A Webometrics Analysis of Website of Central Higher Education Institute (HEI) in Uttar Pradesh

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Abstract: *Webometrics is one of the most widely used information-metrics methods for analyzing how users interact with and use certain web resources and websites. This research is an endeavor to investigate and explore the websites of 17 Central Higher Education Institutes (HEI) of Uttar Pradesh on the basis of established webometrics criteria i.e., domain systems of websites, number of web pages, domain and page authority, to discover the Moz rank and calculates the external, internal and self web impact factor. Data was collected from the HEI through SEO Small Tools and Google search engine. Websites has great influence on society. It is an important source of information to user. This research could help university administrators and programmers to better understand the context of these websites and how to make them more user-friendly and comprehensive to fulfill the requirement of their visitors.*

Keywords: Webometrics, Web Impact Factor (WIF), Higher Education Institute (HEI).

1. Introduction

The impact of ICT can be seen in all aspects of life. Information and communication technology (ICT) is crucial in the interaction of information with people. The information can easily be retrieved and disseminated on the internet with the help of World Wide Web which acts as a communication tool. The Internet and the Web are playing a vital role in the information society with more emphasis on education and research. The publication of websites is the simplest and most effective method of disseminating and communicating information.

The institute's constant source of information is the Internet, which allows it to make its facilities and opportunities available to people all over the world. Websites are the need of today's era for every academic institution to achieve their objectives and perform perfectly. Universities' websites are gateways of the virtual location and important information regarding the admissions, various academic announcements, infrastructure and facilities, alumni, different types of committees, affiliated colleges, research activities, library resources, news and events, information related to examination and results, etc. for their students and patrons. The analysis of websites is an important practice and it has to be done from time to time. Every Indian institution invests substantial human and financial resources to guarantee that their websites give efficient and effective services to their readers. The most basic method of facilitating operational information exchange is to publish it on the website. In the field of Library and Information Science, webometrics study has been recorded as an emerging area of investigation and evaluation. Webometrics comprises all web

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communication related research that uses informetric or other quantification. In this type of research, the webometrics method is applied to process the link analysis of the websites. In this research, website address and age, domain name, page and domain authority, Web link formats (e.g., Hyperlink, Self-link, External link, and In link) and various web impact factors of the universities and institutes websites are taken under the study.

1.1. Concept of Webometrics:

Webometrics involves estimating the World Wide Web (WWW) in order to learn about the type and quantity of hyperlinks, as well as the World Wide Web's reference structure and usage behaviour. In the realm of library and information science, webometrics is a major element. Webometrics is derived with the combination of two words: "web" and "metric". The word “web” means the World Wide Web, whereas "metrics" refers to the mathematical concept of quantification. Webometrics considers linking, linking relationships, linking volume and helps to determine linking significance between websites and web publications, scholarly and others.

The term Webometrics was first devised by Tomas Almind and Peter Ingwersen in the year 1997. They [1] introduce and argue for the interesting idea that it is possible to utilize informetric methods on the World Wide Web (WWW). While informetrics is research into information in a broad sense and not only limited to scientific communication, while informetrics is research into information in a broad sense and not only limited to scientific communication, this includes all network-based communication research that uses informetrics or other quantitative measurements and this is called Webometrics. Sometimes it is used synonymously with ‘Cybermetrics’. It emerged from the field of information science. The four major research areas of Webometric are: content analysis of webpage, structure analysis of link, analysis of website technology (tools) and analysis of website usage. Webometrics, as stated by [2] is a quantitative approach of web-related phenomenon. The webometrics study may be useful to the web, with source data provided by web search engines.

As per [3], the Webometrics study comprises the four key aspects of the web's production and usage, including:

- Web activity assessment (e.g., analyzing log files to see how people search and browse)
- Web link formats (e.g., Hyperlink, Self-link, External link, and In link)
- Web technology evaluation (including search engine performance)
- Content analysis of web pages

The theoretical research of web related fact is called Webometrics, which derived from different designed and methods of bibliometrics analysis. Webometrics is derived from the field of information science. It covered content analysis, evaluation of web pages, classification of links, analysis of hyperlinks and factors that help in linking websites. The core of Webometrics study also deals with web data collection, quality assessment of search engines, and advanced search query formulation. It represents the current trends in the transformation of LIS's attitude towards regarding the web as an intangible source of information. The present paper explores, through Webometrics study, the websites of selected Central Universities and Institutions of Uttar Pradesh.

1.2. Higher Educational Systems in Uttar Pradesh

Uttar Pradesh is the fourth largest state in geographical area, covering 9.0 percent of the country's geographical area. It is the most populous state in the country, accounting for 16.4 percent of the country's population. A Central University in India is a autonomous body under the Department of Higher Education (DHE) of the Ministry of Human Resource Development (MHRD) and are approved by University Grants Commission (UGC) with the regulations made in the regard under the UGC Act, 1956 for the management, determination, and preservation of standards of education, examination, and research in university education. Apart from providing grants to eligible universities and colleges, the Commission also advises the Central and State Governments on the development of higher education. The domain of higher education in Uttar Pradesh operates nearly 4638 colleges affiliated with over 77 universities and institutions. Higher education in India is imparted through Central Universities, State Universities, Deemed Universities, State Private Universities and Institutes of Higher Education in most of the states. This study examines websites' address and age, domain name, page and domain authority, Web link formats (e.g., Self-link, External link, and In link) and web impact factors (WIF) of 17 (06 Central, 01 deemed university, and 10 institutes of higher education) universities and institutes' websites in Uttar Pradesh.

