

Collaboration among Library and Information Science websites of Associations and Societies (LISAS), using webometric methods

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Abstract:

This article aims to study the websites of Library and Information Science Associations & Societies (LISAS) at both national and international levels applying webometric methods. The in-links and co-links to LISAS' Websites were analyzed, firstly, to study the visibility of these Associations & Societies on the web; secondly, the collaboration among these websites at national and international levels was identified, and finally, Web Impact Factor (WIF) of LISAS' websites was determined using link analysis method. According to the link count, this study found that out of 28 LISAS' websites, 4 were extremely popular or the most visible LISAS' websites, namely: ALA, Special Libraries Association, IFLA, and Medical Library Association. According to WIF, the LISAS' websites with high Impact Factor were: International Association of Law Libraries, Tokyo Metropolitan Library, Russian State Library and IFLA.

Based on co-link analysis, the structure underlying the 28 LISAS' websites was also studied. Collaboration among these Associations and Societies was also studied

through their websites using cluster analysis and multidimensional scaling techniques. The results of the clustering analysis showed that there were 3 international clusters (one of which belongs to special libraries group) in the studied LISAS' websites. 2 LISAS' websites from Russia didn't cluster at all with other websites. Similarly, the multidimensional scaling map showed 3 clusters with a few differences in their order.

1 Introduction:

An association is composed of a group of individuals who voluntarily work in order to meet common goals or collaborate in the special fields. Today, there are many unions and associations in all of the world. Individuals working in various professions as well as specialties constitute these organizations to defend their rights, promote their profession and [attain](#) other profits.

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The first groups for defending trade men and merchant's rights have been formed since approximately 2000 years ago. But, primarily the formation of the associations was occurred after industrial revolution to defend economic and material rights.

Formation history of library association dates back to 19th century. The first library association is ALA which was formed in 1876. Then, 1877, British Library Association (BLA) was constituted. The first Asian library association, Japnise Library Association (JLA), was formed in the year 1892.

The main goal of the library associations is to defend librarian's material and intellectual rights and keep social status of library professionals. Several sub goals to this general purpose including to make relationship among members through conferences, support from promotion and improvement of librarian's social as well as professional conditions, construct some rules to administrate and manage libraries better, help libraries to be organized, follow related rules to library affairs up, formulate ethic and professional principles, arrange short-term and continuing education for librarians, publish library science articles and journals, establish regional as well as international agencies, develop information system, contribute to the exhaustive development, relate librarians, librarianship and libraries to the society, codify bills to defend librarian's rights and offer them to the authorities (Mazinani, 2003: 321).

As WWW emerged, deep changes and metaphors have been occurred in various scientific areas as though all disciplines have been affected by new information technologies. Different government and private institutions have also been influenced by these technologies and have utilized various tools available on the web including websites so that they can publish various

information and achieve their objectives as well as demands.

Since the middle of 1990s, a new research field called webometrics has been emerged based on informetric methods which studies nature and characteristics of the web. Almind and Ingwersen (1997) named studying on the web "webometrics". This method was also introduced as "cybermetrics" by e-journal "cybermetrics" in 1997. Webometrics is based on bibliometric method which has been affected by dynamic, variable and distributed nature of the web and search engines' shortcomings as well. Variety of individuals who create web documents and links may affect quality and validity of webometric methods (Bjorneborn and Ingwersen, 2001).

As a scientific field, webometrics is still in the infancy stage. Research on the four domains of webometrics including web content, link structures, users' information seeking and browsing behaviour on the web and search engines performance has been done since the middle of 1990s. Hypertext research allows researchers to both make relationships and follow relations made by others, so it links researchers to each other (Bjorneborn and Ingwersen, 2001).

There are many research methods in LIS including bibliometrics, informetrics and scientometrics. Using mentioned methods which are methodologically so similar, how different types of information are produced, organized, distributed and used by various users having various information needs is examined. Like other scientific fields, these areas have been changed by impacts of new information technologies and so new field "webometrics" emerged based on them in order to evaluate WWW. Webometrics deals with studying qualitative and quantitative aspects of the web which helps users analyze data and information resources available on the Internet. In webometric method,

quantitative aspects of producing and using information resources as well as structural and content aspects of the websites are measured by means of bibliometric, informetric and scientometric approaches. Webometrics is used to develop new methods and techniques by which information distribution models in WWW can be analyzed.

