0	0	0	12	1.2
3001-4000	0	0	1	1	0	3	1	0	0	6	0.6
4001-5000	1	0	0	0	0	3	0	0	0	4	0.4
5001-6000	0	0	0	0	0	0	0	0	0	0	0
6001-7000	1	0	0	0	0	0	0	0	0	1	0.1
Total	120	35	22	249	240	173	92	5	64	1000	100
Percentage	12	3.5	2.2	24.9	24	17.3	9.2	0.5	6.4	100	100.00

Table 2: Distribution of books according to their price and broad classes of division

It reveals from Table – 2 that about half of the collection of the books are on Social Sciences (24.9%) and on Languages and Literature Class (24%). However a good number of collections of books are also found in Pure Sciences (17.3%) and Generalia Class (12%). Books on Arts (0.5%) and Religion (2.2%) are negligible. Again, in question of price of books, it is found from Table – 2 that price of 81.1% of total collection are ranges up to Rs 500.00 and value of 97.7 % of books in the library are up to Rs 2000.00. No books have been found between the ranges of

Rs 5001 – 6000 and there is only 1 (0.1%) book is found between the ranges of Rs 6001 – 7000.

4.3 Publication Year and Distribution of Books

The first book was accessioned in the Accession Register of the Central Library, Vidyasagar University on 10.09.1986. Therefore, books are grouped into those which are published before the year 1986 ie, up to the year 1985 and then in different years. The last publication year i.e., 2012 has been chosen as the last book of the population has been published in that year. Again, from the study it is found that there is only one book which has been published in the year 1903 and there is another book which has been published in the year 1949. So, there are 176 (17.6%) books which have been published during the years 1950 to 1985.

Sl. No.	Year	No. of books	Percentage of books
1	Up to 1985	178	17.8
2	1986	47	4.7
3	1987	45	4.5
4	1988	44	4.4
5	1989	34	3.4
6	1990	28	2.8
7	1991	17	1.7
8	1992	11	1.1
9	1993	20	2.0
10	1994	36	3.6
11	1995	37	3.7
12	1996	38	3.8
13	1997	45	4.5
14	1998	29	2.9
15	1999	17	1.7
16	2000	32	3.2
17	2001	32	3.2
18	2002	25	2.5

19	2003	24	2.4
20	2004	28	2.8
21	2005	29	2.9
22	2006	27	2.7
23	2007	37	3.7
24	2008	39	3.9
25	2009	47	4.7
26	2010	23	2.3
27	2011	12	1.2
28	2012	17	1.7
29	Not available	2	0.2
	Total	1000	100.00

Table 3: Publication of books according to their year of publication

Table – 3 shows that pattern of publication year of books are decrease gradually considering the introduce of different new departments year after year and which is due to purchase of less books or of purchasing books which are published earlier. However, the study shows that the collection of books published in the years 1991, 1992, 1999, 2011 and 2012 are decrease remarkably.

4.4 Language-wise Distribution of Books

It is evident from Table – 4 that the books available in the library are written mainly in six languages. It also revels from the Table that more than three- fourth (76.2%) of the collection are written in English language and 20.8% of the collections are in Bengali language. Collections of books in other languages are miserable. It is interesting to say that 0.8% books are written in more than one language and which is due to explanation of the text in some other languages.

Sl. No.	Language	No. of books	Percentage
1	Assamese	1	0.1
2	Bengali	208	20.8
3	English	762	76.2
4	Hindi	6	0.6
5	Sanskrit	10	1.0
6	Santali	5	0.5
7	More than one language	8	0.8
	Total	1000	100.00

Table 4: Language-wise distribution of books

4.5 Country-wise Publication of Books

It shows from Table – 5 that out of 1000 books under study 754 (75.4%) books are published with in India. Out of another 246 books 139 (13.9%) books have been published from UK and 79 (7.9%) books have been published from USA. Publications of books from other countries are negligible.

Sl. No.	Country Name	No. of books	Percentage
1	Australia	4	0.4
2	Bangladesh	5	0.5
3	France	1	0.1
4	Germany	2	0.2
5	India	754	75.4
6	Ireland	1	0.1
7	Netherland	2	0.2
8	New Zealand	4	0.4
9	Russia	9	0.9
10	UK	139	13.9
11	USA	79	7.9
	Total	1000	100.00

Table 5: Country-wise publication of books

4.6 State -wise Publication of Books

It reveals from the study that out of 1000 books selected for the study 754 (75.4%) books were published in India and 246 (24.6%) were published outside India. State wise publication of those 754 books has been given in Table – 6.

Sl. No.	State Name	No. of books	Percentage
1	Andhra Pradesh	14	1.86
2	Delhi	418	55.44
3	Gujarat	2	0.26
4	Karnataka	4	0.53
5	Madhya Pradesh	1	0.13
6	Maharashtra	16	2.12
7	Pondicherry	1	0.13
8	Rajasthan	10	1.33
9	Tamilnadu	4	0.53
10	Uttar Pradesh	18	2.39
11	West Bengal	266	35.28
	Total	754	100.00

Table 6: State -wise publication of books

The Table shows that out of 754 books 418 (55.44%) books were published from Delhi, 266 (35.28%) books were published from West Bengal. Except the states of Andhra Pradesh, Maharashtra, Rajasthan and Uttar Pradesh publication from other states were miserable.

4.7 Authorship Pattern of Books

It reveals from the Table – 7 that out of 1000 books under study 673 (67.3%) books have been published by single author, 179 (17.9%) books have been published by two authors, 41 (4.1%) books have been published by three authors. Books published by more than three authors are negligible.

Sl. No.	Authorship	No. of book(s)	Percentage
1	1 author	673	67.3
2	2 authors	179	17.9
3	3 authors	41	4.1
4	4 authors	5	0.5
5	5 authors	2	0.2
6	6 authors	3	0.3
7	7 authors	1	0.1
8	10 authors	1	0.1
9	1 editor	52	5.2
10	2 editors	24	2.4
11	3 editors	3	0.3
12	Corporate Body	13	1.3
13	Government Publication	3	0.3
	Total	1000	100.00

Table 7: Authorship pattern of books

Again, in question of editorial publication 52 (5.2%) books have been published by single editor, 24 (2.4%) books have been published by two editors and only 3 (0.3%) books have been published by three editors. Books published by corporate body and government publication are 13(1.3%) and 3 (0.3%) respectively.

4.8 Distribution of Books by their Edition

Time to time new edition of books should be added to the collection to cope up with development of any subject field. From this study it shows that edition of books are distributed from edition 1 to edition 16. Table – 8 depicts that there are 788 (78.8%) books in the library with its first edition, books in the library with its 2nd edition are 88 (8.8%), 3rd edition are 51 (5.1%), 4th edition are 21 (2.1%) and so on. Books having its edition from 7 and onwards are miserable.

Sl. No.	Edition	No. of books	Percentage
1	1	788	78.8
2	2	88	8.8
3	3	51	5.1
4	4	21	2.1
5	5	15	1.5
6	6	14	1.4
7	7	7	0.7
8	8	5	0.5
9	9	2	0.2
10	10	1	0.1
11	11	3	0.3
12	12	1	0.1
13	14	1	0.1
14	15	1	0.1
15	16	1	0.1
16	23	1	0.1
	Total	1000	100.00

Table 8: Distribution of books by their edition

4.91 Subject-wise Average Price of Books

Average price of books based on different subjects are depicted in Table – 91. It reveals from the Table that average cost of books is highest for the books on the subject Microbiology and which is Rs. 1537.34 per book. The next positions are goes in favour of the subjects Anthropology, Chemistry, Zoology and Human Physiology with average price of books of Rs 876.43, Rs 869.34, Rs 705.71 and Rs 550.43 respectively.

Sl. No.	Subject	No. of books	Average price/book
1	Research Methodology	4	210
2	Operation Research	6	195.04
3	Computer	79	347.20
4	Library and Information Science	29	494.14
5	Philosophy	35	394.70
6	Religion	22	423.63
7	Sociology	96	392.99
8	Political Science	49	364.88
9	Economics	86	409.26
10	Law	10	465.70
11	Education	8	371.24
12	Mathematics	48	364.21
13	Physics	60	425.395
14	Chemistry	23	869.34
15	Anthropology	7	876.43
16	Microbiology	12	1537.34
17	Botany	8	393.25
18	Zoology	11	705.71
19	Human Physiology	16	550.43
20	Accounting & Management	60	343.82
21	English language & literature	57	286.33
22	Sanskrit language & literature	24	157.38
23	Hindi language & literature	7	236.43
24	Bengali language & literature	134	71.76
25	Santali language & literature	7	71.43
26	Geography	19	411.92
27	History	41	309.70
28	Others	42	347.25
	Total	1000	

Table 91: Subject-wise average price of books

Average price of books on the subjects Physics, Law, Library and Information Science, Economics, Geography, Religion are ranges from Rs 400 – 500. Again, average price of the books on Computer, Philosophy, Sociology, Political Science, Education, Mathematics, Botany and Accounting & Management and History are ranges from Rs 300 – 400. The Table also reveals that average price of books on Bengali and Santali Language and Literature is less than Rs 100.00 and which are only about Rs 71.

4.92 Distribution of Books in their Price and Pages

Average price of a book in relation to its page number has been presented in Table – 92. It shows that out of 1000 books a maximum of 230 books belong to pages 200 – 300, 181 books within pages 100 – 200, 150 books within 300 – 400 pages. Again, the Table shows that 683 (68.3%) books belong to pages within 100 to 500.

Sl. No.	No. of pages	No. of books	Average price per book (Rs.)	Average price/ pages of a book
1	Up-to 100	73	41.72	00.83
2	100-200	181	162.10	01.08
3	200-300	230	320.58	01.28
4	300-400	150	458.55	01.31
5	400-500	122	467.95	01.04
6	500-600	82	436.10	00.79
7	600-700	60	502.00	00.77
8	700-800	34	471.83	00.63
9	800-900	28	556.86	00.66
10	900-1000	16	757.19	00.80
11	1000-1100	9	418.93	00.40
12	1100-1200	5	1266.504	01.10
13	1200-1300	3	2566.67	02.05
14	1300-1400	5	607.00	00.50
15	1400 & above	2	1884.70	--

Table 92: Page-wise distribution of books

It is found from the Table that there is a positive tendency of price of a book as the pages per book increases. Though in case of range of pages of books within 1300- 1400, the price per book is significantly low perhaps due to sampling error. Average price per pages of a book has also been calculated based on the mid-value of the number of pages of books. The Table also shows that except in some cases there is a decreasing tendency of price per page of a book up to a certain range of 700 – 800 pages, while it again increases.

5 Findings and Conclusions

Data collected through systematic sampling are systematically arranged in tables and are also analysed in suitable form. However the major findings of the study are as follows:

i) Collection of books on Bengali Language and Literature in the library is more than any other subjects. Books on the subjects Computer, Sociology, Economics and Physics are also remarkable but those books are not associated with any individual department. Though books on the subject Anthropology should not be so separated from those of the subjects on biological sciences still its collection is remarkably poor considering the initiation of the Department in the university.

ii) Cost of books on social sciences, language and literature class are less as compared to other classes and their collection is about half of the collection in the library.

iii) Cost of more than 80% of the books in the library is less than or equal to Rs 500.00 and cost of about 98% books in the library are within Rs 2000.00.

iv) Except in certain cases books in the collection are evenly distributed in their year of publication.

v) Considering the type of the library language wise distribution of books is justified because about three- fourth books in the collection are in English language and about 21% books are in mother language.

vi) Ratio of collected books published within India and abroad is about 3: 1 and which is quite satisfactory.

vii) More than 50% of Indian books are published from Delhi where its share in the state of West Bengal is about 36%.

viii) In question of authorship only 10% of the total collection are goes in favour of editorial and other corporate body publication where 67.3% of the total collection is published by single author.

ix) About 79% books in the library are in first edition and 8.8% books are in second edition. Number of books in other editions are gradually decrease.

x) Except in certain cases the price per book in the collection has increased due to increase in

the number of pages per book. However, average price per page of a book is decreased due to increase in the number of pages per book to a certain limit when it is increased again.

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An analytical study of Biotechnology Open Access Journals archived in DOAJ

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Abstract

An analytical study of 57 Biotechnology Open Access Journals is presented in this article. All these journals are archived in Directory of Open Access Journals (DOAJ). The analytical study was done based on the parameters like Country, Language, Keyword, Archiving year in DOAJ. It was also checked that whether there is any publication cost or not for Open Access Journals.

1 Introduction

Information is an essential component for academic environment. One researcher mainly gets the primary information on his research area from a Journal. The huge cost of printed as well as e-journals force libraries to cut off their number of Journal subscription. So it is difficult for a research scholar to access the required information from a journal. Open Access Journals help a lot in this regard.

Budapest Open Access initiative (2012) defines the Open Access Journal as 'free availability on the public internet, permitting any user to read, download, copy, distribute, print, search or link to the full text of these articles, crawl them for indexing, pass them as data to software, or use them for any other lawful purpose, without financial, legal or technical barriers other than those inseparable from gaining access to the Internet itself.' DOAJ (2014) defines open access journals as 'journals that use a funding model that does not charge readers or their institutions for access.'

Open access journals are not only significant sources of information but also help to prevent the duplication of work. These provide universal access to the original ideas and research findings (Bansal & Singh, 2013).

The application of Biotechnological techniques to human affairs makes it the most important of all

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recently developed fields of Science. The application is ever expanding because biotech activities are highly vulnerable for commercialization. Biotechnology has affected all the major domains of human activity and welfare ranging from agriculture to medicine and environment (Banerjee & Chakraborty, 2013). A lot of research is happening in various divisions of Biotechnology. This work attempts to analyze open access journals on Biotechnology. Lihitkar and Lihitkar's (2013) article's framework has been followed partially to make this work.