2. Literature Review

While reviewing the above literature on Webometrics, the authors recognized that it is important to understand how the information on internet can be easily retrieved and disseminated with the help of World Wide Web which acts as a communication tool. In this process, University websites play a critical role in the exponential growth and accessibility of information to their users. That has inspired the authors to undertake this study. Thus, they browsed through the relevant articles and other material on various aspects related to the theme of study.

The focused Webometrics literature examined [4] the various information on authority, contact, navigation, and user support links of 27 universities in Uttar Pradesh and Rajasthan and recommended that websites be evaluated for improvement on a regular basis and given more parameters and scaling. Another study by, [5] investigated 45 state and private universities in Tamil Nadu, gathering raw data from the Alta Vista search engine. It reflects that some of the Tamil Nadu colleges have more web pages, however their link pages are few, and their websites aren't as user-friendly as others, and their websites are far behind in their web link formats (e.g., Self-link, External link, and In link) and web impact factor (WIF).

Similarly, [6] using the Alta Vista search engine, this study examined the websites of 44 private universities in Bangladesh. As a result, while a few universities in Bangladesh possesses larger number of web pages, but lesser link pages, causing its websites to lag behind in terms of (Web link formats, Self-link, External link, and In link) and absolute WIF. Also, [7] studied the categorization of SAARC countries' web presence and related links the search engine-Alta Vista was used to collect the primary data from the websites. It revealed that India was recorded as being on top with the highest number of web pages, internal links, external and total links. Sri Lanka ranked first in both internal and external links of the web impact factor. India is ranked first among SAARC countries in the WISER ranking. It was concluded that Web presence and link analysis are not completely comparable to citations in SAARC countries' scholarly publications.

Many studies were conducted on 16 Indian Institutes of Technology (IIT) in various years with the goal of ranking the websites by measuring their Web Impact Factor. The Alta Vista search engine was used by [8] to analyze web pages and link pages, domain systems of websites, and calculate each IIT's web link formats (e.g., Self-link, External link, and In link) web impact factor, whereas some IITs have a greater number of link pages and larger number of web pages even then their websites lag in terms of web impact factors. [9] looked at the websites of 16 IITs to grade them grounded on their (in-link) WIF and WISER scores. The study looked into the +0.0558824 correlation between WISER Rank and WIF (in-link) and discovered that IIT websites have a strong web presence, with 108514 web pages. [10] used the Google search engine to investigate the 10 leading library websites of India's Higher Educational Institutes (HEIs). It was discovered that when both formulas were used to evaluate the library websites of India's HEIs, half of the rankings were the same, while the other half received different rankings. To conduct Webometrics analysis of 10 Central Universities in North East India. [11] estimated the link pages, Web Impact Factor (WIF), and number of web pages. The study reveals that the Mizoram University scores highest rank among all other universities in North-East India's universities.

Another study by [12] conducted this research to evaluate and rank thirty-one websites of Payame Noor Universities in Iran and provincial capital websites. Data was gathered using the Google search engine and MOZ. According to the study, Google Scholar's search engine had no referencing index for any of the websites. The webometrics ranking and indexing of Payame Noor Universities in provincial capitals are poor, and their contribution to the webometrics of the main Payame Noor University website is deemed to be grossly inadequate. Furthermore, [13] examined the ICSSR research institutes' websites. The study was conducted on the basis of domain extension, domain authority, page authority, just discovered links, spam score, external links, internal links, and web impact factor of institute websites. The data collected using Moz's link explorer tool. According to the findings of the study, the website of the Centre for Policy Research (CPR) ranks top in terms of Web Impact Factor. [14], [15] conducted two separate studies in agricultural universities in Oceania continents and Top-Ranked Indian Higher Education Institutes. Both the studies conducted a webometrics analysis using WIF and WISER Index Value Ranking.

From the literature reviewed, it can be concluded that Webometrics studies are mostly used for calculating and investigating websites of the institutions. In the 21st century, the use of internet technology, such as Webometrics, is now a significant guiding force for knowing about websites easily accessible and maintained on a regular basis by the institution.

3. Objectives of the Present Study

The principal objective of this research is to conduct a Webometric analysis of the 17 central universities and institutes situated in Uttar Pradesh. The present study focused on the following objectives:

- Identify the website address, website age, registration date and IP address.
- Classify and analyze the domain name (protocol, sub domain, and domain extensions).
- Find domain authority & page authority of selected Universities & Institutes websites.
- Count number of internal & external link of selected Universities & Institutes websites.
- Calculate the web impact factor of selected universities & institutes websites.

- Discover the Moz rank of selected Universities and Institutes websites.

4. Hypothesis

The following are the hypothesis framed for the study:

- A majority of the central universities and institutes in Uttar Pradesh have hosted websites on the internet with the "ac.in" domain extension.
- The domain structures of the websites of the majority of central universities and institutes in Uttar Pradesh are secured.
- Most of the EWIF is less than the IWIF.

5. Data Collection Strategy (Methodology)

The survey method of research was used in this study, and data collecting was done through observation techniques. The complete updated list of Uttar Pradesh Central universities and Institutes of National Importance had been extracted through the UGC website (www.ugc.ac.in). In order to achieve the above-mentioned goals, data was gathered from institute's websites, between December 25-31, 2021, in order to limit errors associated with frequent website updates. Small SEO Tools (http://www.smallseotools.com/website) was the online tool that was used to gather data for links and Moz rank. Moz Rank is a tool for determining, and assessing the on-site and off-site characteristics of a website's level of SEO (search engine optimization). It means your link popularity score which is measured by the number of quality of links. Moz Rank is a term derived by SEO Moz's in 2004 which logarithmically scaled 10-point measurement of website linking authority or popularity of a given page on the internet. Moz Rank is essentially a link popularity score that reflects the importance of a web page on the Internet in relation to others. In WIF analysis, the search engine will help in counting the number of pages and linking pages of the website under study. Google now fulfills these criteria in the best possible way, with one of the major databases and search commands for the number of pages on a website as well as for the links. MS Excel was used to analyze the information and show it in a tabular format.