Bjorneborn and Ingwersen (2001) indicate that in the following years, analyzing research findings as well as developing methods and theories to provide better understanding about topology, function, potential and complicated possibilities of the web will be major challenges for webometric researchers.

Problem statement and research importance:

Development of the new information technologies, web emergence and unique features of the web environment such as hypertext and hyperlink have led to a big revolution in the information science area which, in turn, the necessity of studying various aspects of the web to make better and more use of today important phenomenon has frequently been confirmed by researches (Noruzi, 2005).

Today, websites are so important in all sciences that any government or private organization has designed an individual website. Like other centers and organizations, LIS national and international institutions have found the application of web environment to achieve their goals as well as provide services. That is why, each one of these centers has run its own website.

Webometric analysis show nature, structure, content features of websites as well as links structure to understand virtual highways and their interrelations (Bjorneborn and Ingwersen, 2001). In the web environment, visibility of the websites and

introducing their owners to their users are so important that indicated websites reliability. Websites, through links made to each other, allow users to move from one site to another in the minimum time and access to needed information. Relationship between websites is reinforced via links made to each other which results in more visibility of websites having more in-links. Also, this leads to make more and more links in order to meet user's information needs and access to useful information as well. As a result of increasing information resources available on the web, determining which information resource is more reliable and which one is less important and retrieving these resources are difficult. In spite of these problems, webometric methods can help users to improve them.

Studying websites of LIS associations quantitatively and qualitatively demonstrates their impact rate and visibility rate by webometric method. One of the criteria evaluating websites, is to calculate websites impact factor (WIF) and compare their attractiveness and efficiency which can be measured through determining number of in-links, self-links, co-links and out-links.

The present research aims to study the impact rate and visibility of the websites of LIAS, using webometric methods. In addition, using co-links analysis and mapping co-links structure, it determines clusters and important elements as well as studies relationships of these websites at both national and international level.

Websites of LIASs are supposed as important communication tools in the LIS discipline. these roles that associations undertook, today have become more important, necessary and expanded. Importance of publications of LIASs, their contribution to LIS promotion, examining their performance in the web environment, policies and plans for their future as well as

measuring their success rate in the web environment are among reasons indicating importance of webometric analysis on the websites of LIASs.

Websites importance of national and international associations in making interaction and collaboration among persons and organizations doing LIS affairs, creating professional unity, defending rights of individuals and organizations, contributing to the development of information system and its infrastructure in developing countries as well as facilitating access to information is undeniable. Therefore, in-links and use rate of these websites, their visibility, group collaborations, their impact factor and identifying the most important websites are problems to be studied in the present research.

Research objectives

The major aim of this research is to analyze links of websites of LIASs.

Identifying the most frequently used websites of LIS national and international associations, measuring their impact factor, determining visibility of their websites in the web environment, understanding collaboration rate and in-links of these institutions as well as analyzing co-links among them to study the structure of the websites are other purposes of this research.

Research questions

- 1- How is LIASs websites position in terms of total links, in-links, self-links and number of indexed web pages compared with each other?
- 2- How is LIASs websites ranking in terms of their visibility in the web environment?
- 3- How is impact factor of LIASs websites compared with each other?
- 4- Which websites have the highest rate of co-links?

- 5- Using clustering, how many clusters will be categorized in the website of LIASs?
- 6- Using multi-dimensional scaling based on co-links of LIASs websites, how many groups (clusters) will be identified?

Literature review

As mentioned before, webometrics has a short and relatively new background because of its emergence in the middle of 1990s. In spite, of suitable research performed in this field but webometric is not still matured and most of studies done are associated with websites of universities and colleges. That is, there are few studies performed in the variety of fields by means of webometric method. Because there is no study relating to analysis of the links of LIASs websites, we examine related literature derived from the other areas.

