

Web impact assessment of identified higher education institutions in India

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URL citations analysis is one of the methods for web impact assessment. This study classifies URL citations and identifies the motivational factors behind such citations received by higher education institutions in India. Spearman and Chi-square analyses were used to highlight the relationship between the institution groups and website categories. Chi-square test reveals that the National Institutes of Technology had more impact in each category of websites.

Keywords: inlinks; hyperlinks; outlinks; URL; Internet

Introduction

Websites have many functions and analysis of hyperlinks, inlinks, and outlinks obtained through various search engines such as AltaVista, Yahoo, Google etc. have been successfully used for web impact assessment. Presently search engines restrict the facility of gathering hyperlinks, inlinks, outlinks, etc, from websites. So, URL citations that mention a specific URL in the text of a web page, whether hyperlinked or not are used for web impact assessment studies. URL citation queries can be used in commercial search engines even if they do not permit hyperlink queries. Studies have used URL citation counts as indicators of the level of association and strength of relationship between the websites. Such studies used the various scores derived from URL citation counts and established the connection between websites.

Thelwall¹ stated that a Web/URL citation of the website is a web mention of its URL web page, with or without a hyperlink. Thelwall and Sud² used Bing and Yahoo! to collect URL citation data and found that results from the two search engines were similar. Evaluating a website based on their URL citations will give an idea of the website's popularity. A high "web impact" or "online impact" for a document reveals that the website information may be useful for visitors to the source documents of the links³. Development of Application Programming Interface (API) of the search engine opened the gateway for webometric crawlers to reduce the time

for collecting the data. The information on Internet creates new opportunities and challenges for businesses that need to monitor changes around them to compete in better conditions⁴. The present study attempts to assess the web impact of leading Indian institutions through some selective categories of URL citations.

Review of literature

Internet has allowed the researchers to use more web based resources than the print resources. Link analyses have been successfully applied to investigate the academic library website. For example, counting links between directories instead of pages was shown to give total counts of links to each individual university that correlated better with research productivity⁵. Smith through web citation analysis of 22 Australasian refereed e-journals from a range of disciplines, found no significant relationship between inlinks and ISI impact factors⁶. The study concluded that links to e-journals are different to citations because the former target the whole journal whereas the latter target individual articles. Lawrence⁷ found that online articles were more highly cited, indicating that online availability encouraged use with online citations being important research linkages. Vaughan and Hysen⁸ found a correlation between journal web site inlink page counts and the journal impact factor in library and information science (LIS) journals. Shin⁹ found that the impact factor of journals increased when they became available in electronic form

indicating that the greater availability of the electronic format lead to more citations. Vaughan & Thelwall¹⁰ studied 88 law and 38 library and information science (LIS) ISI indexed journals. They found that journals with more online content tended to attract more links as did older journal web sites. Rahimi and Chandrakumar¹³ found a correlation between traditional citation and citations taken from the web. Kousha and Thelwall¹² found a slight correlation between average numbers of URL citations and average numbers of ISI citations for the LIS open access journals published in the year 2000. The present study was undertaken to analyze the URL citations and identify the motivation factors behind these institutions' citations. Spearman and Chi-square tests were used to identify the relationship between the institution groups and classified categories.

Objectives of the study

- To identify and categorise the motivation factors for citing Indian central government funded higher education institutions websites;
- To find the category difference in citing the higher education institutions; and
- To identify the impact of the group of higher education institutions on the web.

Methodology

The researchers identified the centrally funded technical and science education institutions from the website of Department of Higher Education, Ministry of Human Resource Development, Government of India's website (http://mhrd.gov.in/funded_technical_inst_hindi). There are a total of 82 institutions funded by Ministry of Human-Resource Development (MHRD) as of 2012.

These institutions were categorised into 4 groups. The 13 Indian Institutes of Management were grouped as IIMs, 16 Indian Institutes of Technology as IITs, 30 National Institutes of Technology as NITs and 23 institutions which do not belong to any of the above were grouped as ARIs (All Remaining Institutes).

“Webometric Analyst”, a free program for academic research was downloaded from the website <http://lexiurl.wlv.ac.uk/>. This program automatically submits the queries through Bing's Application Programming Interface (API) to process and save results as simple text files. A notepad (Windows – Accessories) file containing the domain name of the institution was used to submit the query. The software

used ‘-site:’ after the URL of an institution domain, in order to exclude links from the same domain.

The researchers manually checked and classified the URL citations extracted by Webometric Analyst and removed the unrelated URL citations. Vaughan et al.¹⁵ designed a classification scheme to study the motivation of hyperlinks of business websites through content analysis. No existing format is available for classifying the academic website. So the classification in this study was developed based on the motivations of corresponding websites. Career, course, results, admission, inter departments, social media, research and news are the categories identified based on the motivation websites (Table 1). The websites that do not belong to any of the above are categorised General.