5.1. Methods of Calculating Web Impact Factor

There are three types of Web Impact Factors derived, which can be expressed in following formulae;

$$\text{SWIF (Simple web impact factor)} = \frac{\text{Total No. of Self links}}{\text{Total No. of Web pages}}$$

$$\text{IWIF (Internal links web impact factor)} = \frac{\text{Total No. of Internal links}}{\text{Total No. of Web pages}}$$

$$\text{EWIF (External web impact factor)} = \frac{\text{Total No. of External links}}{\text{Total No. of Web pages}}$$

6. Scope of the Study

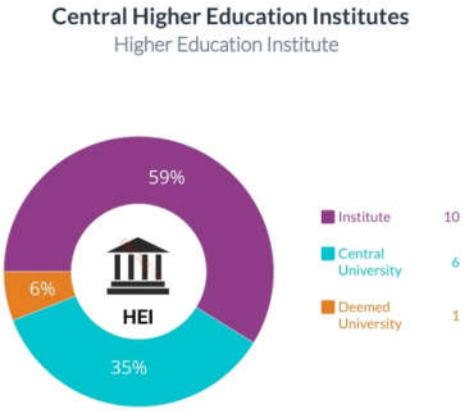
The study was conducted to know about central universities and institutes websites in Uttar Pradesh. Thus, the current study's scope is further limited to the websites of 17 central universities and institutes in Uttar Pradesh. Seventeen websites are therefore evaluated for data interpretation.

7. Data Analysis and Interpretation

Table 1: List of Universities and Institutes of Uttar Pradesh*.

Sr. No.	Type	University/Institute Name	District	Short Name	Year of Est.	Faculty
1	University	Banaras Hindu University	Varanasi	BHU	1916	Multi-disciplinary
2	University	Aligarh Muslim University	Aligarh	AMU	1920	Multi-disciplinary
3	University	Babasaheb Bhimrao Ambedkar University	Lucknow	BBAU	1996	Multi-disciplinary
4	University	University of Allahabad	Prayagraj	UoA	1887	Multi-disciplinary
5	University	Rani Laxmi Bai Central Agricultural University	Jhansi	RLBCAU	2014	Agriculture
6	University	Rajiv Gandhi National Aviation University	Amethi	RGNAU	2013	Technology
7	Deemed University	Indian Institute of Information Technology	Prayagraj	IIIT-A	2000	Technology
8	Institute	Moti Lal Nehru National Institute of Technology	Prayagraj	MLNNIT	1961	Technology
9	Institute	All India Institute of Medical Sciences	Raebareli	AIIMS-R	2013	Medical
10	Institute	All India Institute of Medical Sciences	Gorakhpur	AIIMS-G	2016	Medical
11	Institute	Footwear Design and Development Institute	Noida	FDDI-N	1986	Technology
12	Institute	National Institute of Pharmaceutical Education & Research	Raebareli	NIPER	2008	Paramedical
13	Institute	Rajiv Gandhi Institute of Petroleum Technology	Amethi	RGIPT	2008	Technology
14	Institute	Indian Institute of Information Technology	Lucknow	IIIT-L	2015	Technology
15	Institute	Indian Institute of Technology (BHU)	Varanasi	IIT-BHU	2012	Technology
16	Institute	Indian Institute of Management	Lucknow	IIM-L	1984	Management
17	Institute	Indian Institute of Technology	Kanpur	IIT-K	1959	Technology

***Source**: (https://www.ugc.ac.in/)



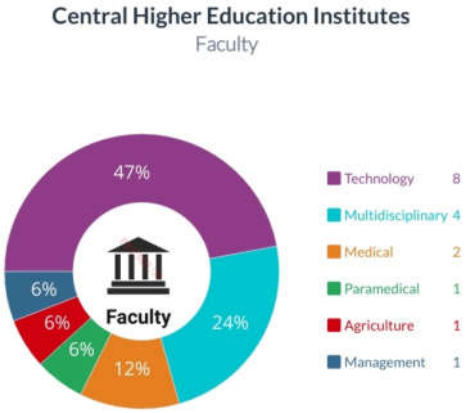


Figure 1(A). Types of HEI **Figure 1(B). Faculty Distribution**

Table 1 describes about the central/deemed universities and institutes which comes under the purview of the Ministry of HRD, Government of India and established by the acts of parliament. There are total 17 higher education institutes (HEI) within the geographical boundaries of Uttar Pradesh (UP). It is evident from Table 1 that, out of seventeen HEI, six are central university, one is deemed university and rest of the 10 are discipline specific institutes. The Figure 1(A) shows the distribution of HEI in percentage out of total 59% are Institute, 35% are central universities and 6% are deemed university in UP. From the Figure 1(B) depicts the total percentage of various faculties in HEI as 47% are technology, 24% are multidisciplinary, 12% in medical and 6% each for paramedical, agriculture and management.