Literature review

Rousseau (1997) analyzed in-links, distribution models of websites as well as inlinks. Using old version of Altavista, he studied 343 websites which were retrieved by searching terms “Informetrics or Bibliometrics or and Scientometrics”. Rousseau found that distribution of top level domains in these sites follows lotka’s distribution. He estimated that self-links rate is 30% (Cited in Bjerneborn and Ingwersen, 2001).

Ingwersen (1998) used term “Web Impact Factor” (WIF) for national domains and personal sites. He offered this notion based on “Journal Impact Factor” (JIF) which is used by ISI for ranking scientific journals in its citation databases. Finally, he defined WIF as the number of out-pages and their out-links to a certain website divided by the number of its web pages.

Vereeland (2000) studies and ranked 156 websites of law school's libraries confirmed by American Lawyers Association in terms of visibility (in-links count) and clarity (out-links count). Based on his findings, there was no significant correlation between visibility and clarity of these sites. Apparently, libraries of these centers paid their attention to pertinent and relevant resources not accessible in the printed format. He indicated that clarity of sites follows law "80-20". That is, a few sites provide majority of information for society. In the other words, it seems that Bradford's law also holds true about studied websites.

Chu (2001) analyzed in-links of 12 websites affiliated to librarianship schools which are confirmed by ALA. He found that out-links are not suitable in terms of both quality and content. He believed that webometric studies need to be performed precisely because both data source (web-based data) and data gathering tools (web search engines) have considerable shortcomings.

Thelwall (2001) demonstrated that there is a significant correlation between in-links count of 25 websites of UK universities and mean of their research productivity.

In an article, Bjorneborn and Ingwersen (2001) introduced selected areas of webometric studies which are prone to develop and some areas that their future is ambiguous. They indicated that as a result of recent studies done on coverage and performance of search engines, researchers have accepted them as a framework for selective analysis of the web quality and content. Finally, they reviewed problems related to WIF and outlined new webometric methods in data collection and navigation of subjects available on the web which are, to a large extent, based on bibliometric method.

In an article entitled "Mapping the structure of library and information (LIS)

websites using cluster and multidimensional scaling", Osareh (2003) analyzed structure of 95 websites of LIS schools from 18 countries. She collected data using AllTheWeb search engine and based on Internet Training and Consulting Services (ITCS). Among them 70 sites were active which formed research sample. She concluded that websites studied are grouped in 7 groups (clusters) including 2 national and 5 international ones. The two-dimensional map showed 5 relevant clusters. Among these 5 clusters, 2 cases (one from USA and the other from Canada) were national and 3 cases (among UK, USA, Iceland, Australia, Germany and 2 college websites from Italy, Finland and Spain) were international.

Thelwall, Vaughan and Bjorneborn (2006) indicate that quantitative methods which have originally been designed for bibliometric analysis and studying citation patterns of scientific journals articles, can also be applied in the field of webometrics using commercial search engines to collect raw data.

Wilkinson et al. (2003) put forward that ambiguity in how web links are created is the major barrier to webometrics. Using random sampling, they examined 414 inter-university links from web space of British University with ac.uk domain in order to study creators' motivations of producing links between academic websites on the web environment. Their research showed that more than 90% of links have been created for purposes such as developing and expanding educational as well as research activities.

Smith (2004) suggested that articles presented in a special issue of JASIST (2004) which is allocated to webometrics are deserved to be read because they encompass a wide range of various approaches to quantitatively studying the web and provide a basic and conceptual framework for webometrics.

Using Altavista, Noruzi (2005) studied how many links have been created to Iranian university websites. He found that the websites of Iranian universities have a low in-link rate. This indicates that for linguistic as well as aesthetic reasons, Iranian (Persian) sites may not receive and attract the attention that they deserve for the WWW.

By comparing reasons of citation and link, Chu (2005) posits that links are mainly created in web page or web site, while in citation, reference is made to sentence, paragraph or a part of one document. In addition, in citation we encounter negative references which have no compatibility with research but link is typically created to positive, relevant and valuable issues. That is, citation have either of these two aspects, confirmation or rejection, whereas link is usually confirmative.