2 Directory of Open Access Journal (DOAJ)

Directory of Open Access Journal, widely known as DOAJ is an online directory that provides access to quality open access, peer-reviewed journals. The aim of the DOAJ is to increase the visibility and ease of use of open access scientific and scholarly journals, thereby promoting their increased usage and impact. The DOAJ aims to be comprehensive and cover all open access scientific and scholarly journals that use a quality control system to guarantee the content. In short, the DOAJ aims to be the one-stop shop for users of open access journals. As on 22nd July 2014, 9912 Open Access Journals on different subjects were archived in DOAJ.

3 Objectives of the Work

- To assess the country wise contribution of Biotechnology Open Access Journals;
- To assess the language wise contribution of Biotechnology Open Access Journals;
- To assess keyword distribution of Biotechnology Open Access Journals;
- To assess year wise contribution of Biotechnology Open Access Journals; and
- To know any publication cost for Biotechnology Open Access Journals.

4 Scope and Methodology

The study is restricted on those journals that are archived in DOAJ only. The directory was browsed to get study related data. Then the homepage of all journals were browsed to get detail information. The data was tabulated and analyzed to get the findings. A percentage calculation was also done in some cases.

5 Analysis and Interpretation

An advanced search was done in DOAJ using the term 'Biotechnology' as subject. The result shows there are 57 Open Access Journals on this subject.

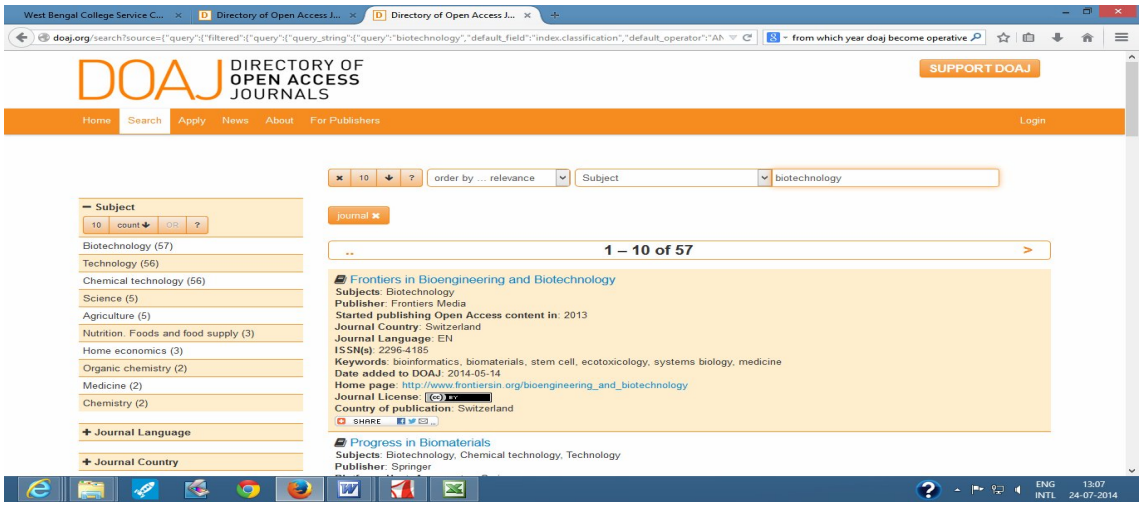

Figure 1: DOAJ page showing the result of search using the subject 'Biotechnology'

Total 57 Biotechnology open access journals were analyzed based on country, language, Key-word, archiving year in DOAJ and publication cost. The data tabulated and analyzed have been mentioned as follows:

Table1 : Country wise distribution of Biotechnology Open Access Journals

Country	No. of e-Journals	Percentage
Argentina	1	1.75
Brazil	4	7.01
Bulgaria	1	1.75
Chile	1	1.75
Colombia	2	3.50
Croatia	3	5.26
Egypt	4	7.01
Germany	3	5.26
India	11	19.29

Country	No. of e-Journals	Percentage
Indonesia	2	3.50
Japan	1	1.75
New Zealand	1	1.75
Nigeria	2	3.50
Pakistan	1	1.75
Romania	3	5.26
Sweden	1	1.75
Switzerland	2	3.50
Slovakia	1	1.75
Turkey	1	1.75
United Kingdom	5	8.77
United States	6	10.52
Venezuela	1	1.75

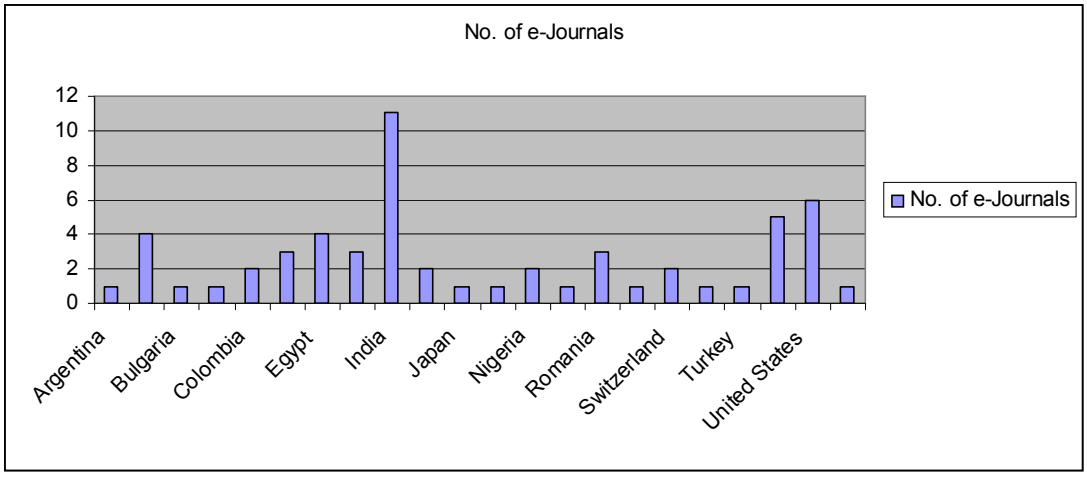

Figure 2: Country wise distribution of Biotechnology Open access Journals

Table 1 and Figure 2 depict the Country wise distribution of Biotechnology Open access Journals. India got the first rank publishing 11 Open Access Journals, followed by USA and UK publishing 6 and 5 Journals. India holds 19.29% part of total Biotechnology Open Access Journals.

Table 2: Language wise distribution of Biotechnology Open Access Journals

Language	No of e-Journals	Percentage
Chinese	2	3.5
Croatian	2	3.5
English	50	87.71
Indonesian	1	1.75
Spanish	5	8.77
Portuguese	4	7.01
Turkish	1	1.75

NB. Numbers of total Journals exceed 57 because few Journals published in more than one language.

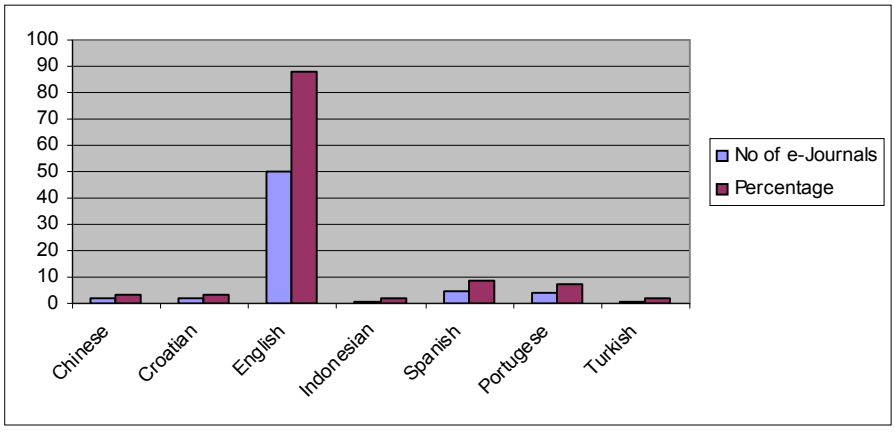

Figure 3: Language wise distribution of Biotechnology Open Access Journals

Table 2 and Figure 3 depict the language wise distribution of Biotechnology Open Access Journals. 87.17% journals published in English. Spanish and Portuguese got the second and third position publishing 8.77% and 7.01%.

Table 3: Keyword distribution of Biotechnology Open Access Journals

Keywords	No. of Journals
Agricultural Biotechnology	4
Animal Science	2
Biochemistry	10
Bioethics	1
Bioinformatics	5
Biological Science	5
Biomedicine	11
Biotechnology	19
Cancer	1
Environmental Science	6
Food Biotechnology	6
Genetics	10
Industrial Biotechnology	3
Microbiology	1
Nano Biotechnology	3
Plant Science	3

NB. Numbers of total Journals exceed 57 because most of the Journals publish articles relating more than one keyword.

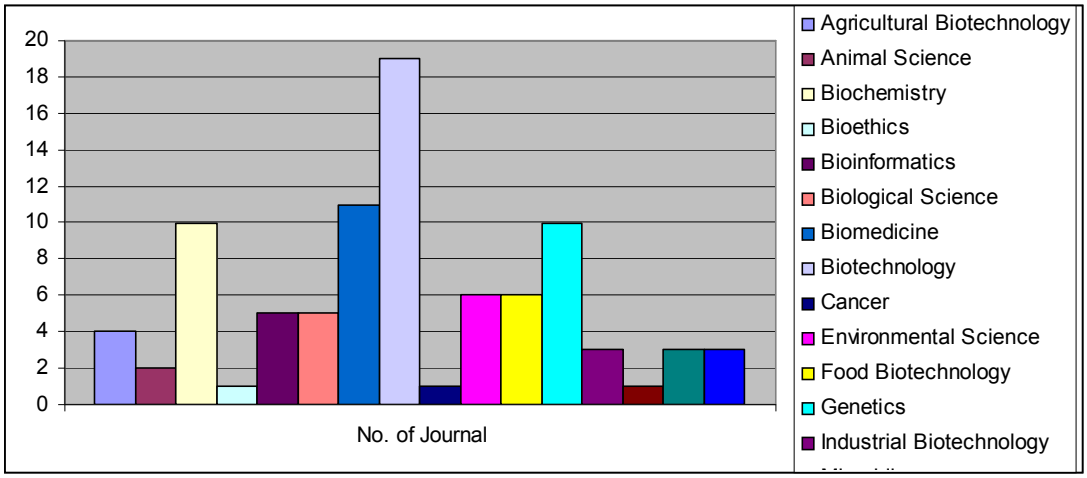

Figure 4: Keyword distribution of Biotechnology Open Access Journals

Table 3 and Figure 4 show that most Journals publish articles relating keyword 'Biotechnology', 'Biomedicine', 'Biochemistry' and 'Genetics'.

Table 4: Year wise distribution of Biotechnology Open Access Journals

Year	No. of Journal Added in DOAJ
2003	4
2004	1
2005	4
2007	3
2008	3
2009	3
2010	4
2011	7
2012	8
2013	19
2014	1

Table 4 is showing the archiving year of the Journal in DOAJ. It is revealed that the first Biotechnology Open access Journal was archived in DOAJ in the year 2003. Most of the Journals were archived in the year 2013.

Table 5: Publication Cost

Charge Publication cost	No. of journals
Yes	29
No	28

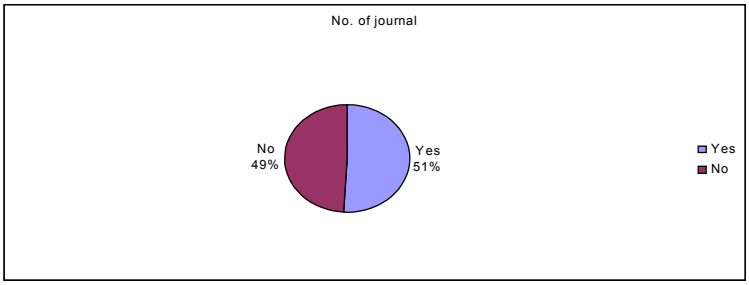

Figure 5: Publication cost

Table 5 and Figure 5 are depicting that most of the Open Access Journal charged for publishing article. 51% Open Access Journals charged publishing cost and 49% are still free.

6 Major Findings

- India is the leading country for publishing Open access journals in Biotechnology.
- English is the most common communication language for the scientific communication in Biotechnology.
- Biotechnology Open Access Journals are publishing articles from different areas of Biotechnology field.
- There was a steady growth of publishing Biotechnology Open Access Journals starting from 2003.
- Most of the Biotechnology Open Access Journals has publication cost.

7 Conclusion

Open Access Journal has changed the information accessibility and utilization. Open Access scientific and scholarly journal provide greater visibility to author because every scholars are using open access journals. Biotechnology professionals are also becoming habituated for using

Open Access Journals. It is suggested that scientist and research scholars should try to publish their research findings in open access journals for greater impact factor and citation index.

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Globalizing College Libraries Using ICT : A Case Study

*Chaudhuri Mafijul Kabir**

Abstract

Most of the universities and the colleges under the universities are to be going to change their collection development, services, and other requirements to cope with the era of globalization. In this paper, an attempt has been made to discuss about the globalizing the college libraries (academic libraries) by using ICT (Information Communication Technology).