Table 2. Website and IP address of HEI of UP

Sr. No.	University/ Institute	Website address	Website/ URL Age*	Website/URL launched	IP Address	Class
1	BHU	https://www.bhu.ac.in/	20.10	09-02-2001	14.139.41.65	A
2	AMU	https://www.amu.ac.in/	20.02	20-10-2001	103.55.108.68	A
3	BBAU	https://www.bbau.ac.in/	9.09	18-03-2012	14.139.228.229	A
4	UoA	https://www.allduniv.ac.in/	14.07	17-05-2007	103.73.188.189	A
5	RLBCAU	http://www.rlbcau.ac.in/	6.05	08-07-2015	69.16.253.113	A
6	RGNAU	https://www.rgnau.ac.in/	4.03	16-09-2017	173.212.239.92	B
7	IIIT-A	https://www.iiita.ac.in/	20.04	22-08-2001	103.142.225.33	A
8	MLNNIT	http://www.mnnit.ac.in/	18.04	07-08-2003	210.212.49.3	C
9	AIIMS-R	https://aiimsrbl.edu.in/	**1.10**	17-02-2020	162.144.180.75	B
10	AIIMS-G	https://aiimsgorakhpur.edu.in/	2.01	01-11-2019	85.187.128.37	A
11	FDDI-N	https://www.fddiindia.com/	20.05	21-07-2001	15.207.246.227	A
12	NIPER	http://niperraebareli.edu.in/	9.10	05-02-2012	164.100.90.100	B
13	RGIPT	https://www.rgipt.ac.in/	13.01	10-11-2008	14.139.251.148	A
14	IIIT-L	https://iiitl.ac.in/	5.01	01-11-2016	69.49.234.221	A
15	IIT-BHU	https://www.iitbhu.ac.in/	9.03	12-09-2012	103.151.208.18	A
16	IIM-L	https://www.iiml.ac.in/	**23.10**	14-02-1998	14.139.245.91	A
17	IIT-K	https://www.iitk.ac.in/	21.07	10-05-2000	202.3.77.184	C

*website URL age (YY.MM) Domain age as on 31st Dec, 2021.

Table 2 gives overview information about the, website address, IP address and class, URL age and their registration date of selected HEI institutes which help one to easily accessible the websites. The IIM-Lucknow is the oldest (23years, 10 months) of the 17 universities, which was registered on February 14, 1998. AIIMS-R is the youngest (1 year, 10 months) among all the domain age of institutes. The IP address stands for "Internet Protocol address" it is a unique number that is linked with a specific computer or computer network. When connected to the internet, the IP address allows the computers to send and receive information. For *e.g.,* IP address is like telephone numbers. The purpose of an IP address is to handle the connection between a device and a destination site. The IP address uniquely identifies every device on the internet; without it, there's no way to contact anyone. Historically, IP classified the world's networks into three categories based on their size: A, B, and C. (D is for multicast addresses, and E reserved for research purposes). The IP addresses are arranged into three primary classes known as IPv4 addresses. The IPv4 addresses have four octets separated by a dot (X.X.X.X); the first octet is class A (1-126), class B (128-191), and class C (192-223). The fundamental distinction between the classes is the ratio of networks to hosts.

The Class A's have a small number of networks, each with a large number of possible host IPs. ISPs and large organizations frequently use this class. Despite the fact that Class B has more networks, it still has a large number of host IP addresses. ISPs also make extensive use of this range. Finally, Class C addresses are better suited to smaller networks where big groups of host IP addresses inside the same network aren't necessary. Class D and E are primarily designated for government and research applications and are not used in civilian usage.

Table 3. Website and IP Address Analysis

Sr. No.	Domain Protocol	Total URLs	Sub Domain	Total URLs	Domain Name Extension	Total URLs	IP Address Class	Total URLs
1	http://	3(18%)	www	13(76%)	ac.in/	13(76%)	A	12(71%)
2	https://	14(82%)	non-www	4(24%)	edu.in/	3(18%)	B	3(18%)
3					.com/	1(6%)	C	2(12%)

Table 3 shows the analysis of domain protocol, sub domain, domain name extension and IP addresses of universities and institutes. The domain protocol is of two types, HTTP and HTTPS. HTTP stands for *Hypertext Transfer Protocol*, which is a set of rules and standards that regulate how information can be sent across the Internet. HTTP establishes communication standards for web browsers and servers. It is a network protocol that runs on top of TCP at the application layer. HTTP employs hypertext structured text to create a logical link between text-containing nodes. HTTPS is the acronym for Hyper Text Transfer Protocol Secure. It is a highly advanced and secure HTTP version. By encrypting all communication using SSL, it provides for secure transactions. It's a hybrid of the SSL/TLS and HTTP protocols. It allows a network server to be identified in an encrypted and safe manner. HTTPS also enables the server and browser to establish a secure encrypted connection. It provides data security in both directions. This assists you in preventing the theft of potentially sensitive information.

The collected data showed that many websites of universities and institutes are older, they were initially using unsecured protocol HTTP but these sites were vulnerable to hacking, academic sites migrated towards more secured websites by using secured protocol HTTPS. Figure 2(A) shows out of 17 universities at present 14(82%) are using secured sites and only

3(18%) using unsecured sites for the organization. But, as the awareness about the website security started many of institution moving towards the secured website. This is observable fact which explicate from the study that Uttar Pradesh central universities and institutes websites are secured.

The ***World Wide Web*** **(WWW)** refers to the vast collection of textual and multimedia documents that can be accessed via the Internet. The name server converts the URL or web address into an IP address that your browser connects to in order to serve the webpage. All websites began with the letters www when the Internet first became popular. However, a few years ago as user behaviour changed, an increasing number of sites began to use non-www names. A URL that does not begin with www is referred to as a "naked" URL. The www domain can also be used as a hostname, and it can be coupled with numerous sub domains.