Osareh (2006) has studied collaboration rate among websites of LIS schools, their in-links and co-links. Also, visibility and national as well as international collaboration among these websites were analyzed. She indicates that research findings of webometrics should be prudently exploited because of search engines' drawbacks in collecting data.

Literature review in Iran

In an article entitled "Comparing websites of Iranian newspapers by means of WIF", 19 Iranian newspapers websites were analyzed. Research findings demonstrated that although there is not a significant relation between, continuous and uncontinuous variables, there is significant relation between external impact factors and other continuous variables. (Kousha, 2003).

Noruzi (2004) studied Iranian universities websites. His research revealed that Shahid Beheshti University has the highest impact factor (12.32) and Ferdowsi

University of Mashhad has the least impact factor (0.38). Also, in terms of site volume (size) Tehran University had 9750 web pages as the most voluminous website and Ilam University with 22 web pages was the least voluminous. Presumably, one of the most factors affecting low volume of Iranian university websites is that many educational departments within universities and the faculty members lack their web pages. It is important to note that those universities which have more international fame have more in-links, while those universities which were internationally less famous and well-known have low in-links, i.e. they could not attract sufficient links successfully because of various reasons including Persian content of their websites, lack of scientific information and inability to disseminate pertinent information in the form of electronic journals and conferences.

Methodology

Link analysis as one of the webometric methods is used for this study. Also, we will analyze co-links using clustering method and multi-dimensional scaling. To cluster and map the studied websites.

Data collection:

In order to provide a comprehensive list of LIASs so many searches were done in the internet but after comparing retrieved results, we chose ALA list (www.ala.org) which comprised 127 LIASs. retrieved websites results, Fortunately, all of them were active; so, none of them was omitted. After searching in 3 search engines namely Altavista, AllTheWeb and yahoo and comparing, we selected Yahoo to collect data because of retrieving more precise than Altavista and AllTheWeb. Then, via yahoo in-links and the number of pages indexed for each website were calculated and registered.

In order to determine total number of links, in-links, self-links and web pages, we used the following formulas:

1- Total links:

The number of total links created to one website is determined through:

Link: http://www.ala.org/OR Link: www.ala.org/

2- In-links:

In-links are links which are received by one web page from other web pages. For counting in-links the following formula is used:

(Link: http://www.ala.org/OR Link: www.ala.org/) not (host: http://www.ala.org/OR host: www.ala.org/)

3- Self-links:

Self-link is a link which is created from one web page within a website to the same web page or other web pages available at the same website. To estimate self-links of websites, we utilized the following formula:

(Link: http://www.ala.org/OR Link: www.ala.org/) and (host: http://www.ala.org/OR host: www.ala.org/)

4- Co-links:

In order to determine co-link status of LIASs websites, below command was used in Yahoo:
Co-link rate = URL of the first site + space + URL of the second site

http://www.ala.org/ http://www.ifla.org/

5- Total size:

To count total size, the following command was used:

domain: www.ala.org

6- WIF

In order to determine WIF of studied websites, we utilized below formula:

(The number of in-links divided by total number of web pages indexed by used search engine).

Research Sample

As mentioned earlier, we selected all 127 LIASs websites which were included in ALA list. To encounter the more important websites we used a threshold to cut the websites with less than 1000 inlink. Therefore, 33 websites were remained for analysis. Then, we used co-link command (formula) for these 33 websites. To select strength co-linked websites, we did another threshold and cut down websites with less than 100 co-links. The 33 websites where decreased to 28 websites. 5 websites which had fewer than 100 co-links were neglected. Thus, 28 websites were chosen as final sample of the present research to be analyzed.