It has been reported that inlinks to a website correlated with the age of the website as older sites received more inlinks¹⁰. Therefore, the age of institution and website was studied to see if any correlation exists between URL citations and age of the institution and age of the website.

The 82 institutions considered in the study were set-up indifferent years, some more than 100 years ago and some recently. Each institution's constituted year was collected from institution's website or other credible websites.

Website age data was collected using the Internet Archive (www.archive.org) to verify and to control the age variable if needed. The days were converted to the number of months from Sep 2012 and used for data analysis¹⁶.

Table 1—Classification of motivation websites based on their contents

Sl. no.	Category	Description of contents
1	Admission	Admission notification, admission procedure, Entrance examinations, etc.,
2	Career	Walk in interview, Vacancy, Placement, Recruitment, Job opportunity, etc.
3	Course	Websites have particulars of coaching, Studies, Disciplines available, etc
4	News	News, Facts
5	Inter_dept	Websites connecting the inter departments
6	Research	Conferences, seminars, symposium, workshop
7	Result	Exam, Result, marks
8	Social media	Face book, Blogs, Twitter, LinkedIn etc.
9	General	Information not associated with any of the above categories

A ratio was calculated by dividing URL citations by age of the website in months. Institutions were sorted from highest to the lowest ratio. First rank was given to the Institute which obtained highest ratio and last rank was given to the lowest ratio institution.

Results

Tables 2 to 5 give details of Indian central government funded institutions including their web addresses year of establishment, number of URL citations, and age of the website in months etc.

Indian Institutes of Management (IIMs)

There are thirteen Indian Institutes of Management with IIM, Kolkata and IIM, Ahmedabad being the earliest to be established in 1961, IIMs; Raipur, Ranchi and Rohtak were established in 2010 and IIMs; Udaipur, Tiruchirappalli and Kashipuri in 2011. IIM, Bangalore received the highest URL citations (496) and IIM, Kashipuri received the lowest 111 URL citations. IIMs, Ahmedabad and Bangalore started their websites in 1996. IIMs; Raipur, Ranchi, Rohtak, Udaipur, Tiruchirappalli and Kashipuri

started their websites in the same year of establishment. IIM, Raipur had the highest URL citation/Age ratio and IIM, Ahmedabad had the lowest (Table 2).

Indian Institutes of Technology (IITs)

There are 16 IITs in India with Kharagpur, Mumbai, Chennai, Kanpur and Delhi being the older IITs that were started between 1951 and 1961. Rajasthan, Ropar, Gandhi Nagar, Hyderabad and Bhubaneswar IITs were started in 2008 and IIT-Varanasi in 2012. IIT, Roorkee received 396 URL citations and IIT, Varanasi 69 citations only. IIT, Mumbai started its website in 1998 and IIT, Varanasi in 2012. IIT, Varanasi had the highest URL citation/Age ratio and Mumbai had the lowest among IITs (Table 3).

National Institutes of Technology (NITs)

There are 30 NIT, with NIT, Bhopal being the first NIT that was established in the year 1960. During the period in 2002 to 2010, ten new NITs each were started. NIT, Calicut received the highest number of

Table 2—URL citations of Indian Institutes of Management

Sl. no	Institute name	Location	Web address	Year of estd./ designated	URL citations		Website age in months	URL Citation/ Age Ratio	Rank
					Number	Percentage			
1	Indian Institute of Management	Raipur	http://www.iimraipur.ac.in	2010	198	1.16	24	8.25	1
2	Indian Institute of Management	Udaipur	http://www.iimu.ac.in	2011	139	0.81	21	6.62	2
3	Indian Institute of Management	Tiruchirappalli	http://www.iimtrichy.ac.in	2011	151	0.88	25	6.04	3
4	Indian Institute of Management	Ranchi	http://www.iimranchi.ac.in	2010	151	0.88	28	5.39	4
5	Indian Institute of Management	Rohtak	http://www.iimrohtak.ac.in	2010	161	0.94	30	5.37	5
6	Indian Institute of Management	Kashipuri	http://www.iimkashipur.ac.in	2011	111	0.65	21	5.29	6
7	Indian Institute of Management	Indore	http://www.iimidr.ac.in	1998	445	2.60	150	2.97	7
8	Indian Institute of Management	Kozhikode	http://www.iimk.ac.in	1996	389	2.28	134	2.90	8
9	Indian Institute of Management	Calcutta	http://www.iimcal.ac.in	1961	457	2.67	175	2.61	9
10	Indian Institute of Management	Lucknow	http://www.iiml.ac.in	1984	478	2.80	184	2.60	10
11	Indian Institute of Management	Bangalore	http://www.iimb.ernet.in	1973	496	2.90	198	2.51	11
12	Rajiv Gandhi Indian Institute of Management	Shillong	http://www.iimshillong.in	2007	141	0.82	60	2.35	12
13	Indian Institute of Management	Ahmedabad	http://www.iimahd.ernet.in	1961	371	2.17	199	1.86	13