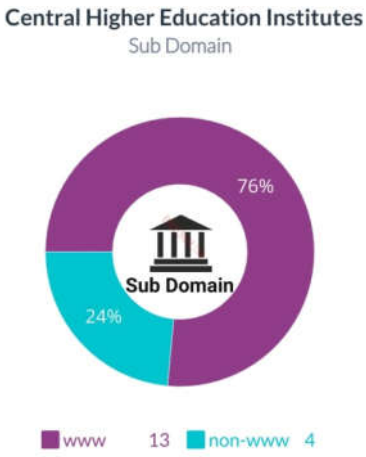


Figure 2(A). Sub Domain

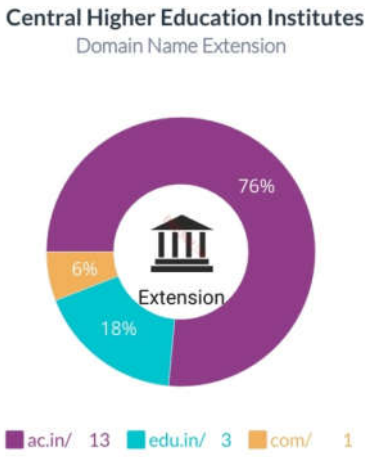


Figure 2(B). Domain Name Extension

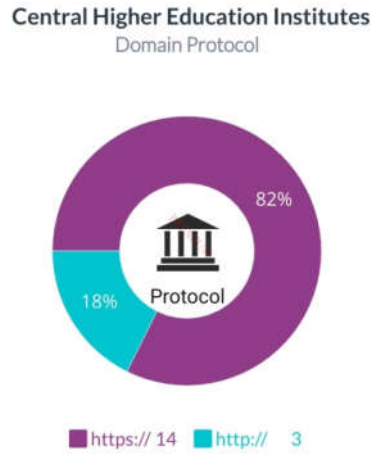


Figure 2(C). Domain Protocol

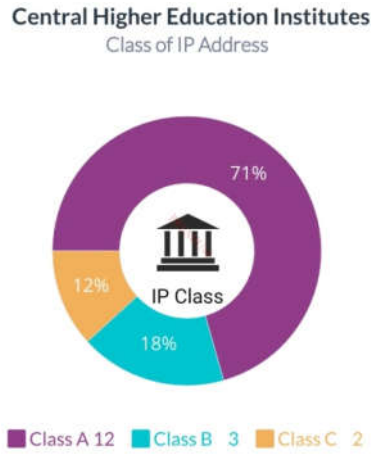


Figure 2(D). Class of IP Address

We can say that, the difference between a www and a non-www URL is negligible. But, websites with a www URL might change to DNS and prohibit cookies. There are no such

technical advantages for a non-www domain. Moreover, search engines treat them as separate entities too. As a result, Google will consider www.example.com and example.com to be two separate websites. This leads to a problem with duplicate material and should be avoided. Figure 2(B)illustrate that majority of universities and institutes 13(76%) are using www and only 4(24%) are using non www for their sub domain of website.

It shows how HEIs are classified based on their domain names, and it also shows that in the present investigation of the institutes; only three types of domain extensions were found. The data taken from Table 2 which can be explained by Figure 2(C) shows that the majority of institutes 13(76%) have 'ac.in' extension, while 'edu.in' 3(18%), and only one website has a '.com' 1(6%) extension. This phenomenon elucidates that majority of the central universities and institutes in Uttar Pradesh are being hosted on website which has "ac.in" domain extension.

Figure 2(D) illustrate about IP addresses of networks in percentage out of total nearly 70%are class A, 18% are class B and 12% are class C, respectively. The fundamental distinction between the classes is the ratio of networks to hosts. It seems that a large chunk (more than 70%) of central Universities and Institutions still prefer class A IP4v addresses because of large number of possible host IPs, although number of networks are less in this class. A comparable number of central Universities' and Institutes' websites (almost 18% and 12%) are operating on class B and class C IP address, which offers more networks along with large number of host IP addresses.

Table 4. Domain and Page Authority

Sr. No.	University/Institute Name	Domain Authority		Page Authority		Moz Rank
		In No's	In %	In No's	In %	
1	Banaras Hindu University, Varanasi	51	7.43	58	7.23	5.8
2	Aligarh Muslim University, Aligarh	52	7.58	56	6.98	5.6
3	Babasaheb Bhimrao Ambedkar University, Lucknow	34	4.96	49	6.11	4.9
4	University of Allahabad, Prayagraj	45	6.56	54	6.73	5.4
5	Rani Laxmi Bai Central Agricultural University, Jhansi	33	4.81	38	4.74	3.8
6	Rajiv Gandhi National Aviation University, Amethi	25	3.64	34	4.24	3.4
7	Indian Institute of Information Technology, Prayagraj	46	6.71	53	6.61	5.3
8	Moti Lal Nehru National Institute of Technology, Gorakhpur	40	5.83	52	6.48	5.2
9	All India Institute of Medical Sciences, Raebareli	34	4.96	38	4.74	3.8
10	All India Institute of Medical Sciences, Gorakhpur	31	4.52	39	4.86	3.9
11	Footwear Design and Development Institute, Noida	39	5.69	51	6.36	5.1
12	National Institute of Pharmaceutical Education and Research, Raebareli	35	5.10	38	4.74	3.8
13	Rajiv Gandhi Institute of Petroleum Technology, Amethi	34	4.96	45	5.61	4.5
14	Indian Institute of Information Technology, Lucknow	32	4.66	33	4.11	3.3
15	Indian Institute of Technology (BHU), Varanasi	41	5.98	48	5.99	4.8
16	Indian Institute of Management, Lucknow	47	6.85	54	6.73	5.4
17	Indian Institute of Technology, Kanpur	**67**	**9.77**	**62**	**7.73**	**6.2**