Methodology

First, using Yahoo all types of in-links, co-links, self-links as well as total size of each website were extracted. sites was determined by related formula and were entered file in EXCEL software. In order to count co-links of websites a matrix was provided in which websites studied were inserted. Using co-link command, individual websites were compared with each other. Afterwards, those websites which had more co-links were selected and websites which had less co-links were omitted from the matrix, due to thresholds

The final matrix was captured by SPSS. In order to refine data for reducing entered information to some significant variables, we used hierarchical clustering and multi-dimensional scaling available in SPSS version 10. It is worth saying that link analysis method was used to rank LIASs websites based on their visibility and impact; clustering method was used to identify important clusters of websites and using

multi-dimensional and via drawing structure of links the main and relevant websites within this field were identified.

Data analysis

Table 1 shows total links, self-links, in-links, total size (total number of web pages of any website) and ranking of LIASs websites based on total links received (revised) by each website as well. Using previously mentioned formulas (commands) total links, in-links, self-links and total size were calculated. As can be seen in table 1, websites of ALA, SLA, IFLA, MLA and AIB have the highest total links and in-links.

Although self-links are not considered for analyzing webometrics and calculating WIF, highly self-links within a website indicated that information and resources

available on it have well been linked to each other. Also, one can find his/her needed information easier through self-links (Noruzi, 2004: 111). In addition, searching self-links search engines provide more precise indexes and generally, self-links rate is important for a website to be retrieved and its visibility. Table 1 illustrates that websites of ALA, SLA and IFLA have the highest rate of self-link, while websites of ANABAD, BIBLIOTECARIOS, DBF, and BIBLIOTHEKSVERBAND have not any self-links.

Total size is indicator of content quantity of one site. According to Table 1, websites of ALA, ALIA, AIB and SLA have the highest total size (the most web pages), while websites of IALL have the least total size.

Table 1: Calculating total links, in-links, self-links and total number of web pages

indexed by Yahoo and ranking of LIASs websites in terms of their visibility on the web

Rank	LIASs	Total size	Self-links	In-links	Total links	URLs
1	(ALA)	125000	1270	292000	302000	http://www.ala.org/
2	Special Libraries Association	48700	408	51900	55600	http://www.sla.org/
3	(IFLA)	12000	328	41300	42700	http://www.ifla.org/
4	(MLA)	32100	84	33800	34600	http://www.mlanet.org/
5	Italy	65400	146	28300	29200	http://www.aib.it/
6	(LAE)	4130	32	16400	16400	http://www.rsl.ru/
7	American Association of Law Libraries	22200	76	15200	15600	http://www.aallnet.org/
8	United Kingdon	5090	84	12800	12800	http://www.cilip.org.uk/
9	International Association of Research, Scientific and Technical	13600	22	6110	6210	http://www.gpntb.ru/

	Libraries					
10	Canadin Library Association	2100	16	3330	3610	http://www.cla.ca/
11	(DBV)	4880	0	3440	3450	http://www.bibliotheksverband.de/
12	(IASL)	1080	93	3060	3130	http://www.iasl-slo.org/
13	Danmarks Biblioteksforening	3700	0	2660	2530	http://www.dbf.dk/
14	Colegio de Bibliotecarios de Chile A.G	2480	0	2250	2270	http://www.bibliotecarios.cl/
15	(ADBS)	4530	8	2190	2260	http://www.adbs.fr/
16	Association of Research Libraries	724	71	2190	2230	http://arl.cni.org/
17	Spain	612	4	2080	2090	http://www.cobdc.org/
18	Alt Libraries Society of North American	1490	15	2020	2070	http://www.arlisna.org/
19	(ABLIDA)	1070	21	1890	1930	http://www.eblida.org/
20	Association des bibliothecaires francais	925	7	1860	1920	http://www.abf.asso.fr/
21	(IALL)	172	17	1840	1740	http://www.iall.org/
22	(ALIA)	10400 0	61	1580	1610	http://alia.org.au/
23	(ASTED)	1560	1	1440	1440	http://www.asted.org/
24	(ALISE)	413	6	1360	1380	http://www.alise.org/
25	National Council of Public Libraries	150	1	1110	1350	http://www.library.metro.tokyo.jp/
26	(ANABD)	1560	0	1310	1300	http://www.anabad.org/
27	(IATUL)	1340	40	1270	1290	http://www.iatul.org/
28	(BIB)	1690	7	1270	1290	http://www.bib-info.de/

In response to question 2, it should be indicated that the more a website has in-links, the more reliable, importance and visible it is. In-links count of a website determines its reliability, importance, quality, visibility and rank and indicates whether users are interested in its information. As illustrated in Table 1, visibility of websites of ALA, SLA, MLA, AIB is more than other's because of their high in-links, while visibility of website is less than other's when a site links to another site, it may mean that citing site has been affected by

cited site. Relation rate between sites demonstrates that they have the same subject and objective.