Table 3—URL citations of Indian Institutes of Technology

Sl. no	Institute name	Location	Web Address	Year of estd./ designated	URL citations		Website age in months	URL Citation/ Age Ratio	Rank
					Number	Percentage			
1	Indian Institute of Technology	Varanasi	http://www.iitbhu.ac.in	2012	69	0.40	9	7.67	1
2	Indian Institute of Technology	Rajasthan	http://www.iitj.ac.in	2008	220	1.29	29	7.59	2
3	Indian Institute of Technology	Ropar	http://www.iitpr.ac.in	2008	236	1.38	40	5.90	3
4	Indian Institute of Technology	Indore	http://www.iiti.ac.in	2009	221	1.29	38	5.82	4
5	Indian Institute of Technology	Gandhi Nagar	http://www.iitgn.ac.in	2008	249	1.46	48	5.19	5
6	Indian Institute of Technology	Hyderabad	http://www.iith.ac.in	2008	295	1.73	57	5.18	6
7	Indian Institute of Technology	Mandi	http://www.iitmandi.ac.in	2009	201	1.18	40	5.03	7
8	Indian Institute of Technology	Bhubaneswar	http://www.iitbbs.ac.in	2008	245	1.43	52	4.71	8
9	Indian Institute of Technology	Patna	http://www.iitp.ac.in	2008	243	1.42	58	4.19	9
10	Indian Institute of Technology	Guwahati	http://www.iitg.ac.in	1994	379	2.22	119	3.18	10
11	Indian Institute of Technology	Kharagpur	http://www.iitkgp.ac.in	1951	323	1.89	106	3.05	11
12	Indian Institute of Technology	Roorkee	http://www.iitr.ac.in	2001	396	2.32	131	3.02	12
13	Indian Institute of Technology	Madras	http://www.iitm.ac.in	1959	263	1.54	160	1.64	13
14	Indian Institute of Technology	Delhi	http://www.iitd.ac.in	1961	245	1.43	155	1.58	14
15	Indian Institute of Technology	Kanpur	http://www.iitk.ac.in	1959	211	1.23	157	1.34	15
16	Indian Institute of Technology	Mumbai	http://www.iitb.ac.in	1958	190	1.11	174	1.09	16

URL citations (453) and NIT, Sikkim received the lowest URL citations (7). NIT, Calicut started its website in 2002, whereas Mizoram, Meghalaya, Nagaland, Delhi, Puducherry, and Sikkim started their websites in 2012. NIT, Mizoram had the highest URL citation/Age ratio and NIT, Agartala had the lowest among NITs (Table 4).

Other institute

There are three Schools of Planning and Architecture, four Indian Institutes of Information Technology (IIIT), a National Institute of Technical Teachers Training and Research (NITTTR) and five Indian Institutes of Science Education and Research (IISER). Indian Institute of Science, Bangalore is the oldest one that was established in 1909. IIIT, Allahabad received the highest URL citations (409)

and IIIT, Jabalpur received the lowest URL citation (7). Indian Institute of Science, Bangalore created its website in 1997 and NITTTR, Bhopal created its website in 2010. IISER, Thiruvananthapuram had the highest URL citation/Age ratio and NITTTR, Kolkata had the lowest URL citation/Age ratio in this group (Table 5).

Institution age

Among the 82 institutions, 25 were started before 1996 (Table 6). Maximum institutions (13) were formed in 2010 followed by institutions each in 2002 and 2008. Spearman's correlation was used to determine the relationship between age of the institution in 2012 (in years) with URL citations. The overall significant Spearman correlation coefficient value of 0.358 confirms the existence of a positive

Table 4—URL citations of National Institutes of Technology (*contd.*)