1 Introduction

In the opinion of Guillen,(2000), globalization is a process leading to greater interdependence and mutual awareness among economic, political and social units of the world. It is the "accelerated compression of contemporary world and the intensification of consciousness of the world as a singular entity". Wikipedia defines globalization in "literal sense as simply a means of international integration , that is a process by which the people of the world are unified into a single society and functioning together". This process is a combination of economic, technological, socio-cultural and political forces, hence Akanni (2008) asserts that globalization is a broad term with several dimensions such as economic globalization, globalization of education, globalization of sports events, globalization of library services, among others. It is obvious from the foregoing that ICT is a major factor in the actualization of globalization. With the use of ICT, it has become possible to access a variety of information and knowledge sources in a manner that would be simple, easy and independent of time, place and subject discipline. ICT revolution is seen as the central and driving force for globalization which has widened the imagination and the abilities of library and information professionals to produce, access, adapt and apply information in their organization and institutions.

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2 Benefits of Globalization

Viewed in the light of globalization which is clearly the shrinking of the world into a seamless entity, the benefits of globalization to the information procession and hence academic libraries are enormous. There are transformations of traditional libraries to virtual migration of information to electronic format. These are all responses to pressure being faced by educational research and learning organizations to acquire, process, manage, discriminate and communicate knowledge in electronic format using the new information technologies. Physical barriers have been broken down, libraries and the services they provide now have borderless territories due to the application of ICT in libraries thus resulting in the benefits articulated several years ago by Alsa and Kelechukwu(1998) as follows:

- Quick and convenient information exchanges;
- Access to experienced and expert individual in thousand fields;
- Enhancement of team work across geographical distance;
- Access to archives information worldwide;
- Transfer of data between machines and provides a great platform to have fun and be entertained;
- As a reference tool, the internet provides wealth of up-to-date resources unavailable in bond volume;
- The internet gives personal access to specialization and experts in hundreds of disciplines;
- It enables you to reach your fellow librarians with messages and documents independent of the constraints of mails, telegraphs or even fax;
- One can collect news and facts which can be stored in one's computer for later use in reference;
- Resources in the internet allow libraries to provide better services to their patrons by giving on-line access to information that will be difficult to locate in any other manner;
- The internet provides access to bibliographic records of millions of books and the details of the holdings of academic and research libraries around the world. Electronic journals and newsletters are made available on a regular basis;
- Librarians can make the selection of books required in their institutions and order them without going from one bookshop or publisher to another;
- The CDROM in another versatile facility made available in academic libraries through the presence of information technology.

Omekwu and Echezona (2008), corroborated these benefits as follows:

- Libraries are now situated in cyberspace;
- Library services are no longer constrained to time of opening and close hours;
- Library users can access services in libraries beyond their own, beyond their country and continent ; and
- The virtuality of information resources means that millions of users can access one resource at the same time.

3 Role of College Librarian

The changes generated by the last wave of globalization put the libraries, together with other types of organizations and with society as a hole, in front of some challenges, to which they react, to answer in a way or another. Libraries are among the oldest socio-cultural institutions, with an important role in the evolution of human civilization through the functions they accomplish: custodial, educational, aesthetic and informational. They are part of all systems in society and along the centuries they have in society.

Internet access is one of the greatest technological advancement in Information and Communication Technology (ICT) which has gone a long way to influence the mode of information gathering, storage, retrieval and dissemination in these times. Academic institutions play major roles in the manpower development of any nation since they provide the high as well as middle level manpower needed for the social, economic and political advancement of nation. This is done through their programmes of teaching, learning, research and community services. The central place of academic libraries is called into play because it is the duty of these libraries to provide the necessary information to the lecturers and students to achieve their teaching learning and research needs in the easiest, fastest and most comprehensive way. The current trend in many library worldwide in the deployment of ICT facilities in rendering services of various kinds to their patrons thereby providing speedy and update information for their use. Furthermore, the globalization of the entire world in recent times has placed additional demands on academic libraries to conform in order to avoid the risk of obsolescence and irrelevance in the scheme of things.

The futuristic academic libraries in the higher education system must globalize if they want to add value to the academic enterprise, concluded the recently held International Conference on Academic Libraries – ICAL 2009. The academic libraries in India and other developing countries are at least a decade behind their counterparts in the developed countries. The ICAL 2009 which was specially called to reposition academic libraries as the next generation libraries, recommended 'globalizing academic libraries' in the network environment. The model proposed by the conference in essence envisages collaboration between libraries at local, state, national, and global level on all library dimensions, for instance performing library functions of resource building, cataloguing, and back end operations at consortia level offering online avenues for managing

library functions. This short of new set up would essentially be helping client libraries relieving them of the hassles and burden of managing local library management systems as well as obviating the need to undertaking capital intensive and time consuming activity of building cataloguing databases at local level.

Libraries constitute an important element of the foundation of knowledge economy, said Dr Sam Pitroda, the chairman of National Knowledge Commission of India in his inaugural address. The government of India has agreed to set up National Commission on Libraries as recommended by National Knowledge Commission. The commission would be set as a statutory body to address academic library vision for 2020. Given issues pertaining to information and learning needs of the country, the manpower requirements of the country in the library sector and how to meet the same through education and training. The government has also agreed to set up and institution in the country for advanced educations and training in the library and information science, he said on the occasion. The futuristic academic libraries must complement each other's resources rather than duplicate them as has been the practice at present, advised Prof. B. L. Mungekar, former Member of Planning Commission and the patron of the conference.

The highlights of the ICAL 2009 were the futuristic vision of academic libraries – globalizing academic libraries by 2020, the framework of planning road map for vision implementation, the exhibition of corporate house such as Elsevier, Sage, Informatics and the INFLIBNET from UGC participated in panel discussion chaired by Prof. B L Mungerkar, on the topic of library publisher relationship for globalizing academic libraries.

The ICAL 2009 therefore gave a call for 'globalizing academic libraries' in the network environment as the academic library vision for 2020. Given the challenges on how to develop academic libraries as the next generation libraries and on how to enable them to cope with imminent expansion planned in the higher education sector.

The IACL – 2009 call for globalizing academic libraries is very timely and relevant. The globalized academic libraries is to be seen as another but different library model promises to offer several inherent advantages over the library model such as strategic, operational , and economic on the following lines:

- Enabling utmost economy and performance in the library operations at the client level;
- Enabling libraries to builds common resources at the consortia level as opposed to current practice of building resources at the client level in the distributed environment;
- Enabling libraries to go in for minimal ICT infrastructure at client level compared to high end requirements mandated as at present;
- Enabling access not only to local resources but also to resources distributed across university libraries;

- Enabling professional staff sufficient opportunities to develop expertise in core library and information science areas and not be bogged down with the requirement to necessary develop high end expertise in ICT; and
- Enabling libraries to play strategic and educational roles in order to add value to the academic enterprise.

The eleven point roadmap that the ICAL 2009 outlined for globalizing academic libraries is as follows:

- To ascertain the strengths and weakness of libraries under the central and state universities in India in the form of a status report;
- To identify alternate modes of managing traditional library function in the global academic library mode;
- To identify the news dimensions that could be added to academic library services by exploiting common pool of resources;
- To identify the strategic and educational roles that libraries and librarians could play to add value to academic enterprise and in the knowledge society;
- To undertake new initiatives such as building digital resources of indigenous knowledge of unique character;
- To formulate ICT plan for systematic development of futuristic global academic libraries;
- To formulate plans for ensuring quality and standards in the functioning and performance of futuristic global academic libraries;
- To encourage international collaboration on all library fronts for bringing about qualitative change in the functioning and performance of futuristic global academic libraries;
- To Identify and formulate appropriate policies, programmes, and systems for ICT integration at library client level and consortia level;
- To identify the priority areas for talent development and formulating talent development plans for the purpose; and
- To evolve suitable strategies for management, library advocacy and marketing essentially with a view to change the public image of the academic libraries.

According to the report of Higher Education in West Bengal (2010 – 2011) there are 452 general colleges in West Bengal under different universities. The following chart shows details:

University	General Colleges
1.Calcutta University	129
2. Burdwan University	93
3. Vidyasagar University	44
4. Kalyani University	43
5. North Bengal University	50
6. West Bengal State University, Barasat	50
7. Gour Banga University	24
8. Sidho Kanho Birsha University	19
Total	452

Most of the above mentioned universities are going to be changed in any form of ICT to cope with globalization era and most of the colleges under these universities are going to be changed in any form of ICT to upgrade their libraries to cope with globalization era.

In the district of 24th Paragonas(South) there are 38 general colleges and 1 Women University (in growing stage). Most of the colleges are accepting the rapid growth of ICT, at least every colleges has their own website.

4 Dinabandhu Andrews College: On Change in Library in Globalization Era

Dinabandhu Andrews College (Government Sponsored), a premier co-education institution was established in the year 1956 by an order of the Government of West Bengal.

The college is named after Rev. C. F. Andrews, a celebrated saint, philanthropist, a trustworthy friend of the downtrodden and a close confident of Kabiguru Rabindranath Tagore. His great love for the people of India and excellent service and sacrifice for the suffering millions of our motherland, more especially for emancipation to all constituents of the college - its administration, staff members and students.

The college was basically constituted at the fringe of this semi-urban zone of 24pgs (South) District with an aim to disseminate the scope of higher education to a huge number of children of the displaced persons from erstwhile East Pakistan, presently Bangladesh. Moreover, this institution is also providing immense opportunities of higher education to a large number of rural and urban students, a substantial and marginalized section of the society.

The college library was started along with the establishment of the college in order to cater the academic and research needs of the faculty, students and staff members. Since then the college library has gone strength to strength to live up to the expectation of its immediate clientele.

The college library comprises Central Library and 15 Separate Seminar Library attached to every Advanced Departments. Besides these, there are 2 separate Library in the Post Graduate

(Zoology and Electronics) and also separate Library in the Morning Section in the college.

The college Library has a collection of more than 30,000 books, 22 Indian Journals, some reference books, and Carrier guidance journal of current information, general knowledge and other documents.

The college library procedures, namely cataloguing, serial management, acquisitions, circulations, catalogue search both manually and automated and access to examination question papers manually.

The Central Library has been completed the database of all books , journals and membership by using CDS / ISIS soft ware according to standards prescribed by the UGC – INFLIBNET and we are going to shift all the records into SOUL soft ware. We are also providing INTERNET facilities to our members. Besides these we are going to organizing a Digital Library section very soon.

Beside the traditional services, Library is offering the following services to users:

- Database Searching
- CD-ROM searching
- INTERNET SEARCHING
- On line Public Access Service
- N-List searching

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Annals of Library and Information Studies: An Analysis of Citation Pattern

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*Bidyarthi Dutta***

Abstract

This study based on 2318 citations appended to 106 research articles of the year 2010-2012 of *Annals of Library and Information Studies*. The authorship pattern shows that 57.7 percent are single-authored, 27.8 percent double- and 10.5 percent triple-authored and the remaining 4.1 percents are joint contributions of four to seven authors. There are 2061 cited authors and nearly 350 cited journals. It is clear that a majority of documents cited in these years were published not more than twenty years ago. The Bradford's law and Lotka's law were verified for the cited journals and authors respectively. It has been observed that the respective distribution patterns fairly in consonance with these two bibliometric laws.

1 Introduction

A citation is a reference to a published or unpublished source of information. More precisely, a citation is an abbreviated alphanumeric expression embedded in the body of an intellectual work that denotes an entry in the bibliographic references section of the work for the purpose of acknowledging the relevance of the works of others to the topic of discussion at the spot where the citation appears (Reitz, 2004). Citation counts precisely indicate how frequently researches are using particular research articles on concerned topic. It can be interpreted as measures of the usage and impact of the cited work. The total number of times each paper has been cited by all journals could be known from citation counts. Citation upholds intellectual honesty that firmly discourages plagiarism. It is the citation analysis that http://en.wikipedia.org/wiki/Citation - cite_note-1 attributes prior or unoriginal work and ideas to the correct sources. It allows the reader communities to determine independently whether the referenced material supports the author's argument in the claimed way and helps the reader to gauge the strength and validity of the material the author has used. The functions involved in the process of citation are acknowledging or citing the author, year, title and locus of publication (journal, book, or other) of a source used in a published work. This is known as citation analysis. This is also considered as an

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important part of the subject bibliometrics. Among the measures that have emerged from citation analysis are the citation counts for:

- an individual article (how often it was cited);
- an author (total citations, or average citation count per article);
- a journal (average citation count for the articles in the journal).

Eugene Garfield has been advocating, since the 1950s, for an index in the field of science and technology. He made some experimental studies and in 1961 brought out an experimental Science Citation Index. Since 1964, Garfield's institution, the Institute of Scientific Information at Philadelphia, has been regularly bringing out the Science Citation Index (SCI). Since 1972 a Social Science Citation Index (SSCI) and in 1980 the Arts and Humanities Citation Index are also being brought out.

Citation Pattern is the pattern of cited journal and also the pattern of author occurrences in references. On the basis of these patterns two important laws are described, i.e. Bradford's Law and Lotka's Law. These are known as fundamental laws of bibliometrics or scientometrics. These laws empirically describe the distribution pattern of journals and authors on any particular subject domain.

Bradford's law of scattering of subjects in information sources, first published in 1934, states that the documents on a given *subject* is distributed or scattered according to certain mathematical function so that a growth in papers on a subject requires a growth in the number of journals/ information sources. The numbers of the groups of journals to produce nearly equal numbers of articles is roughly in proportion to k*(1: n: n2) …, where k is called the Bradford multiplier and n is an integer (1, 2, 3....). Bradford's distribution has several mathematical implications (Dutta and Sen, 2005).