Chu (2001: 122) studied in-links rate of LIS schools websites. He declares that according to suffixes citing sites have sites with MIL and GOV have not cited to studied sites. That is, mentioned sites have the least relation to military centers. Loss of in-links created by government agencies needs to more description, because some government institutions such as LC have relation to LIS

schools. Findings of Chu's research suggest that LIS schools websites should enrich their content to attract more links.

Look (appearance) of a website even affects link attraction. For example, websites with more images are loaded longer which in turn leads to less in-links. Link analysis provides a quality approach to evaluation of organizations, because instead of measuring persons which is done in bibliometric studies, webometrics using link analysis considers all of the organization.

In citation analysis we can only measure individuals, i.e. it has no tool for evaluating all of the institution or school, but in webometrics we can assess all of the schools. Therefore, when we want to study an institution, webometrics is preferable to bibliometrics (Chu, 2001: 125).

Replying to question 3 can be summed up as follows: WIF is highly similar to JIF, i.e. it has been modeled from JIF. As

scientometric studies in which total number of citations given to published articles in one journal at a certain point in time (usually biennial) divided by the total number of published articles (cite able items) in the same journal and time is a criterion for estimating JIF (Osareh 2002), in webometric studies WIF also should be calculated in terms of total number of a website pages indexed by a search engine. It is important to mention that revised impact factor equals with total links divided by number of website pages indexed. Website rank is revealed via its impact factor. WIF is a tool used to evaluate, rank, compare and categorize various websites. In information evaluation, one of tools for identifying websites visibility is WIF. We can even use WIF to study quality of information within a website, website impact rate in the web and its universal fame, its reliability and capacity of being retrieved (Noruzi, 2004: 106).

$$\text{Web Impact Factor (WIF)} = \frac{\text{Revised Impact Factor} = \frac{\text{Total in-links}}{\text{Total number of website pages indexed}}}{\text{Total number of website pages indexed}}$$

Table 2 shows ranking of LIASs websites based on WIF. As can be seen, WIF of websites of IALL, RSL, IFLA, and COBDC is more than other's. The least WIF belongs to websites of GPNTB, AIB and ALIA.

In regard with WIF, there are many criticisms which have been expressed in literature. As a

result of such problems, more reliable websites come down low ranks, i.e. websites with less web pages get high WIF that, in turn, it makes difficult to calculate precisely WIF and reliability rate of websites. This case can be seen better in table 1.

Table 2: WIF and RIF of LIASs, websites

Rank	LIASs	URLs	Total links	Total size	In-links	WIF	RIF
1	IALL	http://www.iall.org/	1740	172	1840	10.69	10.11
2	National Council of Public Libraries	http://www.library.metro.tokyo.jp/	1350	150	1110	7.4	9
3	LAE	http://www.rsl.ru/	16400	4130	1640	3.97	3.97