Sl. no	Institute name	Location	Web address	Year of estd./ designated	URL citations		Website age in months	URL Citation/ Age Ratio	Rank
					Number	Percentage			
1	National Institute of Technology	Mizoram	http://www.nitmz.ac.in	2010	77	0.45	13	5.92	1
2	National Institute of Technology	Manipur	http://www.nitmanipur.in	2010	129	0.75	23	5.61	2
3	National Institute of Technology	Warangal	http://www.nitw.ac.in	2002	439	2.57	79	5.56	3
4	National Institute of Technology	Meghalaya	http://www.nitm.ac.in	2010	48	0.28	11	4.36	4
5	National Institute of Technology	Goa	http://www.nitgoa.ac.in	2010	151	0.88	37	4.08	5
6	National Institute of Technology	Raipur	http://www.nitr.ac.in	2005	322	1.88	84	3.83	6
7	Maulana Azad National Institute of Technology	Bhopal	http://www.manit.ac.in	1960	387	2.26	108	3.58	7
8	National Institute of Technology	Calicut	http://www.nitc.ac.in	2002	453	2.65	131	3.46	8
9	National Institute of Technology	Jamshedpur	http://www.nitjsr.ac.in	2002	251	1.47	77	3.26	9
10	National Institute of Technology	Surathkal	http://www.nitk.ac.in	2002	389	2.28	126	3.09	10
11	Dr. B.R. Ambedkar National Institute of Technology	Jalandhar	http://www.nitj.ac.in	1987	357	2.09	116	3.08	11
12	National Institute of Technology	Durgapur	http://www.nitdgp.ac.in	2003	340	1.99	112	3.04	12
13	National Institute of Technology	Tiruchirappalli	http://www.nitt.edu	2003	357	2.09	118	3.03	13
14	National Institute of Technology	Silchar	http://www.nits.ac.in	2002	297	1.74	113	2.63	14
15	Sardar Vallabhbhai National Institute of Technology	Surat	http://www.svnit.ac.in	2003	312	1.83	122	2.56	15
16	National Institute of Technology	Uttarakhand	http://www.nituk.com	2010	102	0.60	40	2.55	16
17	National Institute of Technology	Nagaland	http://www.nitnagaland.ac.in	2010	33	0.19	13	2.54	17
18	National Institute of Technology	Delhi	http://www.nitdelhi.ac.in	2010	42	0.25	17	2.47	18
19	National Institute of Technology	Patna	http://www.nitp.ac.in	2004	247	1.44	102	2.42	19
20	National Institute of Technology	Hamirpur	http://www.nith.ac.in	2002	88	0.51	41	2.15	20
21	National Institute of Technology	Rourkela	http://www.nitrkl.ac.in	2002	259	1.52	124	2.09	21
22	Visvesvaraya National Institute of Technology	Nagpur	http://www.vnit.ac.in	2002	266	1.56	129	2.06	22
23	National Institute of Technology	Srinagar	http://www.nitsri.net	2003	208	1.22	102	2.04	23
24	National Institute of Technology	Arunachal Pradesh	http://www.nitap.ac.in	2010	22	0.13	13	1.69	24

(Contd.)

Table 4—URL citations of National Institutes of Technology

Sl. no	Institute name	Location	Web address	Year of estd./ designated	URL citations		Website age in months	URL Citation/ Age Ratio	Rank
					Number	Percentage			
25	Motilal Nehru National Institute of Technology	Allahabad	http://www.mnmit.ac.in	2002	183	1.07	119	1.54	25
26	Malaviya National Institute of Technology	Jaipur	http://www.mnmit.ac.in	1963	134	0.78	120	1.12	26
27	National Institute of Technology	Puducherry	http://www.nitpy.co.in	2010	9	0.05	13	0.69	27
28	National Institute of Technology	Sikkim	http://www.nitsikkim.ac.in	2010	7	0.04	13	0.54	28
29	National Institute of Technology	Kurukshetra	http://www.nitkkr.nic.in	2002	50	0.29	117	0.43	29
30	National Institute of Technology	Agartala	http://www.tec.nic.in	2006	37	0.22	52	0.30	30

Table 5—URL citations of All Remaining Institutes (*contd.*)

Sl. no	Institute name	Location	Web Address	Year of estd./ designated	URL citations		Website age in months	URL Citation/ Age Ratio	Rank
					Number	Percentage			
1	Indian Institute of Science Education and Research	Thiruvananthapuram	http://www.iisertvm.ac.in	2008	243	1.42	56	4.34	1
2	Indian Institute of Science Education and Research	Mohali	http://www.iisermohali.ac.in	2007	231	1.35	63	3.67	2
3	Indian Institute of Science Education and Research	Bhopal	http://www.iiserbhopal.ac.in	2008	196	1.15	59	3.32	3
4	Indian Institute of Science Education and Research	Pune	http://www.iiserpune.ac.in	2006	276	1.61	84	3.29	4
5	Indian Institute of Information Technology	Allahabad	http://www.iiita.ac.in	1999	409	2.39	142	2.88	5
6	Indian Institute of Science Education and Research	Kolkata	http://www.iiserkol.ac.in	2006	216	1.26	76	2.84	6
7	Indian Institute of Information Technology, Design and Manufacturing	Kanchipuram	http://www.iiitdm.ac.in	2007	152	0.89	62	2.45	7
8	National Institute of Industrial Engineering	Mumbai	http://www.nitie.edu	1963	341	1.99	150	2.27	8
9	Central Institute of Technology	Kokrajhar	http://www.cit.kokrajhar.in	2006	110	0.64	52	2.12	9
10	Indian School of Mines University	Dhanbad	http://www.ismdhanbad.ac.in	1926	188	1.10		1.79	10
11	National Institute of Technical Teachers Training and Research	Chandigarh	http://www.nitttrchd.ac.in	1967	153	0.89	101	1.51	11