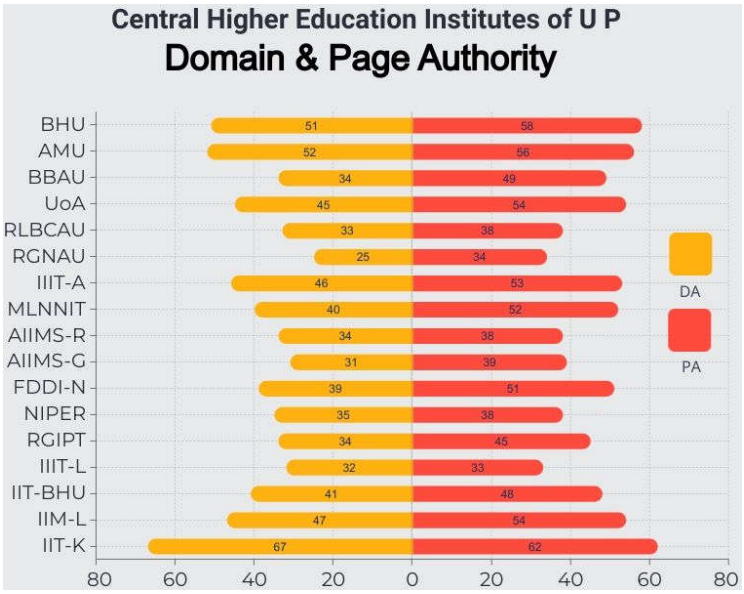


Figure 3. Domain and Page Authority of central higher education institutes of UP.

Domain authority combines various elements (such as total links and link root domains) into a unique DA score**.** Table 4 gives details about the domain and page authority and Moz rank of universities and institutes' websites. It shows that the domain authority of IIT-K received the highest rating of 67 (9.77%), while the RGNAV-A website domain authority score was just 33 (4.11%), the lowest among responding institutes. Page authority is a Moz quality score that anticipates how well a particular page will position in the search engines. A high page authority score means the page has the potential to rank well in search engine results. Again, the IIT-K website received the highest page authority score of 62 (7.73%), while the IIIT-L website received the lowest score of 33 (4.11%). Figure 3 shows the domain and page authority of universities and institutes within UP.

The Moz Rank represents the importance of links on any website. The more inbound links any webpage has, the higher its Moz Rank will be. It assesses the quality and quantity of linked pages to any websites. Moz Rank is a popularity score of any website that is updated regularly and is given a number from 0 to 10. Moz Rank is calculated on a logarithmic scale between 1 and 10. Websites with a Moz rank of zero are the least popular, while those with a Moz rank of ten are the most popular. But, generally, an average Moz Rank of 3 is considered good for every site. IIT-K occupies the top rank with a 6.2 score, followed by BHU-V with a 5.8 and AMU-A with a 5.6 score, occupying the third place in the Moz rank of universities and institutes websites.

Table 5. External, Internal and Self Link with their web impact factor. The term given in bracket is quantity in percentage.

Sr. No.	University /Institute	External Link	Internal Link	Self Link	No. of Webpage	EWIF	IWIF	SWIF
1	BHU	27(5.5)	**696(16.9)**	**723(15.7)**	15300(21.8)	0.0018(0.5)	0.0455(2.0)	0.0473(1.8)
2	AMU	23(4.7)	238(5.8)	261(5.7)	20500(29.2)	0.0011(0.3)	0.0116(0.5)	0.0127(0.5)
3	BBAU	23(4.7)	202(4.9)	225(4.9)	3520(5.0)	0.0065(1.7)	0.0574(2.5)	0.0639(2.4)
4	UoA	39(8.0)	324(7.9)	363(7.9)	2420(3.5)	0.0161(4.3)	0.1339(5.8)	0.15(5.6)
5	RLBCAU	10(2.0)	129(3.1)	139(3.0)	6610(9.4)	0.0015(0.4)	0.0195(0.9)	0.021(0.8)
6	RGNAU	6(1.2)	120(2.9)	126(2.7)	362(0.5)	0.0166(4.4)	0.3315(14.5)	0.3481(13.1)
7	IIIT-A	26(5.3)	308(7.5)	334(7.2)	860(1.2)	0.0302(8.0)	0.3581(15.6)	0.3884(14.6)
8	MLNNIT	61(12.4)	131(3.2)	192(4.2)	2210(3.2)	0.0276(7.4)	0.0593(2.6)	0.0869(3.3)
9	AIIMS-R	49(10.0)	490(11.9)	539(11.7)	3960(5.6)	0.0124(3.3)	0.1237(5.4)	0.1361(5.1)
10	AIIMS-G	21(4.3)	101(2.5)	122(2.6)	399(0.6)	0.0526(14.0)	0.2531(11.0)	0.3058(11.5)
11	FDDI-N	32(6.5)	117(2.8)	149(3.2)	682(1.0)	0.0469(12.5)	0.1716(7.5)	0.2185(8.2)
12	NIPER	15(3.1)	182(4.4)	197(4.3)	1590(2.3)	0.0094(2.5)	0.1145(5.0)	0.1239(4.6)
13	RGIPT	35(7.1)	69(1.7)	104(2.3)	630(0.9)	0.0556(14.8)	0.1095(4.8)	0.1651(6.2)
14	IIIT-L	4(0.8)	46(1.1)	50(1.1)	4110(5.9)	0.001(0.3)	0.0112(0.5)	0.0122(0.5)
15	IIT-BHU	**62(12.7)**	225(5.5)	287(6.2)	820(1.2)	0.0756(20.1)	0.2744(12.0)	0.35(13.1)
16	IIM-L	27(5.5)	600(14.6)	627(13.6)	3960(5.6)	0.0068(1.8)	0.1515(6.6)	0.1583(5.9)
17	IIT-K	30(6.1)	142(3.4)	172(3.7)	2200(3.1)	0.0136(3.6)	0.0645(2.8)	0.0782(2.9)

