Webometric study of private universities in Bangladesh

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ABSTRACT

There have been substantial studies conducted on webometrics, especially on the impact of websites and the web impact factor. The present study analysed the websites of private universities in Bangladesh according to the webometrics indicator. It examines and explores the 44 private university websites in Bangladesh and identifies the number of web pages and link pages, and calculates the Overall Web Impact Factor (WIF) and Absolute Web Impact Factor (WIF). In a cross-sectional study, all the websites were analysed and compared using AltaVista search engine. The websites were then ranked based on these webometric indicators. The study revealed that some private universities in Bangladesh have higher number of web pages but their link pages are very small in number, thus the websites fall behind in their Overall WIF, self link, external links and Absolute WIF. Finally, it is showed that these universities did not have much impact factor on the web and were not known internationally. The major reasons are discussed and suggestions to overcome the problems are presented.

Keywords: Private universities; Webometrics, Web presence; World Wide Web; Web Impact Factor

INTRODUCTION

Different metrics studies such as librametrics, bibliometrics, scientometrics and informetrics are well known and used to measure scholarly communication; identify research trends and growth of knowledge; identify users of different subjects; estimate comprehensiveness of secondary periodicals; forecast past, present and future publishing trends; identify authorship and its trends in documents on various subjects; measure productivity of publishers, individual authors, organisations, country or that of an entire discipline. Bibliometrics research methodologies of library and information science have always been used to provide tools for understanding the dynamics of disciplines, developing policy and justifying research funding. Since 1996 increasing efforts have been made to investigate the web as a significant scholarly medium for science and scholarship by applying bibliometrics techniques (Larson 1996). Terms applied to this new area of study include "webometrics" (Almind and Ingwersen 1997) and recent years have witnessed the emergence of webometrics or cybermetrics. Webometrics covers research of all network based communication using informetric or other quantitative measures. Webometrics is defined as "the study of quantitative aspects of the construction and use of information resources; structures and technologies on the web, drawing on bibliometric and informetric approaches (Bjorneborn and Ingwersen 2004). This definition covers the construction side and usage side of the web which embraces four main areas of webometrics study:

a) Web page content analysis
b) Web link structure analysis (e.g. Hyperlink, Self link and External link)
c) Web usage analysis (e.g. exploiting log files for users searching and browsing behavior) and
d) Web technology analysis (including search engine performance)

Webometrics, in future, may become one of the most interesting research areas for the vast collection of electronic information available on the publicly indexable web. Paisley (1990) rightly identified this area as the future domain of bibliometric research.

BACKGROUND OF THE STUDY

Academic websites in a country are the most important Internet communication tools. They introduce universities, their related institutes and departments, their resources and services, faculty members, student, alumnae and others. Nowadays, an important factor for the success of a university is its website and web accessibility and in particular its visibility on the web (Ramesh Babu, Jeyshankar and Rao 2010). Therefore, it is important to evaluate their presence on the web as it is to evaluate the educational and research performance of the universities. In Bangladesh, the concept is almost unfamiliar as no work has been done on this area. Bangladesh is a developing country and the present literacy rate of the country is 47.9 percent (CIA 2011). The University Grants Commission (UGC) of Bangladesh is the statutory apex body in the field of higher education in Bangladesh. The primary objectives of the UGC are to supervise, maintain, promote and coordinate university education. It is also responsible for maintaining standard and quality in all the public and private universities in Bangladesh. At present there are 54 private and 31 public universities in the country (UGC 2010). Sobhan and Dey (2007) stated that there is huge competition among most of the top universities in Bangladesh to produce graduate of international standard and to cope with the overwhelming local and global challenges. To keep the universities in the race of higher education and scholarly communication, almost all the universities have information and communication technology (ICT) facilities. Comparatively, some top leading private universities are supported by ICT. Private universities in Bangladesh started in 1992, after enactment of the Private University Act. Private universities are now playing a vital role in promoting productivity, innovation, entrepreneurship, gender mainstreaming and overall socio-cultural advancement in Bangladesh. Private universities are now making praiseworthy contributions in the development of ICT in Bangladesh (Miyan 2008). It is found out from different reports (Ashraf, Ibrahim and Joarder 2009) that the numbers of private universities in Bangladesh are increasing and some of the leading private universities have more ICT facilities than some public universities. There have been no rankings of private universities in Bangladesh by any proper authorities or the government. Very few organisations publish complete ranking of the private universities in Bangladesh but these are not accepted and appreciated by the University Grants Commission (UGC) and government of Bangladesh.