(contd.)

Table 5—URL citations of All Remaining Institutes

Sl. no	Institute name	Location	Web Address	Year of estd./ designated	URL citations		Website age in months	URL Citation/ Age Ratio	Rank
					Number	Percentage			
12	National Institute of Technical Teachers Training and Research	Bhopal	http://www.nitttrbpl.ac.in	1966	60	0.35	40	1.50	12
13	Atal Bihari Vajpayee – Indian Institute of Information Technology	Gwalior	www.iiitm.ac.in	1998	193	1.13	154	1.25	13
14	School of Planning & Architecture	Bhopal	http://www.spabhupal.ac.in	2008	48	0.28	41	1.17	14
15	Indian Institute of Science	Bangalore	http://www.iisc.ernet.in	1909	212	1.24	193	1.10	15
16	National Institute of Technical Teachers Training and Research	Chennai	http://www.nitttrc.ac.in	1964	112	0.66	110	1.02	16
17	School of Planning & Architecture	Vijayawada	http://www.spav.ac.in	2008	35	0.20	37	0.95	17
18	School of Planning & Architecture	New Delhi	http://www.spa.ac.in	1959	50	0.29	64	0.78	18
19	Sant Longowal Institute of Engineering & Technology	Longowal, Punjab	http://www.sliet.ac.in	1991	50	0.29	65	0.77	19
20	National Institute of Foundry & Forge Technology	Ranchi	http://www.nifft.ernet.in	1966	48	0.28	75	0.64	20
21	Pandit Dwarka Prasad Mishra Indian Institute of Information, Technology, Design and Manufacturing (IIITDM)	Jabalpur	http://www.iiitdmj.ac.in	2005	16	0.09	38	0.42	21
22	North Eastern Regional Institute of Science & Technology	Itanagar	http://www.nerist.ac.in	1983	50	0.29	124	0.40	22
23	National Institute of Technical Teachers Training and Research	Kolkata	http://www.nitttrkol.ac.in	1965	36	0.21	90	0.40	23

correlation between the age of the institution in 2012 and URL Citations (= 0.358, $n = 82$, $p < 0.01$). The significant Spearman correlation coefficient value was high for IIMs (= 0.825, $n = 13$, $p < 0.001$) followed by NITs (= 0.665, $n = 30$, $p < 0.01$). No significant correlation was found for IITs (= 0.376, $n = 16$) and ARIs (=0.085, $n = 23$).

Website age

Among the 82 institutions, the first website was started in 1996. Maximum of 13 websites were created in 2010 followed by 10 in 2003. By the year, 2012 all the institutions had their websites. The statistically significant correlation (Spearman correlation coefficient is 0.638, $p < 0.01$) between the

age of the website and URL citation count indicated that older websites received more URL citations. The significant Spearman correlation coefficient values are high for IIMs ($= 0.826$, $n = 13$, $p < 0.01$), followed by NITs ($= 0.631$, $n = 30$, $p < 0.01$) and ARIs ($= 0.475$, $n=23$, $p < 0.005$) No significant correlation was found for IITs ($= 0.339$, $n= 16$).

Ratio of website age/URL citations

The statistically significant correlation (Spearman correlation coefficient is 0.386 , $p < 0.01$) between the ratio of website age/URL citations and URL citation count indicated that older website received more URL citations. The significant Spearman correlation coefficient values were high for ARIs ($= 0.811$, $n = 23$, $p < 0.01$), followed by NITs ($= 0.501$, $n = 30$, $p < 0.01$). No significant correlation was found in the case of IIMs ($= 0.470$, $n= 13$) and IITs ($= -0.233$, $n = 16$).