Lotka's Law was named after Alfred J Lotka. It describes the frequency of publication by authors in any given subject field. It states that the number of authors making n contributions is about 1/na of those making one contribution, where 'a' always nearly equals two. More plainly, the number of authors publishing a certain number of articles is a fixed ratio to the number of authors publishing a single article. Since the number of articles published increases, therefore the number of authors producing that many publications becomes less frequent. It means that the number of authors making contributions is about $1/n^2$ of those making one; and the proportion of all contributors, that make a single contribution, is about 60 percent. This means that out of all the authors in a given field, 60 percent will have just one publication, and 15 percent will have two publications ($1/2^2$ times of 60). Seven percent authors will have three publications ($1/3^2$ times of 60), and so on. According to Lotka's law of scientific productivity or cited author pattern, only six percent of the authors in a field will produce more than 10 articles. Lotka's law, when applied

to large bodies of literature over a fairly long period of time, can be accurate in general, but not statistically exact. The general form of Lotka's law can be expressed as y=c/xn where y=percentage of authors, x=number of articles published by an author, c=constant and –n=slope of the log-log plot. The pattern observed for cited authors is also more or less identical. In this study, among 2059 authors, 1598 authors (77.6%) were cited once; 258 authors (12.5%) received two citations and 95 (4.6%) authors received three citations.

2 Related Works

The investigation of citation pattern analysis has been an integral part of LIS research. A good number of studies have been carried out in different times on the citation analysis in several countries of the world. The citation pattern of the *Journal of Biosciences* was studied by Das and Sen (2001). The citation patterns of *Indian Journal of Chemistry Section A* and Indian Journal of Pure and Applied Mathematics were studied by Dutta and Sen (2001). Also the citation pattern of *Indian Journal of Physiology and Allied Sciences* was studied by Koley and Sen (2003). The same for *Indian Journal of Plant Physiology* was studied by Shokeen and Kaushik (2004) and for *Journal of Oilseeds Research* was studied by Kumar and Kumar (2004). Das (2013) studied the bibliometric profile of the Journal of Informetrics. Sharif and Mahmood (2004) studied the style of citing literature by the economists. The citation analysis of scholarly communications was studied by Haridasan and Kulshrestha (2007). The use of bibliometric tool in collection development was discussed by Yeoh and Kaur (2008). Maharana, Majhi and Sethi (2011) carried out citation analysis of top research papers in chemistry with specific reference to India. The citation analysis of doctoral thesis in botany submitted to Kuvempu University was studied by Banateppanvar, Biradar and Kannappanavar (2013). The journal self citation and author self citation of *Annals of Library and Information studies* was carried out by Rattan (2013). The citation patterns of research publications contributed by National Metallurgical Laboratory, Jamshedpur was studied by Sahu, Goswami and Chaudhury (2011). The citation patterns of Indian science journals were executed by Garg and Kumar (2010). Helama (2012) studied citation patterns in doctoral dissertations. The Use of non-social work journals in social work research was discussed by Strothmann (2010). The analysis of research performance in undergraduates receiving face to face versus online library instruction was studied by Clark and Chinburg (2010). Sansone, Leung and Wiederman (2012) were carried out driving citations and aggressive behaviour. The citation management were executed by Glassman & Sorensen (2012). Cox (2008) studied citation analysis of graduate dental theses references. The Rankings and trends in citation patterns of communication journals were studied by Levine (2010). The citation analysis of three types of Ichthyologic Publications were discussed by MLS (2007). Sinn (2005) studied a local citation analysis of mathematical and statistical dissertations. E-Journals and Citation Patterns were discussed by Parker, Bauer & Sullenger (2003).

3 Objectives of the Study

The chief objectives of the present study are to find out:

- Authorship pattern of cited references;
- Distribution of cited author and verification of Lotka's law
- Distribution of cited journal and verification of Bradford's law;
- Forms of document cited;
- Age of cited references;
- Percentage of author self citation;
- Percentage of journal self citation;
- Source or contributing authors;
- Potential keywords to find out thrust areas of research

4 Scope

This study covers citation analysis of *Annals of Library and Information Studies* during the years 2010 (Vol. 57), 2011 (Vol. 58) and 2012 (Vol. 59). The total number of articles and cited references contained by three volumes of this journal is 106 and 2318, which means 21.9 (~22) cited references per article. The number of cited authors and cited journals are 2061 and 350 respectively.

In the year 1954, erstwhile INSDOC launched Annals of Library Science as its first publication and Dr. S R Ranganathan was its first Editor. The journal's title was expanded to Annals of Library Science and Documentation in 1964 and again renamed in 2001 as Annals of Library and Information Studies. Into its 61st volume in 2014, *Annals of Library and Information Studies* is the oldest continuing and peer-reviewed Indian LIS journal at the national level.

This journal has been chosen because in India it is leading core journal in LIS perspective. *Annals of Library and Information Studies* is a quarterly journal in publishing original papers, survey reports, reviews, short communications, and letters pertaining to library science, information science and computer applications in these fields.

5 Methodology

The cited items have been categorized in sixteen classes or document types, i.e.

1. 1. journal article
2. Book
3. Cyber reference

4. Thesis
5. Report
6. Proceedings
7. Conference paper
8. Seminar paper
9. Workshop paper
10. Dissertation
11. Book chapter
12. Encyclopaedia
13. News item
14. Monograph
15. Standard
16. Handbook

Different Components of citation that have been studied here listed below:

- For Journal article= author(s), cited journal name with vol. and issue no, country, year.
- For Book= author(s), place of publication, year of publication.
- For Cyber References= author(s), URL. The references are indicated as "Cyber Yes", if access time is present and "cyber-No", if access time is not present.
- For Thesis= author(s), place, year
- For Report= year, place
- For Proceedings= author(s), place, year
- For Conference paper= author(s), place, year
- For Dissertation= author(s), place, year
- For Seminar paper=author(s), place, year
- For Workshop paper=author(s), place, year
- For Book Chapter= author(s), place, year
- For Encyclopaedia=author(s), place, year
- For News Item=source-name, author, year
- For Monograph=author, year
- For Standard= place, year
- For Handbook=author(s), place, year

The references from each article of each issue of the journal were collected for the period of 2010-12, which accounted for 2,318 citations. The data relating to all the references appended to the articles during the period were collected and analysed.

6 Results & Analysis

6.1 Authorship Pattern

The authorship pattern has been presented in Table 1 and Figure 1 that reveals that the percentage of single authored citation is highest (57.7%) followed by two authored citations (27.8%) & three authored citations (10.5%). Hence solo research is highest in this subject area compared to team research. The citation of more than three authors, i.e. the large team research is negligibly small here.

Table 1: Authorship pattern

No. of articles contributed by	2012	2011	2010	Total	Percentage
single author	234	418	526	1178	57.7%
2-author	90	211	266	567	27.8%
3-author	36	80	99	215	10.5%
4-author	7	17	21	45	2.2%
5-author	2	5	14	21	1.0%
6-author	2		3	5	0.2%
7-author	2	3	7	12	0.6%

6.2 Verification of Lotka's Law

The pattern observed for cited authors is more or less identical with Lotka's distribution. In this study, over the entire period, among 2059 authors, 1598 authors (77.6%) were cited once; 258 authors (12.5%) received two citations and 95 (4.6%) authors received three citations. These are the percentage values obtained assuming the value of a = 2. The top three cited authors over the said period are, E Garfield, M Thewall and V.L.Kalyane respectively.

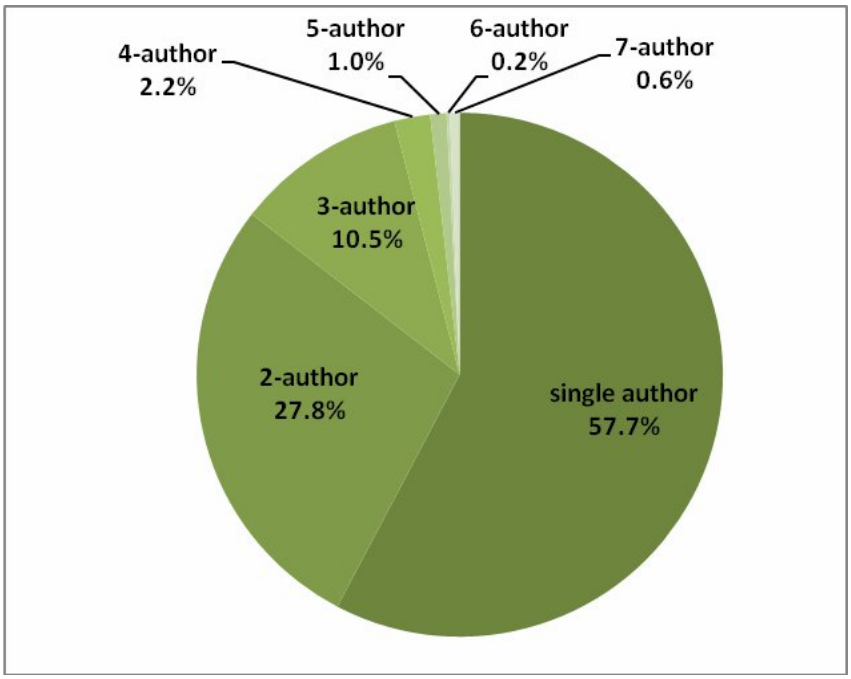

Figure 1: Authorship pattern

Table 2: List of cited authors since 2010 to 2012

Rank	Cited author	Frequency (No. of
1	Garfield E	154
2	Thewall M	53
3	Kalyane V L	42
4	Kademani B S	30
5	Leydesdorff L	29
6	Kumar S	23
7	Garg K C	19
8	Rousseau R	18
9	Gupta B M	17
10	Glanzel W, Sen B K, Smith A	13
11	Cronin B, Ingwersen P	12
12	Arunachalam S, Gordon J, Kumar V, Lease	10
13	Prathap G	9
14	Babu B R, Dutt B, Egghe L, Lane F S, Moed H F, Price D J de Solla, Small H, Smith A G	8

15	Arora J, Bradford S C, Gopalakrishnan S, Hirsch J E, Jansen B J, Lagoze C, Mukhopadhyay P, Noruzi A, Schubert A, Tenopir C	7
16	15 authors cited 6 times each	6
17	15 authors cited 5 times each	5
18	41 authors cited 4 times each	4
19	95 authors cited 3 times each	3
20	258 authors cited 2 times each	2
21	1598 authors cited once each	1

Table 3: Distribution of number of authors and frequency of citations (2010-12)

No. of authors	Frequency of citation	Cumulative No. of authors (X)	Cumulative frequency of citation (Y)	Ln (X)	Ln (Y)
1	154	1	465	0.00	6.14
1	53	2	311	0.69	5.74
1	42	3	258	1.10	5.55
1	30	4	216	1.39	5.38
1	29	5	186	1.61	5.23
1	23	6	157	1.79	5.06
1	19	7	134	1.95	4.90
1	18	8	115	2.08	4.74
1	17	9	97	2.20	4.57
3	13	12	80	2.48	4.38
2	12	14	67	2.64	4.20
4	10	18	55	2.89	4.01
1	9	19	45	2.94	3.81
8	8	27	36	3.30	3.58
10	7	37	28	3.61	3.33
15	6	52	21	3.95	3.04
15	5	67	15	4.20	2.71
41	4	108	10	4.68	2.30
95	3	203	6	5.31	1.79
258	2	461	3	6.13	1.10
1598	1	2059	1	7.63	0.00

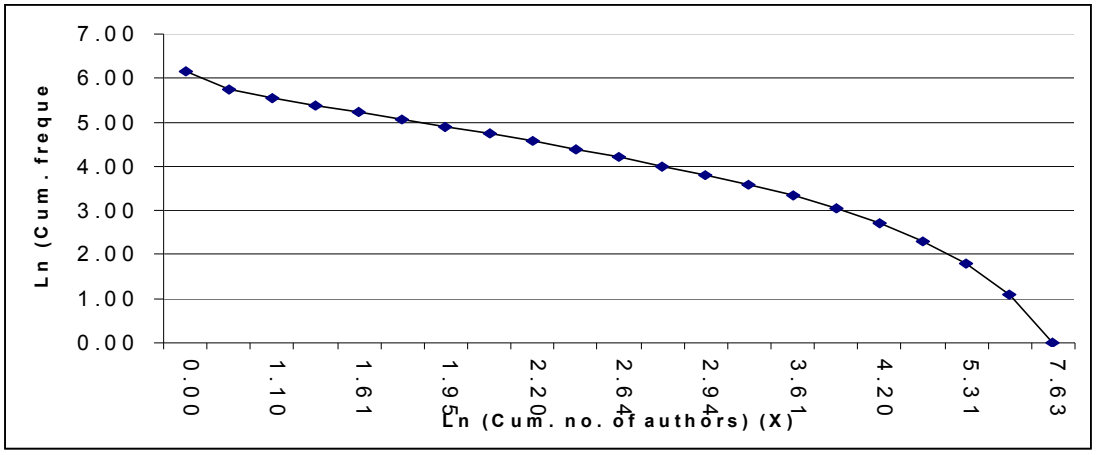

Figure 2: Ln (X) vs. Ln (Y) plot

The cumulative values of the two variables are presented in Table 3. The Ln (X) vs. Ln (Y) plot in Figure 2 shows central linear portion with slight upward concave curvature at the top and upward convex curvature at the tail of the curve. The central linear portion conforms the consonance of cited author pattern to Lotka's law but with little deviation as signalled by tilts at two ends. The equation depicting Lotka's distribution may be presented as:

$$y=c/x^n \text{.....(1)}$$

Where, c and n are constants for a particular set of data. The values of Lotka's constants, i.e. 'c' and 'n' for the three years and over the stipulated period (2010-12) are furnished in Table 4.

Table 4: Values of Lotka's constants over different years

Year	Lotka's constants	
	c	n
2010	1002	1.4
2011	728	1.5
2012	528	2.3
2010-12	2059	1.4

The values of 'n' for the years 2010, 2011 and (2010-12) are almost equal, while the same for the year 2012 somehow varies. The values of 'c' are also different over different years. It can thus be inferred that the cited author distribution patterns over the years for this journal are not exactly alike.