At present, UGC and Bangladesh government are making plan to impose different terms and conditions for the improvement of the private universities in Bangladesh. The present study, webometrics assessment may be adopted to measure their ranking as it is relatively less costly. This study explores the issues relating to webometrics and will create a new avenue for assessing the performance of Bangladesh private universities on the Web. This is the first webometric analysis of private universities in Bangladesh.

LITERATURE REVIEW

The science of webometrics and the study of links created between web pages try to determine a model for scientific usage of the web and also information resources with highest impact on the web using the new calculating methodologies to measure inlinks of the web pages (Vaugan and Thelwall 2003). In fact, webometrics is a science based on informetrics methods, which studies the nature and characteristics of websites. In this science the content analysis of web pages are performed through calculating and analysing their outlinks and inlinks. The ratio between the external inlinks received by a website and the number of web pages comprising that website is called web impact factor (WIF), which reflects its global fame as well as the quality of information resources it provides. The concept of WIF was introduced first on 1997 by a Spanish researcher, Rodriguez Gairín (Rodriguez and Gairin 1997). The basic idea of this concept came from journal impact factor (JIF) which was introduced by Dr. Eugene Garfield in the 1960s and used by the Institute of Scientific Information (ISI) to select the scientific journals for citation indices ever since (Garfield 1999). WIF is an indicator to measure and compare efficiency, attractiveness, and success of websites in a broad level such as country domains or a limited level such as academic websites. Absolute WIF or External WIF is the ratio of external inlinks to the web pages indexed by search engines.

Since mid 1990s, there have been efforts to study the structure and characteristics of the web by itself, web contents and links and also web search engines using new informetrics methodologies. Several studies show that web sites can be compared and ranked in different domains based on their impact factor. Ingwersen (1998) calculated the WIF for some Danish domains and websites. He used AltaVista for his study because he believed this search engine covers a broad area of the web and provides sufficient information for webometrics studies. Jeyshankar and Ramesh Babu (2009) conducted a study on Tamil Nadu universities where they examined and explored the websites of 45 universities in Tamil Nadu comprising 27 state and 18 private universities. They found that that some universities in Tamil Nadu have higher number of web pages but their corresponding link pages are very small in number and the websites fall behind in their simple, self link and external link WIF. Mukhopadhyay (2004) studied the WIF for SAARC (South Asian Association for Regional Cooperation) countries as well as the sub domains of academic and research institutions in India. He believed that because of the hierarchical structure of the web, WIF should be calculated in three levels and also believed that well-known search engines such as Alltheweb, AltaVista, and Hotbot can be used for data gathering and calculating WIF in each of the above mentioned levels.

In another study, two types of websites in Australia were compared: Australian universities websites and Australian electronic journals. Analysing the results of his study, the author concluded that the WIF is an appropriate indicator to measure the general impact of large institutions such as universities and research institutes, but it is not reliable to evaluate websites with small content volume such as electronic journals (Smith 1999). Smith and Thelwall (2002) studied the WIF for the Australian Universities' websites. Counts of links into the websites of Australasian universities were calculated from the output of a specially designed crawler that covered universities in the UK, Australia and New Zealand. These figures were compared to those from the commercial search engines such as AltaVista and AllTheWeb. WIFs for Australasian universities were then calculated by dividing link counts from the three countries by academic staff numbers at each target university. Smith and Thelwall (2002) concluded that AltaVista and AllTheWeb search engines could find more

domains and links compared to other Internet search engines and they are also more accessible and easier to use.

The world universities are ranked based on their academic and research performance every year by some reputable centres such as the Institute of Higher Education, Shanghai Jiao Tong University (IHE-SJTU). The result of this ranking, published annually as Academic Ranking of World Universities (ARWU), is of international importance (Aminpour 2006 and ARWU, 2011). Abrizah, Noorhidawati and Kiran (2010) highlighted the web performance of Asian institutional repositories through global visibility and performance of Asian top-ranked universities in the archiving and sharing their research output through institutional repositories, based on the Ranking Web of World Repositories (RWWR). Their findings signify Japan as the biggest contributor of Asian repositories, followed by India and Taiwan. It shows that only 48 of them are listed in the Top 400 RWWR. This implies that only 12% of Asian institutional repositories are visible and incorporate good practices in their web publication as extracted from the quantitative webometrics indicators used by the ranking. It is suggested that if the web performance of an institutional repository of a research institution is below the expected position, the university authorities should reconsider their web policy to increase the volume and quality of their intellectual output / research publications through institutional repositories. In the present study, the number of web pages, inlinks, external inlinks and also the overall and absolute WIFs for 44 private universities with exclusive and active websites were calculated using Alta Vista search engine. Then, the websites were compared and ranked according to the mentioned webometric indicators.