					0		
4	IFLA	http://www.ifla.org/	42700	12000	4130 0	3.44	3.55
5	Spain	http://www.cobdc.org/	2090	612	2080	3.39	3.41
6	ALISE	http://www.alise.org/	1380	413	1360	3.29	3.34
7	Association of Research Libraries	http://arl.cni.org/	2230	724	2190	3.02	3.08
8	IASL	http://www.iasl-slo.org/	3130	1080	3060	2.83	2.89
9	United Kingdom	http://www.cilip.org.uk/	12800	5090	1280 0	2.51	2.51
10	ALA	http://www.ala.org/	30200 0	12500 0	2920 00	2.33	2.41
11	Association des bibliothecaires francais	http://www.abf.asso.fr/	1920	925	1860	2.01	2.07
12	EBLIDA	http://www.eblida.org/	1930	1070	1890	1.76	1.8
13	Canadin Library Association	http://www.cla.ca/	3610	2100	3330	1.58	1.71
14	Alt Libraries Society of North American	http://www.arlisna.org/	2070	1490	2020	1.35	1.38
15	Special Libraries Association	http://www.sla.org/	55600	48700	5190 0	1.06	1.14
16	MLA	http://www.mlanet.org/	34600	32100	3380 0	1.05	1.07
17	IATUL	http://www.iatul.org/	1290	1340	1270	0.94	0.96
18	ASTED	http://www.asted.org/	1440	1560	1440	0.92	0.92
19	Colegio de Bibliotecarios de Chile A.G	http://www.bibliotecarios.cl/	2270	2480	2250	0.90	0.91
20	ANABAD	http://www.anabad.org/	1300	1560	1310	0.83	0.83
21	BIB	http://www.bib-info.de/	1290	1690	1270	0.75	0.76
22	DBV	http://www.bibliotheksverband.de/	3450	4880	3440	0.70	0.7
23	American Association of Law Libraries	http://www.aallnet.org/	15600	22200	1520 0	0.68	0.7
24	Danmarks Biblioteksforening	http://www.dbf.dk/	2530	3700	2660	0.71	0.68
25	ADBS	http://www.adbs.fr/	2260	4530	2190	0.48	0.49
26	International Association of Research, Scientific and Technical Libraries	http://www.gpntb.ru/	6210	13600	6110	0.44	0.45
27	Italy	http://www.aib.it/	29200	65400	2830	0.43	0.44

					0		
28	ALIA ¹	http://alia.org.au/	1610	10400 0	1580	0.01	0.01

In response to question 4, research results are displayed in figures 1 and 2. Co-link is similar to co-citation in printed resources. It is as an indicator of some relation between two websites. In the other words, these two sites have some similarities in their working field.

Results showed that there is the highest co-link rate between websites of IFLA and ALA (125000 links). This means that 125000 sites jointly have made links to both IFLA website and ALA website. Therefore, similarities between these two websites are more than the other websites. That is, they may have similarities in subject areas, methodology, objectives language, geographical region and so forth.

Results relating to question 5

As can be seen in figure 1, via clustering method we have identified 3 main clusters and 2 websites which have not formed any cluster. Websites categorized in the same cluster have more relation and websites that have low co-links have less relation to each other. Two unclustered websites include GPNTB and RSL which compared with other clusters have become distant from each other and have the least co-link rate. It may be rooted in being non-English language websites.

The 3 main clusters include:

1- First cluster (special cluster): There are ARL, SLA, IFLA, CLA, AALL, ALISE, MLA, BIBINFO, ARLISNA and ABF in this cluster. Presumably, it is a special-research cluster. As can be observed, all above websites excluding CLA, IFLA, and ABF have special aims and activities.

According to Figure 1, ARL, SLA, IFLA and CLA have made relation to each other as soon as possible and formed the first sub cluster in the first cluster (group). The reason seems, the same geographical area (Canada and America), ARL and SLA have been included in this sub cluster; because of being important as one of the major LIS associations which includes a variety of LIS fields, IFLA is also in this sub cluster and finally, CLA has been grouped into this sub cluster for reasons such as geographical location, common scholarly, economic, political and professional objectives as well as importance of special and general information included in this site. The next sub cluster in the first cluster (group) encompasses AALL, ALTSE and MLA that their remarkable characteristic is being special and locating in the same geographical area namely North America. Placing ABF in the first cluster-which of course is distant from the rest-is likely rooted in some reasons such as containing useful information and harmony of its scientific, cultural, social, economic and political aspects. Interestingly, it lacks some features of this cluster including linguistic, geographical, subject and special characteristics included in most associations within the first cluster.