6.3 Types of Documents

Literature cited in the journal is published in different types of documents like books, journals, conference proceedings, thesis etc. The information regarding the type was collected from the

source data and presented in Table 5 and Figure 3.

Table 5: List of type of document for the stipulated period (2010-12)

Rank	Type of document	Frequency with percentage
1	Journal	1258 (54.3%)
2	Cyber-Yes	411 (17.7%)
3	Book	327 (14.1%)
4	Cyber-No	135 (5.8%)
5	Proceedings	39 (1.7%)
6	Report	34 (1.5%)
7	Thesis	33 (1.4%)
8	Conference paper	30 (1.3%)
9	Seminar paper	21 (0.9%)
10	Workshop paper	8 (0.3%)
11	Book Chapter, Dissertation	7 (0.3%)
12	Encyclopedia	4 (0.2%)
13	Handbook, Monograph, News Item, Standard	1

The analysis of document type for the entire time span reveals that the percentage of journal article citation is highest (54.3%) followed by cyber-yes citations (17.7%), book citations (14.1%) & cyber-no citations (5.8%). Hence journal article is maximum and the total percentage of cyber references & book citations (37.6%). The percentage of others type of document are very small (7.9%). The notable feature is that the percentage of cyber-reference is occupying the dominant position. This indicates that users are mostly concerned about online documents nowadays and this trend is rapidly increasing day by day. Also, cyber-yes reference always outnumbers cyber-no reference, which means that the authors are aware of access time and the same is given with the reference. Since cyber references are highly ephemeral in nature, therefore access-time should be mandatory in cyber-reference.

6.4 Citation Age

This study reveals yearwise distribution of citations. The age of citations was calculated by noting the difference between the year of publication of citing articles and that of cited documents and are presented in Table 6 and Figure 4.

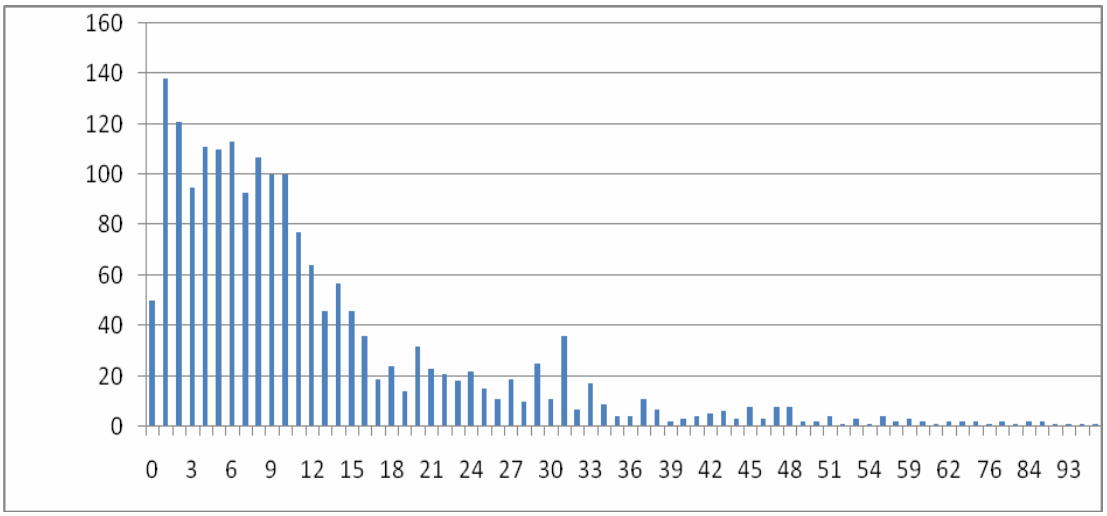

Figure 4: Distribution of citation age over the entire time span (2010-12)

The analysis of overall citation age states that the frequency of one year old citation is highest (138) followed by the frequency of two year old citation is (121). The frequencies of six, four and five year old citations are (113), (111) & (110) respectively. This result indicates that the authors mostly use very recent citations.

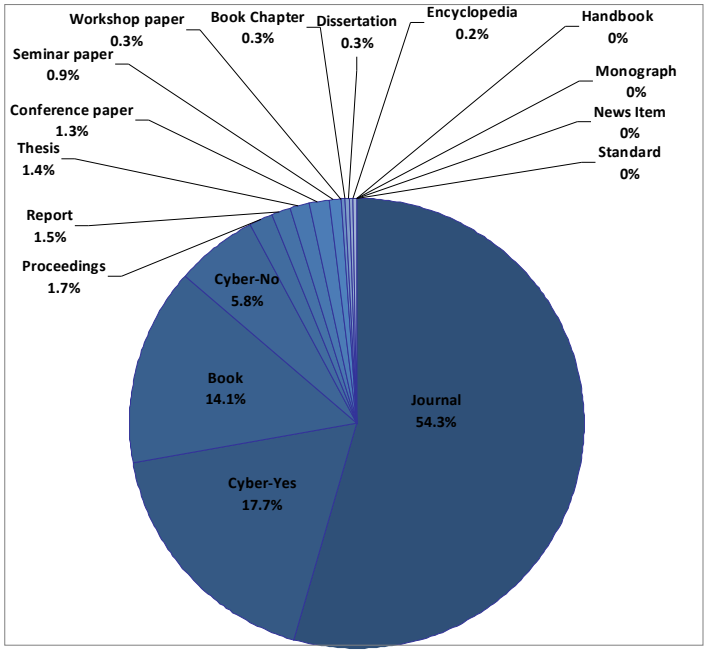

Figure 3: Distribution of types of documents for the stipulated period

Table 6: List of citation age over the total time span (2010-12)

Citation age (in years)	Frequency	Citation age (in years)	Frequency
0	50	36	4
1	138	37	11
2	121	38	7
3	95	39	2
4	111	40	3
5	110	41	4
6	113	42	5
7	93	43	6
8	107	44	3
9	100	45	8
10	100	46	3
11	77	47	8
12	64	48	8
13	46	49	2
14	57	50	2
15	46	51	4
16	36	52	1
17	19	53	3
18	24	54	1
19	14	55	4
20	32	57	2
21	23	59	3
22	21	60	2
23	18	61	1
24	22	62	2
25	15	63	2
26	11	64	2
27	19	76	1
28	10	78	2
29	25	83	1
30	11	84	2
31	36	85	2
32	7	89	1
33	17	93	1
34	9	104	1
35	4	145	1

6.5 Source Authors

The list of source authors for this period is presented in Table 7, which shows that B K Sen contributed highest number of articles (7) since 2010 to 2012 followed by B M Gupta (6 articles), and I U Rajgoli and K C Garg who contributed 3 articles each.

Table 7: List of source authors

Rank	Source authors	Frequency (No. of articles contributed)
1	B K Sen	7
2	B M Gupta	6
3	I. U Rajgoli, K C Garg	Contributed 3 each
4	B. Mukherjee, G. Prathap, J. K Pal, J. K. Sarkhel, M. Haneefa K, P. P. Ray, P. S. Mukhopadhyay, S Kumar	Contributed 2 each
5	160 authors	Contributed 1 each

6.6 Cited Journals' Ranking and Bradford's Distribution

The ranking of cited journals is done to identify the core journals containing the research literature. It is necessary to know the most productive journals used in references and for further study of the subject, this information is useful for the librarians as well as research scholars. The ranked cited journals are listed in Table 8 and the corresponding Bradford's pattern is presented in Table 8A.

Table 8: List of cited journal names since 2010 to 2012

Rank	Journal Name	Frequency (no. of times cited)
1	Scientometrics	114
2	Essays of an Information Scientist	82
3	Annals of Library and Information Studies	59
4	Journal of Documentation	49
5	Journal of the American Society for Information Science and	36
6	Current Science	35
7	Journal of Information Science	26
8	Information Technology and Libraries, Journal of the American Society for Information Science	25
9	Annals of Library Science and Documentation	20
10	The Electronic Library	19
11	ASLIB Proceedings, SRELS Journal of Information Management	18
12	College & Research Libraries, Science	17
13	Information Processing & Management	15
14	Library Trends	14
15	Library Review	13
16	Journal of Academic Librarianship	12

17	Libri, Malaysian Journal of Library and Information Science, Nature, Online Information Review	11
18	American Documentation, Library Management	9
19	Bottom Line: Managing Library Finances, Bulletin of the Medical Library Association, DESIDOC Journal of Library & Information Technology, Indian Journal of Open Learning, Information Studies, Library and Archival Security, Library Hi Tech, New Library World, The International Information & Library Review	8
20	3 journals cited 7 times each	7
21	5 journals cited 6 times each	6
22	10 journals cited 5 times each	5
23	10 journals cited 4 times each	4
24	22 journals cited 3 times each	3
25	47 journals cited 2 times each	2
26	215 journals cited 1 times each	1

Table 9: Analysis of Bradford's pattern

S.No.	Year	No. of cited journals (J)	Freq. of citations (C)	Av. freq. of citation (C/J)	Observed pattern	Approximated pattern	Value of 'k'	Value of 'n'
1	2010	167	607	3.6	4*(1 : 5.2 : 35.2)	$4*[1 : 5 : (6)^2]$	4	5
2	2011	168	443	2.6	9*(1 : 3.6 : 14)	$9*[1 : 3.6 : (3.6)^2]$	9	3.6
3	2012	129	224	1.7	9*(1 : 3.2 : 9)	$9*[1 : 3 : (3)^2]$	9	3
4	2010-	347	1273	3.7	8*(1 : 5.6 : 36.7)	$8*[1 : 6 : (6)^2]$	8	6

The average frequency of citation is least in the year 2012 and highest during the entire period. The values of 'k' for the years 2011 and 2012 are identical and least for the year 2010. Similarly the values of 'n' for the years 2011 and 2012 are nearly identical and least for the year 2010. The important feature is that the overall value of 'k' lies within the range of individual yearly values while the same for 'n' crosses the range of individual yearly values. The distribution of cited journals approximately tallies with Bradford's pattern.

6.7 Keyword Analysis

In the year of 2010 of *Annals of Library and Information Studies* keywords are not present. In the year of 2011 few keywords are present. But in the year of 2012 sufficient keywords are available. It is clear from the analysis of keywords that the thrust area of research during this period was e-resource consortia. Several articles about the country Nigeria also appeared in this journal during the time. Maximum number of keywords occurred only once that is listed in Table 10.

Table 10: List of keywords for the year 2012

Keyword	Frequency
E-resources	7
Consortia	4
Nigeria	3
Bi-frequent keywords: Academic libraries, Archiving, Bradford's Law, E-journals, Resource Sharing	
Mono-frequent keywords: Attitude to computers, Bibliometrics, Bradford Distribution, Bradford's Law of Scattering, Bradford's zones, Citation Measure, Collection development, Collection Security, Computer literacy, Computer skills, Concept Symbols, Content Management, Critical Success Factors, Databases ranking, Defaults, DeLCON, Dementia, Diffusion, Digital Libraries, Digital Preservation, Disease, Doctoral theses, DRDO, Dye-sensitized solar cells, E-journals consortium, Electronic health information, Electronic resources usage, ERMS, Financial and industry databases, Higher education, Impact Factor, INDEST-AICTE Consortium, Indexing & Abstracting Service, Indian Language, Indian S & T journals, Information and communication technology, Information format preferences, Information Management, Information resources, Information seeking behaviour, Information utilisation, Institutional Repository, Koha, Language Search, Letter correspondences, Librarians, Library Security, Library Automation, Library Cooperation, Library staff, Matthew Effect, National Solar Mission, Networking, Non-Silicon, Online Interactivity, Open Source Software, Pakistan, Pricing, Productivity of journals, Psychology, Publication, R & D strategy, Rabindranath Tagore, Research output, Scholarly Electronic Resources, Scientometrics, Scientometrics-India, Silicon, SUCHI, Text Processing, Training, Uganda, Universities, University Libraries, URLs, Usage, Usage Statistics, Use studies, Web 2.0 Website Quality, Women in Science	

6.8 Self Citation

The analysis of overall author self citation reveals that in 2010 author self citation is highest (79) followed by 2011 author self citations (44) & 2012 author self citation (18). Hence in 2010 author self citation is maximum here compare to other. The analysis of overall journal self citation reveals that in 2010 journal self citation is highest (24) followed by 2011 journal self citations (30) & 2012 journal self citation (5). Hence in 2011 journal self citation is maximum here compare to 2012.

Table 11: Author self citation

Year	Frequency (no.of times self cited authors)
2010	79
2011	44
2012	18

Table 12: Journal self citation

Year	Frequency(no. of times self cited journals)
2010	24
2011	30
2012	5

6.91 Indian vs. Foreign Citation

The analysis of overall country wise citations reveals that the foreign citation is highest (75%) & Indian citation is low (25%). The Indian authors highly prefer foreign sources of information compared to Indian sources.

Table 13: Indian vs. Foreign citation

Country	Frequency
Indian citation	353 (25%)
Foreign citation	1068 (75%)

7 Conclusion

Annals of Library and Information Studies is a leading quarterly journal in library and information studies. It is core journal in LIS perspective. The results highlight that 75% citations are from outside India. Its percentage of self citation is pretty low. The journal has a Web site too to attract international attention and it is an open access journal that increases its international visibility. Of the cited items, journal article is maximum here compare to others. The percentage of others type of document are small. Core journals have been identified which shall be useful to scientist and libraries. The cited journal distribution pattern fairly in consonance with Bradford's distribution pattern and the cited author distribution pattern more or less tallies with Lotka's distribution pattern. It is to be noted that the solo research or individual research in this subject is highly dominating compared to team research as clear from the analysis of authorship pattern.