OBJECTIVES AND METHOD

This is an analytical descriptive research carried out as a cross sectional study. The primary objective of this study is to calculate the web impact factor of the private universities in Bangladesh. Specifically the objectives are:

 a) To identify and analyse the websites of private universities in Bangladesh.
 b) To calculate the number of web pages, number of link pages, number of self link pages and external link pages of the private universities websites in Bangladesh and rank them by number of web pages and WIF.
 c) To calculate the overall Web Impact Factor (WIF) of private universities in Bangladesh.

This study sampled all the private universities with exclusive websites in Bangladesh. These lists are approved by the University Grants Commission of Bangladesh (UGC). The methodology of evaluation of web engines is addressed by Clarke and Willett (1997). They compared Alta Vista, Excite and Lycos. It was found that Alta Vista performed significantly better than Lycos and Excite as it has large web coverage and (thus far) provides search features suitable for informetric studies of the web. That is why the present study uses Alta Vista (www.altavista.com) search engine for collecting raw data. The number of inlinks, external links, and the web pages listed in each academic website was counted using the following commands in Alta Vista search engine (Statistical Cybermetrics Research Group 2000).

Total pages
Site:HostName.Domain
Inlinks
Linkdomain:HostName.Domain
External Inlinks
 Linkdomain:HostName.Domain-site:HostName.Domain
The following formulas were used to calculate the Overall Web Impact Factor (WIF) and the Absolute WIF for each websites.

Total pages   = A
Inlinks   = B
External links = C

Overall WIF of the website= Number of inlinks the website receive (B)/ Number of web pages indexed from the same website (A). OWIF=B/A

Absolute (External) WIF of the website = Number of external links (C) / Number of web pages indexed from the same website (A). AWIF=C/A

Because of the instability of the web and its content, the increasing number of web pages and also the continuous changes in the number of links, the data was gathered in a short period of time to make the results more precise. The websites of the Bangladeshi private universities were all investigated at the same day, 30 September 2010. The data was then entered in Microsoft Excel spreadsheet to be analysed.

RESULTS: WEBOMETRICS ANALYSIS

Ten universities, out of 54 private universities in Bangladesh were omitted due to different problems such as server down during the period of study or did not have websites. Therefore, 44 private universities websites were studied. As indicated in Table 1, Daffodil International University with 22,825 web pages had the highest rank for total pages, followed by North South University with 5,266 web pages, East West University with 4,521 web pages and BRAC University with 3,502 web pages. The last two private universities in the list, Asian University of Bangladesh and Central Women's University have only 4 web pages. United International University (25,267) ranked first in the number of inlinks, followed by Daffodil International University (7,915) and BRAC University (4,375). The American Bangladesh University was ranked last in terms of number of inlinks.

Table 1 shows that Daffodil International University with 4,680 external inlinks was in the first position. Independent University, Bangladesh with 537 and American International University with 500 external inlinks were in the second and third position respectively. Eastern University as well as Sylhet International University with 1 external inlinks was ranked last. It is also showed that Bangladesh universities do not have any external link.

In Table 2, Asian University of Bangladesh with 4 web pages, 88 inlinks, and 2 external links had the highest overall impact factor (22.00), but not the highest absolute WIF. The second in rank was the United International University with 1,842 web pages, 25,267 inlinks and 84 external inlinks, with 13.72 overall WIF and 0.05 absolute WIF. The last in the list was Daffodil International University with 0.35 overall WIF and 0.21 absolute WIF.