Table 5 illustrates universities and institutes' websites in Uttar Pradesh on the basis of internal links, external links, self or total links with their number of web pages and WIF. External links are hyperlinks that lead to a domain other than the link source's domain. Figure 4 shows that external link of IIT-BHU 62(12.7%) occupies the first place, followed by MLNNIT with 61(12.4%) and AIIMS-R scored 49(10%). Internal links are hyperlinks on a page that lead to different web page source on the similar website or domain, such as figure or text.

The total links are the total number of links to a site. The BHU with 696(16.9%) internal link secured top position, followed by IIM-L scored 600(14.6%) and AIIMS-R 490(11.9%). In terms of self/total link BHU occupied first place with 723(15.7%), IIM-L hold second place with 627(13.6%), followed by AIIMS-R 539(11.7%). whereas, IIIT- L scored least among all the institutes for the external, internal and total link.

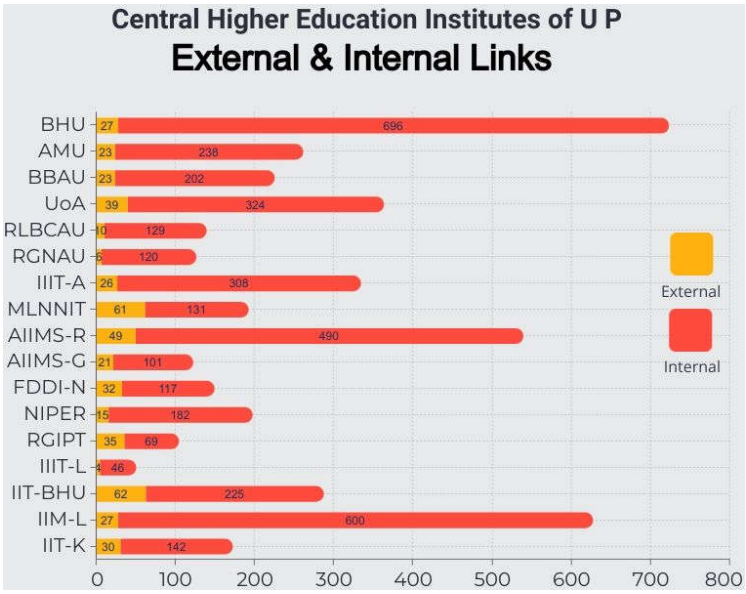


Figure 4. External and Internal Links of central higher education institutes of UP.

8. Web Impact Factor

A metric tool, known as web impact factor, estimates the relevance of websites either in specific field or across the field. The greater the WIF, the better the website's reputation is considered. Any website with a greater impact factor is potentially more valuable or of higher quality than those with a lower impact factor. The WIF provides quantitative tools for rating, assessing, categorizing, and exploring websites, leading domains, and sub-domains.

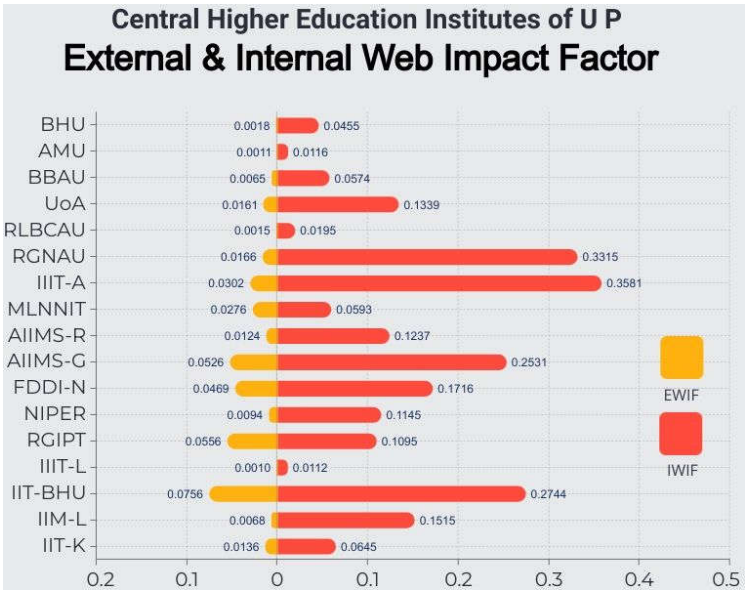


Figure 5. External and Internal Web Impact Factor of central higher education institutes of UP.

The WIF of external and internal links possessed by UP universities and institutes is shown in Table 5 and Figure 5. Here, IIT-BHU occupies first position with 0.0756 external impact factor followed by RGIPT (0.0556) and AIIMS-G (0.0526). In terms of internal impact factor IIIT-A (0.3581) secured top position, followed by RGNAU (0.3315) and IIT-BHU (0.2744). Hence it is obvious/ verified from the analysis that the majority of EWIF is less than the IWIF for UP institutes and universities.