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Who Should Be A Librarian? Neuropsychology, Prefrontal Cortex and Aging of LIS entrants

Soumen Mallik[*]

Abstract

The solemnity of Librarianship in the divine of knowledge generation cycle has ever acknowledged. Librarians are playing the role of priests to the knowledge era albeit unfortunate struggle for status and respect from the society. The entrants of the professional training experiences contradictions in professional expectations and apathetic facilitation by both the organizations and society. Information professionals are required to be matured human beings to overcome the professional dilemmas and sustainability of their profession career. Neuropsychological maturation has been considered as crucial for the aspirants to become librarianship trainees. The results of the researches on neuropsychology, human brain development and educational psychology have been analyzed. This study recommends that the incumbents must be at least of 21 years old to become professional trainees in librarianship.

1 Introduction

Librarianship is a worship to the divine of knowledge. Librarians are latent companions of knowledge generators in their journey of novelty. Existence of this noble profession is justified by the exhaustive use of recorded knowledge. It is a peculiar profession in the sense that librarians cannot dictate a research rather they follow its growth and direction. Moreover, the library and information science (LIS) professionals have no control over the generation of knowledge although they are questioned about the usage of collective knowledge. The analogy of library services with health care services provided by nursing staff in hospitals has been mentioned very commonly. Interestingly, librarians are always blamed for retrieval of irrelevant information and nobody care to think about the incomplete invocation of actual information required by the users. Since the user needs are dynamic so as the treatment of subjects by the LIS professionals. Such inherent dilemma of information professional community is expected to expand its horizon. Therefore, the LIS incumbents are required to be psychologically strong for their acquaintance with the professional education in librarianship and also for the sustainability of their professional career.

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The LIS entrants should be matured human beings to understand the professional intricacies of librarianship. The primary traits expected from an information professional are - a holistic attitude to serve the intellectual thrust of users, diagnosis of information queries of users, reconciliation of user's unexpressed knowledge domain, and interest in cross domain intellectual activities. To perceive these qualities, human beings are required to attain a minimum age to complete their neuropsychological development. This article analyses the research output on the maturation of human brain regions (neuropsychological development) required for understanding the issues of professional intricacies in librarianship. Finally, this article attempts to suggest the minimum age for LIS aspirants to initiate their professional training in librarianship.

2 Review of Literature

The application of modern neuroscience data in the design of educational programs has been advised since 1970s which was initiated by Epstein (1974a, 1986) and McCall (1988; McCall et al., 1983). The review of literature reveals that both the issues are critical in nature and establishing relationships between brain and mental growth is difficult to interpret. Moreover, most investigators in this area are reevaluating previously published data; there is little hope that many desirable or critical variables were used in a single research report.

Garry and Garry (1977) evaluated the socio-economic and ideological factors influencing the LIS incumbents for their career choice in librarianship. The study was largely based on data supplied by the Faculty of library science, University of Toronto, which revealed that the recruitment of the majority (more than 50%) of the entrants to the faculty of library science are in the 21-24 age categories.

The results of the survey carried out by Issa and Nwalo (2008) highlights that 38.4% of the LIS entrants were influenced by previous library work experience. The results concluded that the profession remains equally popular amongst both the male LIS students (50.3%) and females (49.7%). That 46.9% of them were in the 22-26 age bracket showed that the younger undergraduates constitute the majority.

Singh and Chander (2013) reports about the predominance of female students (60.6%) over male students (39.4%) in LIS education in India. The results of also exhibits that the huge proportion of respondents (88.8%) joined LIS education between the age group of 20-25, followed by only (10.8%) respondents who enter in the profession at the age of 26-30. Universities wise analysis also shows that the respondents from all the universities joined this course at younger age (20-25). The average means of joining to LIS education is 24.5 years.

3 Importance of Aging in LIS Education

Professional activity in librarianship emphasizes identification of knowledge domains, analysis of information contents, determination of right information for right users and overall management of

information system and centers. Moreover, the LIS incumbents are required to be receptive of any changes in the process of knowledge generation. The knowledge generation cycle is a dynamic process as every sphere of knowledge is ever changing. Therefore, the cognitive maturity of LIS incumbents is considered to play a crucial role in professional training of librarianship.

Historically librarianship has been found to be the least rather last career option for majority of the LIS entrants. Those half-hearted LIS entrants are being trained to be skilled workforce in information activity. They are told that the library is the heart of civilized society, academic institutions etc., ironically they are also learnt that the librarians are striving for due status and respect in their workplace as well as society. The significance of budgeting methodologies in LIS curriculum may be lost in the era of lamenting curtail of fund in library resource building almost everywhere. The dichotomy in LIS training and professional reality necessitates the psychological maturity amongst the LIS incumbents to achieve the goal of professional education in librarianship. The maturity of LIS aspirants is required for understanding of their professional objectives as well as the scope of their professional activity in the society and also to cope up with the dynamics of knowledge activity.

Maturity may be defined operationally as the attained level of psychological functioning beyond which measures of performance no longer increase significantly with age. The term maturity indicates towards the matured human brain which can perform intellectual activities significantly in cross domain information activities (Wechsler, 1950). As conceptualized by Cauffman and Steinberg (2000), psychosocial maturity is constituted of three factors: (a) responsibility, including self-reliance, formation of identity and independence; (b) perspective, including the ability to take the point of view of others, and to analyse decisions within a broader context; and (c) temperance, which looks at ability to limit impulsiveness, and the level of evaluation of situations before acting. In a study assessing psychosocial maturity and decision-making in groups of young people of differing ages (school and college students, ranging in age from 12 to 48 years), Cauffman and Steinberg found that by the age of 21 participants appeared to be more stabilized in their judgment, that psychosocial maturity was a better predictor than age of antisocial decision-making, and that the steepest inflection within psychosocial development occurred between the ages of 16 and 19 (Bryan-Hancock & Casey, 2010).

The LIS professionals are required to be intrinsically motivated for information activities. Researches on career competencies of incumbents exhibit serious doubts about the motivation and the level of knowledge and skills of students (Boutin et al, 2009, and Billett, 2009). An important reason for these disappointing results seems to be the fact that most students fail to develop a clear career wish (let alone a career identity) during their time at school (Geurts & Meijers, 2009). Lack of intrinsic motivation (Plane, 2009) results in students making rather random career choices, and this, in turn, prevents in building of successful professional career.

In Western nations, career guidance in education is primarily based on the trait-and-factor approach (European Commission and OECD, 2004; Sultana, 2004; Irving & Malik, 2005; Watts & Sultana, 2004). In this approach which through the work of Holland (1973, 1985) had a huge influence on the shape and content of career guidance and counselling in education, the concepts 'informed choice' and 'decision making' are key. In this model, a good career choice is made when the personality and the talents of a potential employee match with the required knowledge and skills of the job in question. Therefore, counsellors and teachers should provide students with reliable information about their talents and with information about the knowledge and skills that are needed to carry out particular jobs. The idea here is that students can then make rational choices regarding their careers (Kuijpers, Meijers & Gundy, 2011).

The limitations of this model are also evident. One's career path has become more and more unpredictable, and therefore, it is increasingly difficult to make rational and information-based career choices (Mitchell, Levin & Krumboltz, 1999; Guindon & Hanna, 2002). The idea that students even have the cognitive ability to make rational career choices is also being challenged. Simon (1983) observed that people were not able to make rational decisions because they do not have all the facts, do not have a consistent value system, and, furthermore, do not possess sufficient reasoning skills. Humans have a 'bounded rationality'(when individuals make decisions, their rationality is limited by the information they have, the cognitive limitations of their minds, and the time available to make the decision) that basically only allows them to engage in 'irrational behaviour'(an action or opinion given through inadequate use of reason, emotional distress, or cognitive deficiency) (Tersky & Kahneman, 2000). Youths, in particular, are only capable of a short-term perspective; they only concentrate on one problem at a time (Coleman, 1989). Neurological and neuropsychological research explains this 'bounded rationality' among youths exists because their prefrontal cortex (part of the brain responsible for choice-making) only develops fully between age 20 and 30 years (Gladwell, 2006). Therefore, young people when faced with complex situations will, generally, jump to conclusions (Stuss & Anderson, 2003; Schwartz, 2004).

4 Biology of Human Brain

The National Institute of Neurological Disorders and Stroke provides detailed description about the structure of brain. The brain is the most complex part of the human body. This three-pound organ is the seat of intelligence, interpreter of the senses, initiator of body movement, and controller of behavior. Lying in its bony shell and washed by protective fluid, the brain is the source of all the qualities that define our humanity.

The brain is like a committee of experts. The brain processes involved in mental function are composed of large anatomical regions that are organized hierarchically into executive, cross-

modal, perceptual, and imaging functions. All the parts of the brain work together, but each part has its own special properties. The brain can be divided into three basic units: the forebrain, the midbrain, and the hindbrain.

4.1 Hindbrain - It includes the upper part of the spinal cord, the brain stem, and a wrinkled ball of tissue called the cerebellum. The hindbrain controls the body's vital functions such as respiration and heart rate. The cerebellum coordinates movement and it is involved in learned rote movements for example performing art or playing games.

4.2 Midbrain - This is the uppermost part of the brainstem which controls some reflex actions and it is the part of the circuit that involved in the control of eye movements and other voluntary movements.

4.3 Forebrain - The forebrain is the largest and most highly developed part of the human brain: it consists primarily of the cerebrum and the structures hidden beneath it. The cerebrum sits at the topmost part of the brain and it is the source of intellectual activities. It holds memories which allow to plan, enables to imagine and think.

4.4 Cerebral Cortex - The cortex originates from the Latin word for bark and it is the coating to the surface of the cerebrum. The cerebellum is a vital layer of tissues which coordinates and regulates muscular activity. Most of the actual information processing in the brain takes place in the cerebral cortex. The cerebral cortex is popularly known as "gray matter" (GM). The cortex is gray because nerves in this area lack the insulation that makes most other parts of the brain appear to be white. The folds in the brain add to its surface area and therefore increase the amount of gray matter and the quantity of information that can be processed.

The nervous system is the decision and communication center of human body. The central nervous system (CNS) is made of the brain and the spinal cord. The peripheral nervous system (PNS) is made of nerves. Together they control every part of living body. Sensory nerves gather information from the environment, send that information to the spinal cord, which then speed the message to the brain. The brain then makes sense of that message and fires off a response. Motor neurons deliver the instructions from the brain to the rest of the body. The spinal cord is made of a bundle of nerves running up and down the spine, which resemblances a superhighway, speeding messages to and from the brain at every second.

4.5 The Inner Brain

The structures that lie deep within the brain, hidden from view, are the gatekeepers between the spinal cord and the cerebral hemispheres. These structures determines emotional state of individuals and most importantly they modify human perceptions and responses depending on that state, and accordingly allows to initiate necessary movements. Like the lobes in the cerebral

hemispheres, these structures also visible in pairs i.e., each is duplicated in the opposite half of the brain.

4.6 Hypothalamus

This is about the size of a pearl that directs a multitude of important functions. It is also an important emotional center, controlling the molecules responsible to feel exhilarated, angry, or unhappy.

4.7 Thalamus

The thalamus seats near the hypothalamus and it is a major clearinghouse for information going to and from the spinal cord and the cerebrum.

4.8 Nervous System

The brain and the rest of the nervous system are composed of many different types of cells, but the primary functional unit is a cell called the neuron. All sensations, movements, thoughts, memories, and feelings are the result of signals that pass through neurons. Neurons consist of three parts namely- The cell body, Dendrites and axons.

4.8.1 The cell body - contains the nucleus, where most of the molecules that the neuron needs to survive and function are manufactured.

4.8.2 Dendrites - extend out from the cell body like the branches of a tree and receive messages from other nerve cells.

4.8.3 Axons - Signals then pass from the dendrites through the cell body and may travel away from the cell body down an axon to another neuron, a muscle cell, or cells in some other organ. The neuron is usually surrounded by many support cells. Some types of cells wrap around the axon to form an insulating sheath. This sheath can include a fatty molecule called myelin, which provides insulation for the axon and helps nerve signals travel faster and farther. Axons may be very short, such as those that carry signals from one cell in the cortex to another cell less than a hair's width away. Or axons may be very long, such as those that carry messages from the brain all the way down the spinal cord.

Scientists have learned a great deal about neurons by studying the synapse-the place where a signal passes from the neuron to another cell. When the signal reaches the end of the axon it stimulates the release of tiny sacs. These sacs release chemicals known as neurotransmitters into the synapse. The neurotransmitters cross the synapse and attach to receptors on the neighboring cell. These receptors can change the properties of the receiving cell. If the receiving cell is also a neuron, the signal can continue the transmission to the next cell.

4.9 Thinking Process

Each cerebral hemisphere can be divided into sections, or lobes, each of which specializes in different functions. The cerebral hemispheres comprises of two frontal lobes are situated behind the forehead. Both of these two lobes help to plan, imagine and making argument. The frontal lobes seems to be acting as short-term storage sites and thereby allowing one idea to be kept in mind while other ideas are considered. In the rearmost portion of each frontal lobe is a motor area which helps control voluntary movement. A nearby place on the left frontal lobe called Broca's area which allows thoughts to be transformed into words.