Table 1: Distribution of Total Pages by Private Universities in Bangladesh

No	Name of Private universities	Total pages	Inlinks	External Inlinks	Overall WIF	Absolute WIF
1	Daffodil International University	22,825	7,915	4680	0.35	0.21
2	North South University	5,266	4,311	289	0.82	0.05
3	East West University	4,521	4876	120	1.08	0.03
4	BRAC University	3,502	4,375	144	1.25	0.04
5	American International University Bangladesh	2,515	3,176	500	1.26	0.20
6	University of Liberal Arts Bangladesh	2,159	1,261	66	0.58	0.03
7	Northern University Bangladesh	2,139	1,181	96	0.55	0.04
8	United International University	1,842	25,267	84	13.72	0.05
9	Independent University, Bangladesh	1,823	2,218	537	1.22	0.29
10	International Islamic University, Chittagong	922	1,033	86	1.12	0.09
11	Ahsanullah University of Science and Technology	735	1670	187	2.27	0.25
12	The University of Asia Pacific	520	832	76	1.60	0.15
13	University of Information Technology & Sciences	488	567	55	1.16	0.11
14	Metropolitan University	365	357	2	0.98	0.01
15	Bangladesh University of Business & Technology	291	138	112	0.47	0.38
16	Eastern University	218	302	1	1.39	0.00
17	State University Of Bangladesh	206	240	72	1.17	0.35
18	Darul Ihsan University	178	245	78	1.38	0.44
19	Presidency University	175	460	40	2.63	0.23
20	International University of Business Agriculture & Tech.	173	596	86	3.45	0.50
21	World University of Bangladesh	158	223	44	1.41	0.28
22	Stamford University, Bangladesh	155	669	87	4.32	0.56
23	ASA University Bangladesh	138	210	44	1.52	0.32
24	Dhaka International University	127	172	64	1.35	0.50
25	Premier University, Chittagong	120	80	89	0.67	0.74
26	Southeast University	102	671	114	6.58	1.12
27	University of Development Alternative	94	377	10	4.01	0.11
28	Primeasia University	93	155	55	1.67	0.59
29	Manarat International University	84	163	9	1.94	0.11
30	Southern University of Bangladesh	72	236	10	3.28	0.14
31	Bangladesh University	60	173	0	2.88	0.00
32	Sylhet International University	59	110	1	1.86	0.02
33	Green University of Bangladesh	57	136	34	2.39	0.60
34	IBAIS University	55	370	156	6.73	2.84
35	East Delta University	51	76	42	1.49	0.82
36	Leading University	45	135	90	3.00	2.00
37	Queens University*	35	52	11	1.49	0.31
38	University of Science & Technology, Chittagong	22	46	91	2.09	4.14
39	Prime University	16	50	41	3.13	2.56
40	University of South Asia	11	67	10	6.09	0.91
41	American Bangladesh University*	6	4	5	0.67	0.83
42	Gono Bishwabidyalay	6	31	9	5.17	1.50
43	Asian University of Bangladesh	4	88	2	22.00	0.50
44	Central Women's University*	4	13	5	3.25	1.25

Note: *The University was closed down by the Government of the People's Republic of Bangladesh on 22.10.2006. However, now the University is operating by obtaining a Stay Order from the Court.

Table 2: Distribution of Overall WIF by Private Universities in Bangladesh

No	Name of Private universities	Total pages	Inlinks	External Inlinks	Overall WIF	Absolute WIF
1	Asian University of Bangladesh	4	88	2	22.00	0.50
2	United International University	1,842	25,267	84	13.72	0.05
3	IBAIS University	55	370	156	6.73	2.84
4	Southeast University	102	671	114	6.58	1.12
5	University of South Asia	11	67	10	6.09	0.91
6	Gono Bishwabidyalay	6	31	9	5.17	1.50
7	Stamford University, Bangladesh	155	669	87	4.32	0.56
8	University of Development Alternative	94	377	10	4.01	0.11
9	International University of Business Agriculture & Tech.	173	596	86	3.45	0.50
10	Southern University of Bangladesh	72	236	10	3.28	0.14
11	Central Women's University*	4	13	5	3.25	1.25
12	Prime University	16	50	41	3.13	2.56
13	Leading University	45	135	90	3.00	2.00
14	Bangladesh University	60	173	0	2.88	0.00
15	Presidency University	175	460	40	2.63	0.23
16	Green University of Bangladesh	57	136	34	2.39	0.60
17	Ahsanullah University of Science and Technology	735	1670	187	2.27	0.25
18	University of Science & Technology, Chittagong	22	46	91	2.09	4.14
19	Manarat International University	84	163	9	1.94	0.11
20	Sylhet International University	59	110	1	1.86	0.02
21	Primeasia University	93	155	55	1.67	0.59
22	The University of Asia Pacific	520	832	76	1.60	0.15
23	ASA University Bangladesh	138	210	44	1.52	0.32
24	East Delta University	51	76	42	1.49	0.82
25	Queens University*	35	52	11	1.49	0.31
26	World University of Bangladesh	158	223	44	1.41	0.28
27	Eastern University	218	302	1	1.39	0.00
28	Darul Ihsan University	178	245	78	1.38	0.44
29	Dhaka International University	127	172	64	1.35	0.50
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36	East West University	4,521	4876	120	1.08	0.03
37	Metropolitan University	365	357	2	0.98	0.01
38	North South University	5,266	4,311	289	0.82	0.05
39	American Bangladesh University*	6	4	5	0.67	0.83
40	Premier University, Chittagong	120	80	89	0.67	0.74
41	University of Liberal Arts Bangladesh	2,159	1,261	66	0.58	0.03
42	Northern University Bangladesh	2,139	1,181	96	0.55	0.04
43	Bangladesh University of Business & Technology	291	138	112	0.47	0.38
44	Daffodil International University	22,825	7,915	4680	0.35	0.21