Figure 6 shows that IIT-A (0.3884) is in top place based on the Self Web Impact Factor (SWIF)**,** followed by IIT- BHU (0.3500) and RGNAU (0.3481). It may be noted that, IIIT-L with EWIF (0.0010), IWIF (0.0112) and SWIF (0.0122) ranked last in all three web impact factor among the institutes and universities of UP.

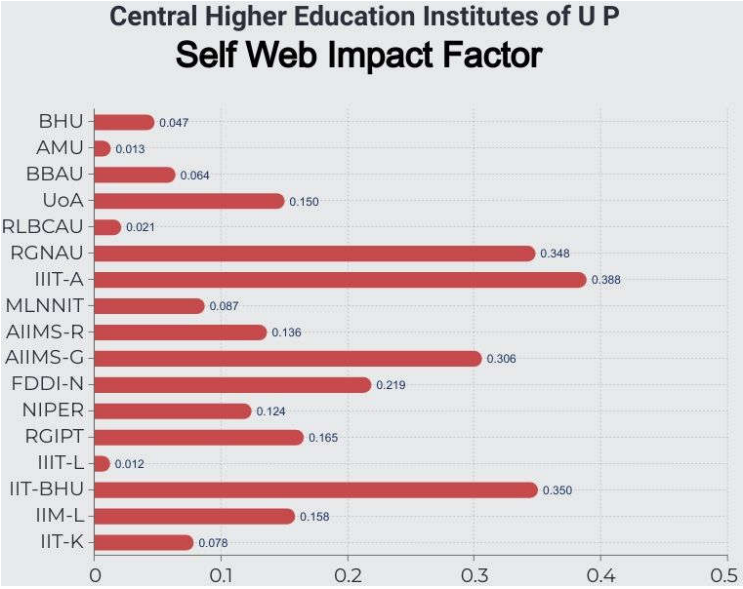


Figure 6. Self Web Impact Factor of central higher education institutes of UP.

9. Findings

Websites are the access point for institutions and play an important role in dissemination of information to the users. The Web Impact Factor and link analysis of Uttar Pradesh's higher education institutions is still an undiscovered area of webometric research. Hopefully, the current study provides a realistic view and information regarding the websites of 17 HEI in Uttar Pradesh. In this area, further webometric study is needed. The following are the study's principal findings:

- Majority of HEI are using “ac.in” extension only few uses other “edu.in” and “.com”.
- Domain age of IIM-L is the oldest and AIIMS-R is the youngest among all institutes.
- There are more secured sites in institutes than the unsecured site.
- Most of universities and institutes are using www as sub domain, while few using without sub domain in websites.
- Majorities of IP address network used by universities are class A (12), class B (3) and class C (2) respectively.
- IIIT-K secured first position in Moz rank, domain and page authority.

- In the analysis part such as external link IIT-BHU secured first position, whereas for internal and total BHU secured first position in all the universities and institutes.
  In EWIF the top position secured by IIT- BHU whereas, IIIT-A secured top position in both IWIF and SWIF.

10.Discussion on Results

Today, websites are considered to be the repository of all information that can be presented to the world, which increases the importance of the suitable evaluation of websites. The primary goal of our study is to analyzed the age of website, address, domain name, page and domain authority, web impact factors and Moz rank of selectively chosen Universities & Institutes websites situated within geographical boundary of Uttar Pradesh but are administrated by central government of India. It was revealed in our analysis that majority of institutes are now using 'ac.in' extension in their domain name. This finding is in sync with that of [2] findings that, one third of the central universities' websites have 'ac.in' extension, likewise, [8] also found that most of Indian institute of technologies (IITs) have been using 'ac.in' extension rather than any other domain name.

Further, the present study discovered that most of the central universities/institutes in Uttar Pradesh are established in the 21st century. i.e., after the year 2001. Our findings are comparable to the findings of [16], who examined the deemed university websites in India and concluded that majority of Uttar Pradesh universities were established after 2001.

Additionally, the current study used search engine optimization (SEO) and Google search engine for data collection and evaluate the WIFs. Likewise, [11], [17], [10] have exploited the same tools for data collection and evaluation of Web link formats of higher education institutions in India.

Furthermore, the current study analyzed the internal link, external link, and self-link, Web Impact factor of central universities in Uttar Pradesh, and it revealed that external link is less than internal link in the website; a conclusion similar to the findings of [16], who has also concluded the same result in relation to external and internal link.

We also discovered in the present study that most of the institutes' websites have now switched to the secured sites (https) rather than the unsecured site (http). Most of the universities and institutes are still using www as subdomain, while few have given up subdomain in websites. The class A is the most preferred IP address network used by the central universities, next choice is class B and otherwise class C, (12, 3, 2, respectively). The [15] study also employed the similar security concern about the institutes' websites and efforts have been made by them to know the website security issues of the institutions and rank them.

11.Suggestions

The following suggestion can be made on the basis of study conducted in our paper;

- HEI authorities should appoint a team for creating, designing and updating of the websites for time to time.
- Different webpage should be developed so that the large amount of the text can easily handle.

- Web developer should not keep too much information on the single webpage because it makes difficult for users to extract useful information.
- The layout, colour, and structure of each website should be simple and attractive.
- The University Grant Commission (UGC) and HEI should take out some guidelines for the building of library websites.
- The websites of universities need to attract more external links and web impact factor and by creating online sources and services, providing update new and research information to the users.

12.Conclusion

The websites act as a communication channel between the institutes and the users; it keeps the user abreast about the latest news, announcements, new updated policy, courses and services. This study emphasized on the Internal Link; External Link and Self Link, Web Impact Factor for each website of universities, deemed universities and institutes of central government of India in Uttar Pradesh. These findings open the door to further studies of other new areas of the web.

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