Comparison of institutions

We categorised the 82 Indian central government funded institutions (ICGFL) under 14 groups as listed in Table 6. The 30 National Institutes of Technology 16 (36.6%), received 5996 (35.1%) citations and occupies top position followed by Indian Institutes of Technology 16 (19.5%) having received 3986 (23.3%) citations. The 13 Indian Institutes of Management (15.9%) received 3688 (21.6%) citations. The remaining 11 groups of institutions received 3425 (20%) citations. National Institute of Industrial Engineering (NIIE) had the highest impact based on average citations (341, 14.9%). It was followed by IIMs (284, 12.4%), IITs (249; 10.9%). Schools of Planning & Architecture (SPAs) had the lowest impact based on average citations (44, 1.9%) among all the groups of institutions.

Spearman's correlation determines the relationship between number of branches and URL citations of the corresponding groups. The significant Spearman correlation coefficient value of 0.880 confirms that there appears to be a strong positive correlation between the number of branches and URL citations of the corresponding Groups... ($= 0.88$, $n = 14$, $p < 0.001$). All institutions were pooled together in category ARI except IIMs, IITs and NITs (Table 7). After the revised grouping, the IIMs had topmost impact based on average citations (284, 32.18%), followed by IITs (249, 28.26% and NITs (200, 22.67%). All remaining institutions (ARIs) had lowest impact (149, 16.89%) among all the groups of

institutions. Each URL cited institution was studied carefully and categorised based on their content as given in Table 8.

There were 4804 (28.1%) websites that cited Indian Central Government Funded Institution's Groups for career associated information, 3757 (22.0%) websites had cited course-related information, 3018 (17.7%) websites had cited Indian central government funded institutions for admission-related information, 1760 (10.3%) websites that cited research-related information shared 78.1% and secured top 4 positions; 21.9 % websites citations were shared by general, news, Inter_dept, result, and Social media among all categories.

IIMs were at the top in general (24.80%), news (3.1%), research (11.6%) and social media (5.0), IIT secured top position in course (23.5%), and inter_dept (5.5%), NIT was in top position in general (10.7%) and result (4.0%) and ARI came top in the category admission (21.0) and career (30.5%) related information.

Chi-square test

A Chi-square test was conducted to examine whether there was a relationship between Indian central government funded institution's groups and categories of URL citations. The results revealed that there is a significant relationship between the Indian central government funded institution's groups and categories of URL citations (Chi-square value square value = 337.839 ; $df = 24$; $p > 0.001$). (Figure 1)

Overall NITs (35.1%) cited more than the ARI group (20.0%). IIMs and IITs groups are also had cited more or less equal to ARI groups of institutions. The IIMs were cited more by Social_media (29.8%) websites than Inter_dept (12.5%). It was reverse in the case of IITs which were more cited by Inter_dept (34.2%) than Social_media (19.0%). NITs were cited more by RESULT (45.1%) as compared to the Courses (31.2%).

ARI group of institutions were cited more by category Admission (23.8%) than the News (10.7%). Phi (0.141) and Cramer's V (0.081) revealed association between the categories is weak.

In spite of significant association between the Indian Central Government Funded Institution's Groups and Categories of citations, we found that some of the institutions were not cited in some of the categories (Table 8). NIT- Sikkim and NIT-Pondicherry were not cited in Admission-related websites. NIT-Pondicherry and SPA-New Delhi were

Table 6—Branch details of Indian Central Government Funded Institutions (ICGFI) with their citations.

Sl. no.	Institute	Abbreviation	Groups		Citations		Average Citations Per group		URL citations/Web Site Age Ratio Average
			Number	%	Number	%	Number	%	
1	Indian Institutes of Management	IIM	13	15.9	3688	21.6	284	12.4	4.21
2	Indian Institutes of Technology	IIT	16	19.5	3986	23.3	249	10.9	4.14
3	Indian Institute of Science Education and Research	IISER	5	6.1	1162	6.8	232	10.1	3.49
4	National Institutes of Technology	NIT	30	36.6	5996	35.1	200	8.7	2.72
5	National Institutes of Industrial Engineering	NIIE	1	1.2	341	2.0	341	14.9	2.27
6	Central Institute of Technology	CIT	1	1.2	110	0.6	110	4.8	2.12
7	Indian School of Mines University	ISMU	1	1.2	188	1.1	188	8.2	1.79
8	Indian Institutes of Information Technology	IIIT	4	4.9	770	4.5	193	8.4	1.75
9	National Institutes of Technical Teachers Training and Research	NITTTR	4	4.9	361	2.1	90	3.9	1.11
10	Indian Institute of Science	IISC	1	1.2	212	1.2	212	9.3	1.10
11	Schools of Planning & Architecture	SPA	3	3.7	133	0.8	44	1.9	0.97
12	Institute of Engineering & Technology	IJET	1	1.2	50	0.3	50	2.2	0.77
13	National Institute of Foundry & Forge Technology	NIFFT	1	1.2	48	0.3	48	2.1	0.64
14	North Eastern Regional Institute of Science & Technology	NERIST	1	1.2	50	0.3	50	2.2	0.40
Total			82	100.0	17095	100.0	2291.2	100.0	