5. Maturation of Human Brain

The advances in imaging techniques revealed a great deal about the development of the living human brain. Researches using magnetic resonance imaging (MRI) to acquire structural images across the lifespan has revealed that the human brain continues to develop for many decades (Shaw et al., 2008). A number of studies have suggested that cerebral and cognitive maturation are intimately correlated. Rates of cerebral maturation have been estimated from cross-sectional studies of skull size, the electroencephalogram, cortical thickness, cortical volume, and nerve cell densities (Epstein, 1974a, 1974b, 1980, 1986; Hudspeth, 1985; Hudspeth, & Pribram 1990; Hudspeth & Thatcher, 1987; Thatcher, 1990; Thatcher, Giudice, & Walker, 1987). This diverse set of measurements provides consistent evidence that cerebral maturation proceeds in a discontinuous manner, characterized by spurts and plateaus.

The detailed pattern of neuropsychological maturation has been described by Hudspeth, Pribram and Thatcher (Hudspeth 1985; Hudspeth & Pribram, 1990; Hudspeth & Thatcher, 1987). Their analysis showed that brain maturation exhibits five cycles (i.e., spurts and plateaus) over the first 21 years of postnatal development and that the temporal sequence of maturation in specific regions of the brain is consistent with cognitive development as outlined in the work of Piaget and Inhelder (Inhelder & Piaget, 1958; Piaget, 1950, 1971).

Before the advent of MRI, scientists already knew a lot about the brain functioning. When people suffered brain damage or injury to particular parts of the brain, scientists could see what functions were impaired, and infer that the injured areas governed those functions. For example, people who had strokes in the area of the brain affecting speech lost the ability to speak. Autopsies showed when particular parts of the brain matured, the connections were wrapped in white matter, or myelin.

The structural and functional MRI (sMRI and fMRI respectively) have revolutionized the human brain developments. Age-associated region-specific, linear and non-linear changes in white matter tracts (Giedd et al., 1999; Lebel and Beaulieu, 2011; Ostby et al., 2009; Paus et al., 1999) and cortical grey matter (volume, density, and thickness) (Ostby et al., 2009; Paus, 2005; Shaw

et al., 2008; Tamnes et al., 2010) have been described in structural MRI studies. The results of the studies on structural and functional changes in the developing human have been summarized as follows:

A. The first ever human brain structure is formed in the third week of the gestation (while the embryo is in the mother's womb) (Ladher & Schoenwolf, 2005). At week 4 of gestation, the rostral (anterior or ventral) portion of the neural tube forms three vesicles that are destined to be the forebrain, the midbrain, and the hindbrain (Jessell & Sanes, 2000; Rash and Grove, 2006b; Rhinn et al, 2006; Stern, 2001). The rostral-most prosencephalic (forebrain) vesicle then forms two vesicles that are destined to become the telencephalon (cerebral cortex) and the diencephalon (thalamus, hypothalamus, and other structures).

Maturation patterns over the first decade of life (1-10'/2 years) were synchronized across all brain regions. Beginning with the stirrings of puberty, maturation in the temporal, central, and frontal regions of the human brain shows different onsets and offsets of rapid change. The human brain maturation during this period was observed in the following brain regions namely parieto-occipital, temporo-temporal, and central regions between 13 and 17 years of age, although the peaks of maximum change are separated by approximately 1-year intervals. The results of all the researches excerpts that the postpubertal maturation proceeds from the posterior to the frontal areas of the brain (Hudspeth & Pribram, 1990).

One of the most consistent findings from MRI studies is that there is a steady increase in white matter volume in several brain regions during childhood and adolescence. An early developmental MRI study revealed differences in the density of white and grey matter between the brains of a group of children (average age 9 years) and a group of adolescents (average age 14 years; Sowell et al., 1999). The results showed adolescents had a higher volume of white matter and a lower volume of grey matter in the frontal cortex and parietal cortex compared with the younger group. Increased white matter and decreased grey matter density in the frontal and parietal cortices during adolescence is a finding that has been corroborated by several studies carried out by a number of different research groups with increasingly large numbers of subjects (Barnea-Goraly et al., 2005; Giedd et al., 1996, 1999; Paus et al., 1999; Pfefferbaum et al., 1994; Reiss et al., 1996; Sowell et al., 1999). The adolescent brain development is characterized by comparatively late maturation of the frontal lobes (Park A, Wallis C & Dell K., 2008), although enhanced synaptic connectivity is evident during this part of life. The cortical areas of the brain continue to thicken as neural connections proliferate throughout the childhood which continues till the adolescence. The gray matter volume in the frontal cortex reaches its peak at approximately 11 years of age in girls and 12 years of age in boys which reflects the dendritic overproduction (Lenroot & Giedd, 2006). There are rarely used synaptic connections which are selectively pruned (Giedd, 2008) and subsequently makes the brain more efficient by allowing it to change structurally in response to the demands of the environment (Spear ,2000). Pruning also

results in increased specialization of brain regions (Casey et al., 1997); however, the loss of gray matter that accompanies pruning may not be apparent in some parts of the brain until young adulthood (Sowell et al., 1999, Rubia et al., 2000 & Sowell, et al., 2003). In general, loss of gray matter progresses from the back to the front of the brain with the frontal lobes among the last to show these structural changes (Sowell, et al., 2001, Giedd,. 2008).

The pioneering developmental MRI study, emanating from the National Institute of Mental Health paediatric neuroimaging project, Giedd et al. (1999) performed longitudinal MRI scans on healthy participants ranging in age from about four to 22 years. Scans were obtained from each participant at two-year intervals. The results show that the volume of grey matter in the frontal lobe increased during late childhood and early adolescence with a peak occurring at around 12 years. This was followed by a decline during adolescence. Similarly, parietal-lobe grey matter volume increased during childhood to a peak at around 12, followed by decline during adolescence. Grey matter development in the temporal lobes was also non-linear, but the peak was reached later at about 17 years. In another longitudinal study by the same group, participants aged between 4 and 21 were scanned every two years for 8 to 10 years (Gogtay et al., 2004). In terms of cortical grey matter density, sensory and motor brain regions matured earliest, followed by the remainder of the cortex, which matured (in terms of grey matter loss) from posterior to anterior regions. This loss of grey matter occurred last in the superior temporal cortex. A later study analysed cortical thickness and investigated the age of at which peak cortical thickness was reached, and again showed earlier maturation in sensory and motor regions and later maturation in parts of the frontal and temporal lobes (Shaw et al., 2008).

Gray matter is made up of the cell bodies of neurons, the nerve fibers that project from them, and support cells. One of the features of the brain's growth in early life is that there is an early blooming of synapses (the connections between brain cells or neurons) followed by pruning as the brain matures. Synapses are the relays over which neurons communicate with each other and are the basis of the working circuitry of the brain. Already more numerous than an adult's at birth, synapses multiply rapidly in the first months of life. In a baby, the brain over-produces brain cells (neurons) and connections between brain cells (synapses) and then starts pruning them back around the age of three. The process is much like the pruning of a tree. By cutting back weak branches, others flourish.

Neural connections that survive the pruning process become more adept at transmitting information through myelination. Myelin, a sheath of fatty cell material wrapped around neuronal axons, acts as "insulation" for neural connections. This allows nerve impulses to travel throughout the brain more quickly and efficiently and facilitates increased integration of brain activity (Anderson P., 2002). Although myelin cannot be measured directly, it is inferred from volumes of cerebral white matter (Paus, 2001). Evidence suggests that, in the prefrontal cortex, this does not occur until the early 20s or later (Rubia, 2000, Sowell, 2003).

5.1 Pre Frontal Cortex (PFC)

Although there is no universally acceptable definition of the PFC, the Merriam Webster Dictionary defines it as "the gray matter of the anterior part of the frontal lobe that is highly developed in humans and plays a role in the regulation of complex cognitive, emotional, and behavioral functioning". The PFC may be regarded to be the region of the cortex that receives its principal thalamic inputs from the mediodorsal nucleus of the thalamus (Kolb,2006). This cortical region is located somewhere at the anterior end of the cerebral hemispheres and refers not to a single region but to a group of related regions. Pandya and Yeterian (Pandya, 1985) proposed that the expansion of PFC subareas is correlated directly to the expansion of the sensory areas. The implication from this conclusion is that the PFC must have some function in the integration of sensory information from different modalities, and as more information is processed, the PFC must have enlarged.

The PFC supports cognitive functions that are necessary to organize behavior in time and in context, i.e., social behavior. The PFC controls concentration and attention which helps in executive function. The most important function of PFC is considered to be the novelty detection (Shimamura , Janowsky & Squire, 1990) and decision making (Shimamura, 1995a; Shimamura, Jurica, Mangels, Gershberg & Knight, 1995b), therefore, the developed and healthy PFC is required by an LIS aspirant for a successful professional career. Similar to the role the PFC plays in regulating the interaction with the external world, this region is crucial for attention to and inhibitory control of internal mental representations engaged during working memory, employment of strategies, planning and decision-making (Knight et. al., 1999)

The prefrontal cortex coordinates higher-order cognitive processes and executive functioning. Executive functions are a set of supervisory cognitive skills needed for goal-directed behavior, including planning, response inhibition, working memory, and attention (Anderson , 2001). These skills allow an individual to pause long enough to take stock of a situation, assess his or her options, plan a course of action, and execute it. Poor executive functioning leads to difficulty with planning, attention, using feedback, and mental inflexibility (Anderson, 2001), all of which could undermine judgment and decision making.

6 Recommendation

Considering the age specific selective pruning of synaptic connections, linear and non-linear development of brain regions this is evident that 20- 21 years of age is the most crucial for neuropsychological maturation. Apart from the completion of pruning and myelination, the prefrontal cortex also started to be mature by this age. Therefore, this study recommends that the minimum age for LIS entrants should be 21 years.

7 Conclusion

The foregoing results of human brain researches are indicative of the fact that a teen brain is capable of reasoning like an adult, but the emotions and impulses makes a difference in decision making (mental task) as the prefrontal cortex is a little immature in teenagers as compared to adults. In terms of sheer intellectual power, the brain of an adolescent is a match for an adult's. The capacity of a person to learn will never be greater than during adolescence. At the same time, behavioral tests, sometimes combined with functional brain imaging, suggest differences in how adolescents and adults carry out mental tasks. Adolescents and adults seem to engage different parts of the brain to different extents during tests requiring calculation and impulse control, or in reaction to emotional content. Three basic steps of neuromaturation namely - synaptic overproduction, pruning and myelination has been found to be responsible for improvement of the brain's ability to transfer information between different regions efficiently. This information integration undergirds the development of skills such as impulse control (Luna et al. 2001). Although young children can demonstrate impulse control skills, with age and neuromaturation (e.g., pruning and myelination) comes the ability to consistently use these skills. (Luna & Sweeney 2004).

The training in LIS is more than sheer knowledge of organization of documents or application of information communication technology, beyond which is the attitude to serve selflessly, self-realization as a devotee to the divine of knowledge and an urge for betterment of practice and services. Here comes the significance of PFC maturation and considering a minimum age of 21 years for initiation of LIS education.

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Visual Representation of Information and Modern Libraries

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Abstract

Contemporary libraries are hybrid environment with physical space, objects and access to a digital resources. Library collections are either owned by libraries, having conditional accesses; or resources which are freely available. Libraries also dealing with user generated contents through tagging of resources, community blogs etc. Information communication technology (ICT) has revolutionized library services i.e., card catalogue to OPAC, CAS and SDI into e-mail based or RSS based services and also online reference services. Visualization techniques are implanted by the libraries for better data analysis and decision making. Libraries needs user interface which is compatible with different personal digital device such as smart phones and also a different interface to larger screens such as touch screens etc. This article discuss about the importance of visual representation of data in technology based library activities and services.

1 Introduction

Information is an inevitable part of our daily life. We seek information in varied ways from multiple sources. The huge amount of information in disparate formats, contents and structure require more time and cognitive power to analyse and access the relevant part. As information becomes richer and complex there is a need for alternative ways to organise and represent information. Information visualisation is one technique to visually represent the information. The visual metaphors are capable of representing cognitive relationships.

There are several information organisation and representation systems which have been used by the conventional libraries. Traditional knowledge organisation system such as classification helps to achieve a browsing pattern on library shelves. Through catalogue we provide multiple access points to the collection. Classification and cataloguing together give user a multi dimensional view of the collection. Libraries all over the world have been using different methods such as classifi-

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cation schemes, citation analysis etc. to map the underlying relationships among the information resources.

Libraries are keen adapt new technologies and we have enough evidences to prove that. There is a paradigm shift from card catalogue to OPAC , traditional way of CAS and SDI to e-mail based or RSS based services and also online reference services. Digital availability of various resources enhances the shift towards digital libraries and more services based on digital platforms. We have innovative technologies that offer access to information and resources. In case of traditional library the visibility of sources as physical objects play as well as face to face interaction with people plays a major role in various library services. Libraries are no more a standalone building with a collection of few books and journals. Libraries are hubs in a knowledge network providing access to an enormous collection of information through various services. The users are equipped with sophisticated tools to seek information. Libraries have to adopt innovative methods to present its collection and services to the users.

2 New Generation Libraries

Libraries are hybrid environment with physical space, physical objects and access to a number of resources and services which are digital in nature. Libraries have their presence in multiple spaces; it can be a physical library, digital collections through digital library, a representation of physical library as library OPACS on the web and also a complete representation on virtual world. Collection of a library is also disparate in nature; it can have physical collection of different resources, collection of digital objects etc. Collection and services of the libraries are accessed by different methods. A library collection can be accessed through different services, such as OPAC, search and browse facilities of digital libraries and other online and offline resources. A library needs a user interface which should be compatible with different personal digital device such as smart phones and also a different interface to larger screens such as touch screens etc and also there may be special collections which require more specific interfaces to access. Library collection can include resources which are owned by libraries, resources which library will have conditional accesses; resources which are free, so the accession levels of each resource can vary. Libraries can provide access to various services and collection through different tools such as social networking, mobile technologies etc. Users can interact with the library collection and its services through any of the interfaces either physical or digital. The libraries are also dealing with user generated contents through tagging of resources, community blogs etc. Library will have multiple services such as user oriented services and technical services. Traditional services such as CAS, SDI reference services etc. have gone though a face over using latest technologies. Technical services include collection management, classification, cataloguing etc.