Note: *The University was closed down by the Government of the People's Republic of Bangladesh on 22.10.2006. However, now the University is operating by obtaining a Stay Order from the Court.

DISCUSSION

The number of links received by a university website shows its impact on the web and also the number of visitors it attracts. The present study calculated and compared the number of web pages, inlinks, external inlinks and also the overall and absolute WIF of private universities in Bangladesh. It covers active exclusive websites, compared and then ranked these universities according to webometric indicators. The present study chose Alta Vista because of its ability to cover a broader range of the web as opposed to the other commercial search engines. Moreover, some essential data could not be retrieved via other commercial search engine like Google, Yahoo and Live Search at the time of the study. In fact, they could not process some of the main queries useful for webometric purposes (Statistical Cybermetrics Research Group 2000). Several webometric studies (Ingwersen 1998; Smith 1999; Mukhopadhyay 2004; Agarin and Nwagwu 2006) also report Alta Vista to be more reliable than other search engines.

AltaVista search engine indexes 4 web pages on the Asian University of Bangladesh website at the time of the study. These pages in general received 88 inlinks from which 2 were external. Since the WIF is calculated by dividing the number of inlinks to the number of web pages, it will be falsely high for new websites with few web pages. Therefore, the website of Asian University of Bangladesh with only 4 web pages was placed at the top of total private universities in Bangladesh. The WIF of Asian University of Bangladesh was 22.00. It is obvious that major private universities in Bangladesh such as BRAC University, American International University Bangladesh, East West University, Daffodil International University with thousands of web pages have more effective presence on the internet. The reports of the Webometrics ranking of world universities confirm the higher position of these private universities in their ranking (Ranking Web of World Universities 2010). Thewall (2000) believes that calculating WIF of a domain by AltaVista can be precise enough if the number of web pages in the website is relatively high. He suggests that before using a search engine for calculating WIF for a website, the high number of web pages in the same website should be ensured.

Another factor that can increase the WIF of a university website is to make appropriate information resources easily accessible and usable for its users. Electronic publishing and distributing scientific materials via a university website will attract more audiences and as a result the university website will receive more inlinks and get higher WIF. Thewall (2002) studied 100 universities website of the UK and the results of his research showed that the highly linked to pages are those that facilitate access to a wide range of information. Linguistic barrier is another factor affecting WIF. Other researchers also discussed that websites which provided non-English web pages attracted less visitors and received less inlinks and therefore obtained lower WIFs (Noruzi 2006). According to the Ranking Web of World Universities (2010), Bangladesh University of Engineering and Technology (BUET) was the 23rd position in top 100 South Asian universities and in Bangladesh it is the best among all public and private universities in Bangladesh. In general, it is reported and identified that Dhaka University is the largest and oldest universities in Bangladesh while its rank among the top South Asian universities was 76. However, global ranks of some private universities in Bangladesh are BRAC University 56th position, American International University Bangladesh 87th position, East-West university 95th position and Daffodil International University was the 99th position in top 100 South Asian Universities. While some South Asian universities and institutes such as Indian Institute of Technology (IIT, Bombay) and Delhi University were ranked seventh respectively. According to the same report, three universities such as Tokyo, Hong Kong and Kyoto were ranked third among all

the Asian universities. None of the Bangladeshi universities were among the first 100 universities in Asia. According to country webometric ranking reports, some of the Bangladeshi universities were ranked as follows: Bangladesh University of Engineering and Technology (BUET) (2916), BRAC University (4577), University of Dhaka (5531), American International University Bangladesh (5882) East-West University Bangladesh (6210) and Daffodill International University (6359).