Table 7—Ranking of Indian Central Government Funded Institutions' Groups based on average citations

Sl.no.	Institutions Groups	Abbreviation	Groups		Citations		Average Citations Per Institute		URL citations/Web Site Age Ratio Average	Rank
			Number	%	Number	%	Number	%		
1	Indian Institutes of Management	IIM	13	15.9	3688	21.6	284	32.18	4.21	1
2	Indian Institutes of Technology	IIT	16	19.5	3986	23.3	249	28.26	4.14	2
3	National Institutes of Technology	NIT	30	36.6	5996	35.1	200	22.67	2.72	3
4	All remaining Institutions	ARI	23	28.0	3425	20.0	149	16.89	1.78	4
Total			82	100.0	17095	100.0	882	100.0		

Table 8—Names of Institutions not present in any of the category

Category	Institute Names	No. of institutions
Admission	NIT-Sikkim, NIT-Puducherry	2
Career	All institutes present	0
Course	All institutes present	0
General	IET-Punjab, NIT- Meghalaya, NITTTR-Kolkata	3
News	IET-Punjab, IIIT-Jabalpur, NERIST-Nirjuli, NIT-Sikkim, NIT-Pondicherry , NITTTR-Kolkotta, NITTTR-Chandigarh, NITTTR-Bhopal	8
Inter_dept	CIT-Kokrajhar, IISER-Kolkotta, IISER-pune, IISER-Mohali, IISER-Bhopal, IISER- Thiruvananthapuram, ISMU-dhanbad, NERIST-Nirjuli, NIFFT-Ranchi, NITTTR-Chennai, NITTTR-Kolkotta, NITTTR-Chandigarh, NITTTR-Bhopal	13
Research	NIT-Pondicherry, SPA-New Delhi	2
Result	IISER-Bhopal, NIT-Meghalaya, NIT-Pondicherry	3
Social_media	IET-Punjab, IIIT-Kancheepuram, IISER-Bhopal, NIT-Sikkim, NIT- Meghalaya, NIT- Nagaland, NITTTR-Chandigarh,, NITTTR-Bhopal	8