New generation libraries	
Multiple spaces	Physical and digital spaces
Multiple collections	Physical, digital
Multiple access points	Different interfaces, accession levels, tools
User interactions	Collection, services
User generated contents	Discussion forums, tags etc.
Multiple services	User oriented, technical

Table1: New generation libraries

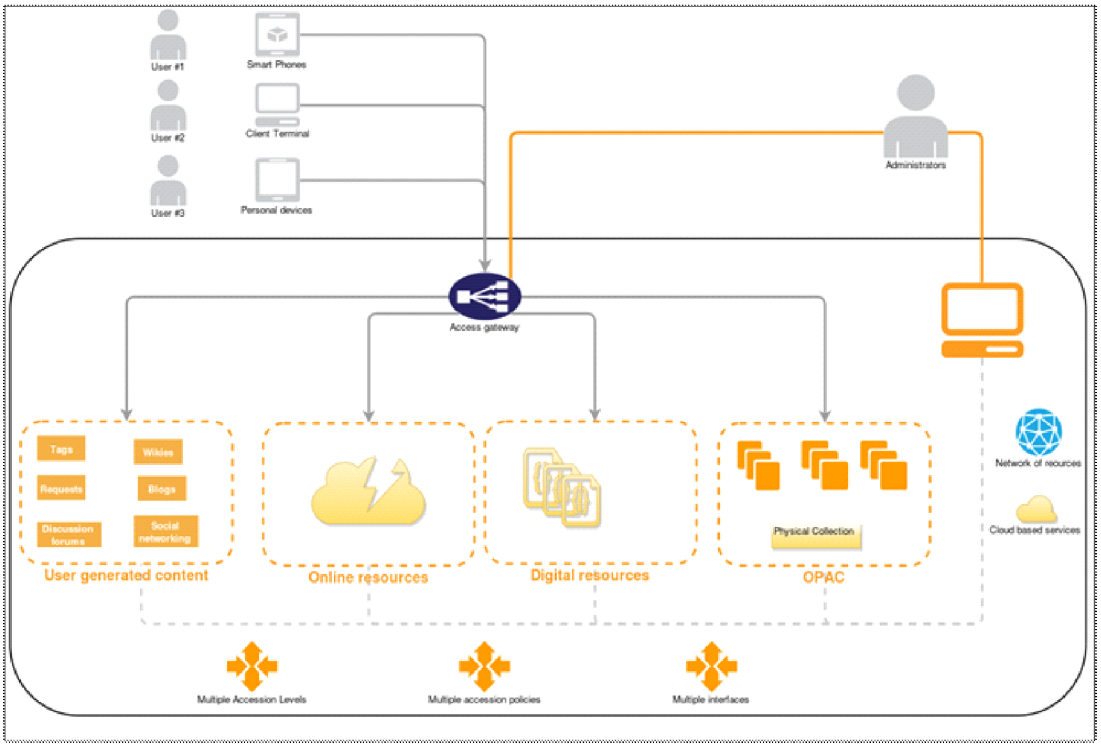

Figure 1: Library services and collections

Advanced technologies in all spheres production, dissemination and use of information forced libraries also to try innovative technologies. Web 2.0 technologies showed a transformation in the way library services are delivered to library users. Libraries developed or absorbed different methods to have a control on the overflow of information. Technologies related to semantic web,

controlled vocabularies, metadata etc. stands for sharing and reusing of information. Collecting information is no longer a problem, but managing and extracting the required information from that collection is more problematic. Apart from this the data libraries deal in relation to users, services and collection is very huge. Libraries need to opt for better data analysis and visualization techniques for decision making.

3 Related Works

Power of information visualization in identifying the patterns and to extract insight from large amount of information is already proved through different applications of it in biological data field (Zhu and Chen, 2005). Libraries are not new to the technologies related information organization and retrieval for example the browsing pattern given by a classification scheme or the co relation of information sources given by citation analysis etc. Visualization is a promising technology for libraries to manage large scale of information. It can be applied in different aspects library collection and services.

Nowadays, wide varieties of users access, extract, and display information that is distributed on various sources, which differ in type, form and content. Users need to easily understand what kind of objects are stored in the available sources they have access to, how they can retrieve and organize them in ways that permit to make rapid decisions on what is relevant and which patterns exist among objects. Users also need to manipulate the retrieved information in order to incorporate it in their specific tasks. In this context, the conventional interfaces, based on the view of information retrieval as an isolated task in which the user formulates a query against a homogeneous collection to obtain matching documents, are completely out of date. Indeed, this view does not correspond to the reality of users working with networked information systems. For example, users are often unable to formulate specific questions, and they realize what they are trying to ask and how to ask it by browsing the system (Costabile & Semeraro, 1998).The main advantage of visual technique is its capability of shifting load from user's cognitive system to the perceptual system. Information visualization is defined as "a process of transforming information into a visual form enabling the user to observe information" (Card et.al.,1997).In the information system context, visualizations have a wide range of applications, they can be used for visualizing various types of meta-information, as well as queries and retrieved results (Costabile &Semeraro, 1998). Majors, Rice (2012) studied the role of user interface in web-scale discovery tools in relation with purchase of the services. There are several studies on user interfaces of OPAC, digital libraries etc. but none of these studies cover the information visualization as such.

4 Information Visualization and Libraries

There are different areas where information visualization can be applied both in physical libraries as well as in digital libraries. Visualization can be used not only in user interface designing but also for data mining , decision making etc. in relation with various administrative aspects of libraries.

Multiple aspects of visualization can be used in libraries, such as aesthetic aspects of it for attracting users towards the library, data analysis aspects in decision making etc.

4.1 Collection Analysis

Collection evaluation is one of the most important activities libraries involved. Collection analysis is required to evaluate the strength and weakness of the collection, changes needed in the collection, for cost evaluation etc. Visualization is highly useful in collection analysis since it includes large volume of data. Data related to users requirements, use of library resources and against the cost of purchasing it etc. Instead putting it in multiple tables and explanation a simple visualization can give you a clear picture of data. For example, if a group of libraries wanted to go for regional consortia for physical resource sharing, geospatial analysis of libraries against their sharable collection portion would be helpful. The collection size and diversity can be expressed using statistical analysis and proper visualization. Funding, user statistics and collection can be expressed through a temporal analysis and visualization. Citation analysis of collection for cost-effectiveness can be expressed through a network analysis and networked visualization. Topical analysis can be used to represent content in relation to the collection, for example to create a classified profile.

4.2 User Related Data

The user data can be user generated data or data about the users. The data about users such as resource usage pattern, demographic studies etc are highly important in designing various library policies. The user activity data in online or physical library can give insights about library policies on collection development, facilities enhancements, accession policies etc. The user generated data can be tags, contributions in discussion forums and community blogs etc. These data can be studied in terms of user satisfaction, user interests etc. User activity data can be used for decision taking in relation with library opening timings, access restrictions, introducing new services etc.

4.3 Resource Sharing

Resource sharing is one of the concepts libraries practice over last few decades. It can be as shared cataloging environment or reciprocal lending etc. Another form of resource sharing can be of library consortiums, collaborative reference services etc. Now resource sharing has no geographical limitation, one can have access to different services across the world. Since the options are more libraries have to take proper decisions regarding that by analyzing 'N' number of options on the data related to resource used, different kind of resources and their access levels, modes of access etc. For example, resources which are freely available on internet can be made accessible to all library users. Resources which are purchased and have restricted access should not be open to all users. And also to monitor the volume of downloads etc. These sorts of data are valuable in relation with library policy making.

4.4 Collection Management

Collection management involves development, storage and preservation of collections. We have different modules for collection management such as acquisitions, serial management, archiving etc. All these activities are basic requirement for a better performance of the library. A library will have physical collections, digital collections, rented ones, owned ones etc. Before procuring resources we need to analyze so many factors such as whether that resource is available in the library collection, or is it freely available on internet etc. In case of serials management the subscription dates, availability through another channels, accession policies etc. has to be checked.

4.5 Online Public Access Catalogue

OPAC clearly acts as an entry point to the library collection. The interface of OPAC has to be capable to reveal different collections library provides with multiple access points to that. Information visualization can be used in the OPAC to enhance the user experience. Traditional hierarchical and key word based interfaces can be supported with advanced visualization so that the user can get an idea about multiple characteristics of the collection within very less time.

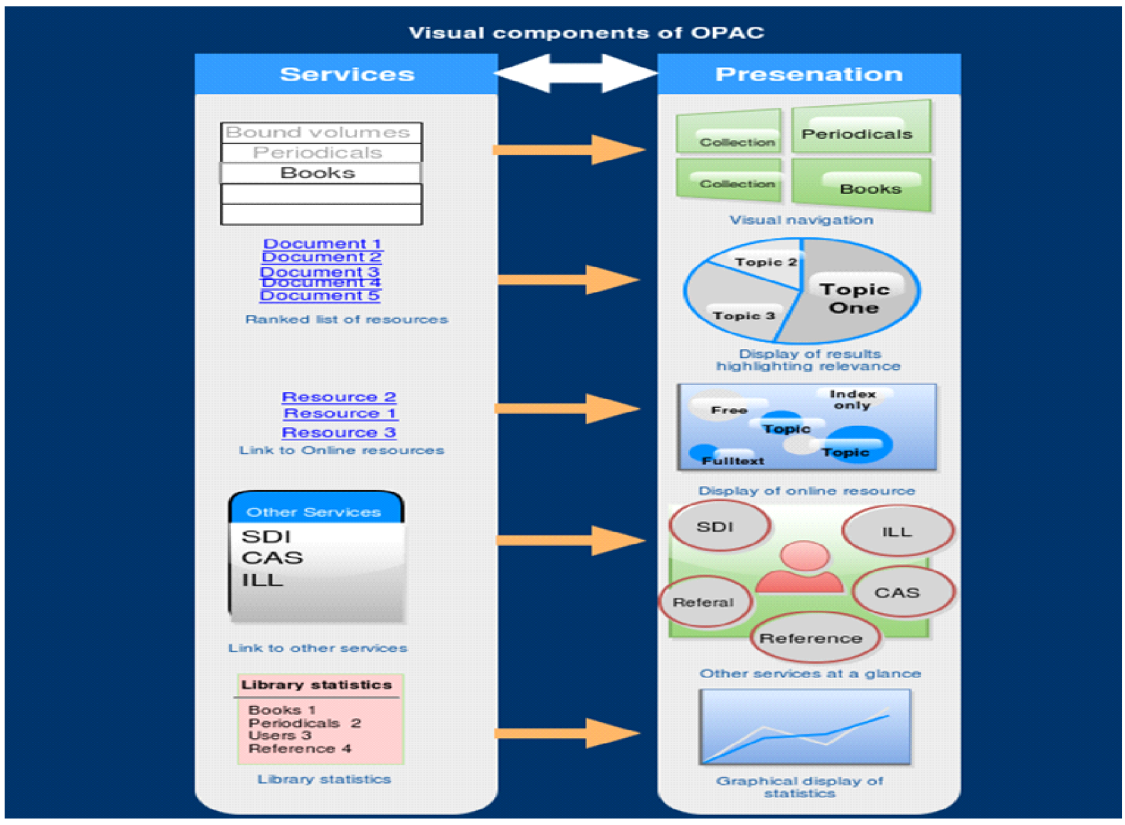

Figure 3: Visual components of OPAC

4.6 Digital Libraries

Digital libraries should be considered an entirely independent system. The collection of a digital library contains digital objects. A user gets to interact with the digital library through the search interface. So it is highly important to display the collection as well as search results in libraries so that the user does not have to spend too much time just to find out what is there and how to retrieve it. Another aspect is search results display where the user can analyze the information and take a proper decision in relation with the information need.

4.7 Search and Retrieval of Information

We have standardized schemes for organizing and retrieving the information. In case of physical libraries user requirements and priorities decide the location and organization of resources even though it is backed by a standard classification scheme. We provide several aids to locate the information such as card guides, shelf labels, classification chart, card catalogue chart etc. All these things can be combined in to single visualization and the user can explore it multiple ways.

4.8 Dynamic Data Management

Dynamic data of libraries can be the data related to information resource usages or user generated contents etc. For example, the data of article downloads or how many people are accessing different kind of networks, and services etc. There can be user generated data such as the upload by users, the online activities of users etc. These data is important to shape the library policies in relation to the resource usage, access levels etc.

4.9 Library Services

In case of user oriented services such as CAS, SDI etc. instead of sending just mails useful visualizations can be provided. For technical staff visualizations are helpful to analyze the user profiles, resources, user requirements etc. Another example is the user requests for information or information source. The data related to these requests need to be analyzed to enhance the performance of libraries. We use social networking platforms for library extension services such as publicity activities. The aesthetic aspects of visualization can be used to attract the people towards the library.

4.10 Administrative Task

Data analysis is prerequisite for any decision making task in administration. The power of visualization in data analysis is unquestionable. Putting up an appropriate visualization of data can display various aspects of it and can be expressed more effectively to others. For example, instead of showing multiple tables for discussing cost effective analysis of resource sharing , you can blend data from different sources and display in an effective visualization.

5 Conclusion

Today libraries have to process huge volume of information be it a library collection or user related data. Not only finding but managing of the large volume of information is also a herculean task. Information visualization technologies can be used in multiple ways in libraries including interfaces, information retrieval, data analysis etc. Visualisation is a novel approach to use of library services as well as in library policy making

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