The result of the study showed that in general the private universities in Bangladesh did not have much impact on the web and were not known at the international level, evident by the webometrics indicators low. The number of web pages, the number of accessible .ppt, .doc, .pdf, and .ps files, and also the academic rank of a university announced annually by credible academic world rankings such as Institute of Higher Education of Shanghai Jiao Tong University, China and Times Higher Education, UK are considerable factors in the webometric ranking of universities. The policy makers of the private universities in Bangladesh and also the managers of their websites are not paying attention to these results. They are not familiar with webometric studies and benefits of improving web ranking. Almost all the private universities of Bangladesh use ICT for managing the administrative processes and some are using ICT at a moderate level (Huda, Tabassum and Ahmed 2009). As they are not aware of web ranking, they do not perceive its necessity to make websites active and rich in a way to be attractive and usable for students, professors, both in Bangladesh and global internet users. On the other hand, using traditional methods of publishing scientific productions and information resources in most of the private universities causes lower inlinks and WIFs. There are also language barriers. English-speaking webmasters and authors rarely link to non-English language literature. As some of the private university websites in Bangladesh use both Bengali and English languages, these websites may be less used. It is found from different reports, observations and visiting websites that some other reasons for the lower presence of the private universities in Bangladesh on the web are as follow; structural problems in web designing, providing few English web pages, limitation of access to the scientific resources, not indexing most of the private universities in Bangladesh by major search engines and web directories, the instability of web servers and inefficient web designs. The Open Access movement has not been openly embraced by most of the private universities, where the researchers probably have well-established routines of publication in prestigious journals and see little benefit in alternative methods of access to the same material. Only one private university in Bangladesh has established an institutional repository. BRAC University is the first university in Bangladesh that have institutional repository named as BRAC University Institutional Repository (Hasina 2008). As advised by the Cybermetrics Laboratory (Ranking Web of World Repositories 2010), this study also agreed that if the web performance of a research institution is below the expected position according to their academic excellence, university authorities should reconsider their web policy, promoting substantial increases of the volume and quality of their intellectual output / research publications.

RECOMMENDATIONS AND CONCLUSIONS

In this aspect this research suggests that:

- The university websites should facilitate all users to access the academic and scientific resources as well as to up-to-date information and news in both local language, and in English.
- The web designs and the links between pages to be corrected, so that the search engines can easily access and index the latest materials uploaded to the websites; and the users can easily find their relevant information in the shortest possible time.

- The universities should provide special budget for the web design, support and updating of their websites.
- The web masters try to use HTM, HTML, PHP, PDF, PPT and Doc formats to ensure that the internet search engines can index their websites.
- Providing a site map for the university website could help search engines index all the centres related to the institute such as institutes, faculties, programme, research centres etc. Also allocating special subdirectories to each school, educational groups and department of the university will help this purpose. A site map is a useful tool to make web pages easily accessible to both users and search engines which leads to increase the visibility of the website.
- Web masters try to introduce universities web pages in international websites, internet guides and search engines.
- Universities should provide some space for the faculty members, staff and graduate students to design their own web pages and introduce their professional and scientific products and activities on the university website.
- The web masters of universities websites try to find useful information such as Open Access (OA) resources to add to the richness of the website content. Open access repositories through institutional repositories can transform the research scene from one of isolation and marginalisation, to one of inclusion and international cooperation (Abrizah, Noorhidawati and Kiran 2010). It will help the main goal of the websites which is facilitation of access to reliable as well as up-to-date resources. Providing a variety of information and a broad collection of professional up-to-date resources in universities will attract more users and visitors, increase the visibility and number of Inlinks and as a result lead to a bigger WIF. Good ranks are probably correlated with higher number of potential authors who self-archive (scholars and postgraduates) and the effort made by the academic library to collect and disseminate the university's intellectual output.
- Professors and faculty members should be encouraged to upload their course syllabus, course resources (if possible), and the content of their courses on the university website and they should encourage students to use the above facilities provided for them.
- To increase visibility and the number of Inlinks, websites should provide English web pages because English language is the most common language used by international and academic societies around the world.

This study has been exploratory and there is scope for future webometric research in this area. It would be useful to carry out a more comprehensive study comparing more institutions and comparing web with conventional publication output and indicators of economic and technological development. Web link analysis of university website is promising in general terms, but in practice web links are not entirely equivalent to citations in the scholarly literature as much of the web content of university sites also include administrative, teaching and recreational content. This study observes that some private universities in Bangladesh have higher number of web pages but correspondingly their link pages are very small in number, and the websites fall behind in their overall, self link and external WIF.

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