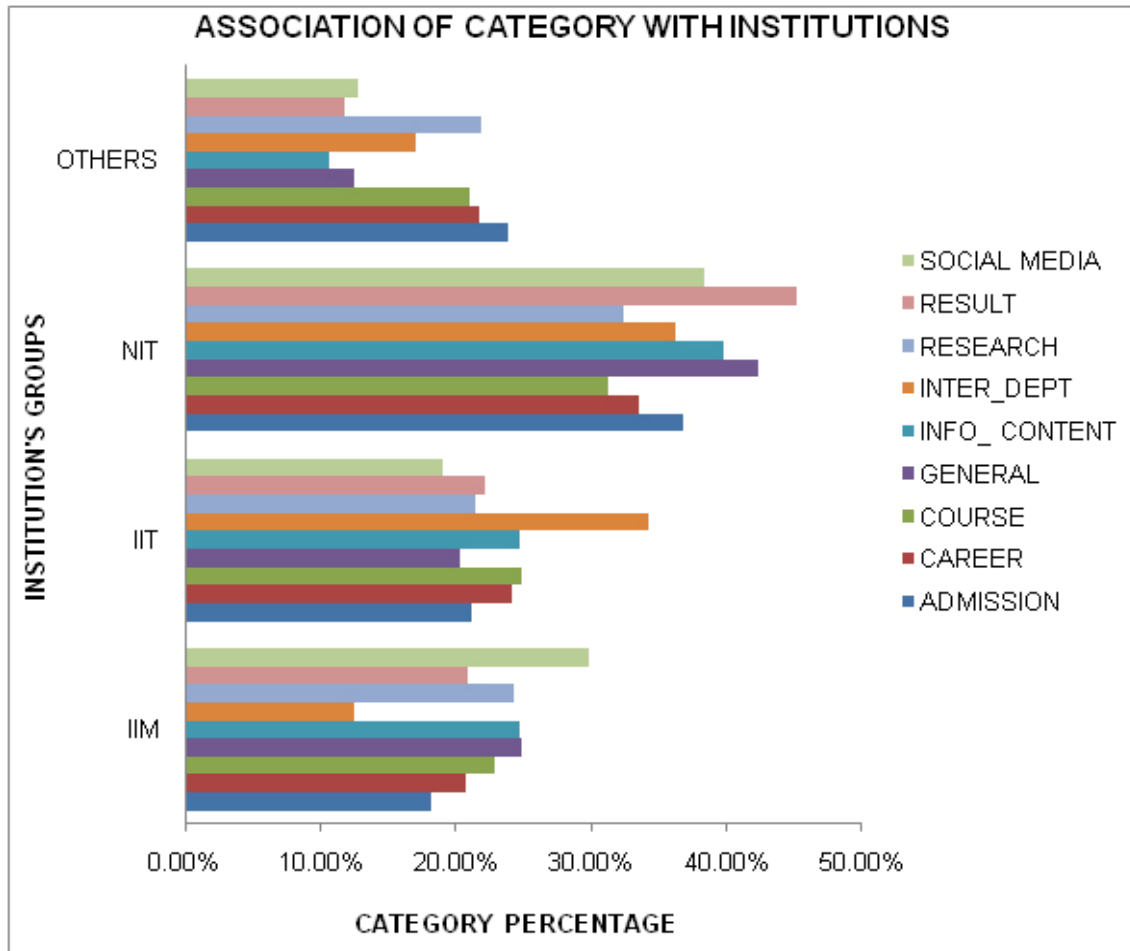


Fig. 1—Percentage of Categories of Indian Central Government Funded Institutions’ Groups

not cited in Research-related websites and IISER-Bhopal; NIT-Meghalaya and NIT-Puducherry were not cited in RESULT-related websites. Category Inter_dept was not found in 13 institutions followed by SOCIAL MEDIA which was not found in nine institutions.

Discussion

Comparison of age

Positive correlation values indicated that URL citations increased with Institutional age. IIMs and NITs revealed that older institutions attracted more URL citations. IITs and ARIs showed no significant correlation between URL citation's count and Institution's age. The present study found high correlations in website age than Institutions' age probably because of the significant correlation between ARI group of institution and with Web Site Age. The correlation value of Web site age is comparatively higher ($r=0.475$) than institution age in ARI groups. Website's age of IIMs, NITs and ARIs showed significant positive correlation than IITs with URL citations^{10, 16}. It is found that the age of the website affects the number of inlinks it attracts in scholarly and commercial websites.

Category

URL citations patterns of Indian Central Government Funded Institutions were analysed by classification approach. Various factors that could potentially influence the number of URL citations were studied, and factors that are more important were identified. Chi-square test revealed that NITs obtained top position in all categories. It can be concluded that URL citations of NITs had a closer relationship and associate more strongly than any other group. IITs secured second position in Career, Course, News, Inter_dept and Results category, since these groups offered technology courses like NITs. IIMs obtained second position in General, News and Research category which indicated that this group concentrates more on Research than other Institutions. ARI groups of institutions secured second position in Admission category only because it offers a wider range of courses. Thelwall *et al.*¹⁷ applied Chi-square test to determine the online impact of academic subjects between Taiwan and Australia. They found Taiwan has more impact Websites classified as computing, technology & engineering while Australia has more in science, social science & humanities.

Some of the ARIs were not cited in research, social media, Inter_dept and obtained lowest URL citations. Thelwall and Sud² found that websites in the same group have different website characteristics. Thelwall *et al.*¹⁴ study supported that many university homepages were not designed to provide useful information to the visitors.

The two vital factors that determine the URL citation in all the categories of institute are career and courses. Research was at the 4th position which confirmed that these motivation websites were looking for more research oriented results from higher-education institutions. It was supported by the results of links between universities related to research in United Kingdom¹⁸ and Israel¹⁹. This study confirmed that web impact of universities tends to be proportional to their research productivity²⁰. The results of the study revealed that Indian Central Government Funded Institutions (ICGFI) clearly needed to diversify on their web relationship within and among other Indian universities in areas of academic activities.

Limitation

The study was conducted using all institutions funded by Human-Resource Department, Government of India. The results of this may be generalised with similar crawlers like Webometric Analyst. Only one-time collected data was used for this research, and for this reason, no comparison results were available. Hence, it is suggested to use the periodically collected data to know the effect on variation and also identify the duration of data collection to get consistent results.

Conclusion

Website administrators should provide need based information by regularly updating their websites and introducing their websites to other sites on the web which will attract URL citations. Connectivity plays a vital role in recognizing websites in extended virtual environments. Identifying and categorising the motivation factors for citing Indian central government funded institutions website, finding the category difference and identifying the highest impact of the group of Indian Central Government Funded Institutions on the web are the best objectives to assess the web impact and give more knowledge about web impact assessment. This study classifies the URL citations and identifies the motivational

factors behind these Institutions' citations. They are also suitable tools for web impact assessment analysis.

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