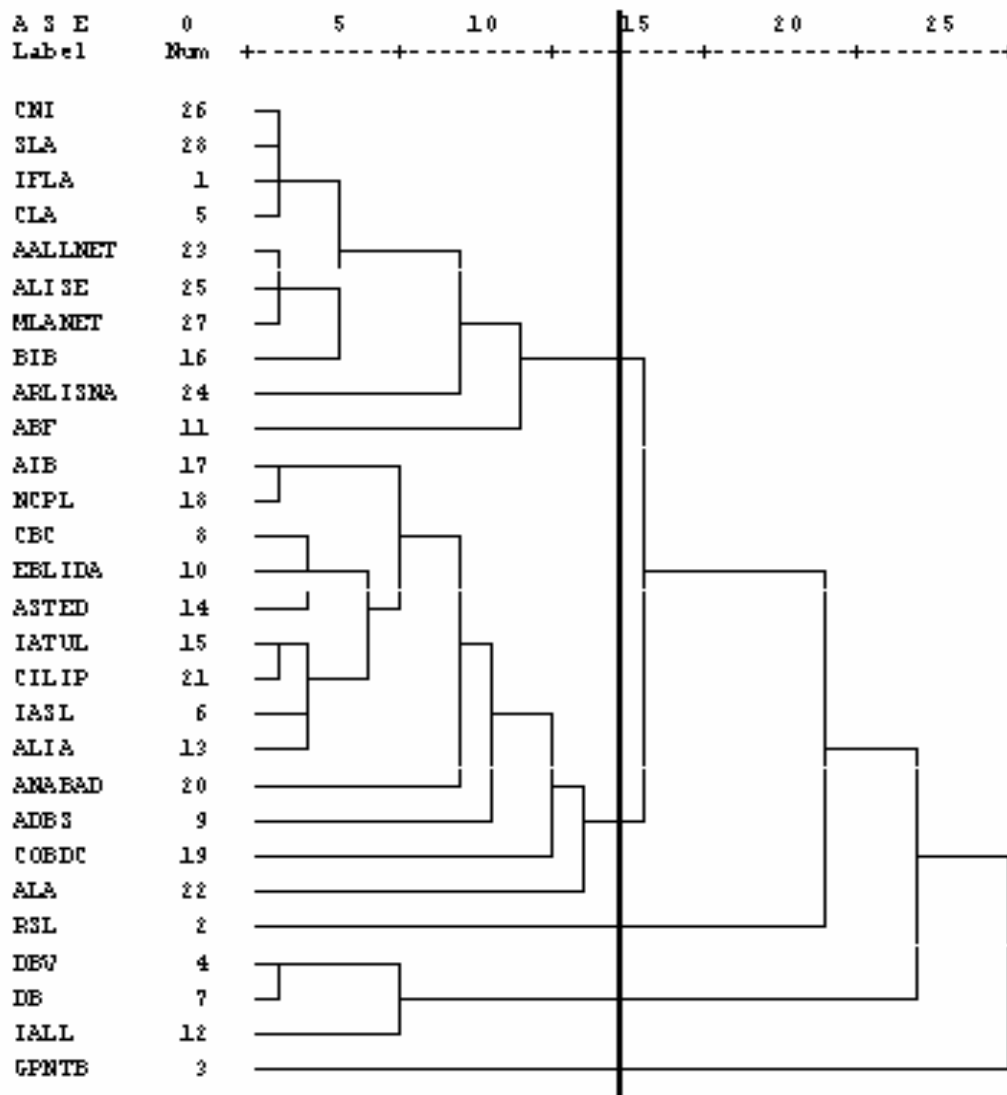
2- The second cluster (international): It is an international cluster in which there are the following associations: AIB, EBLIDA, ASTED, IATUL, BLA, IASL, ALIA, ANABAD, ADBS, COBDC and ALA.

There are 3 sub clusters in this cluster which have strong relations. The first sub cluster comprises AIB and which the only common feature between them is to have non-English language. These 2 associations have likely linked to each other for user's needs.

The second sub cluster includes EBLIDA and ASTED and finally, the third sub cluster is

composed of IATUL, BLA, IASL and ALIA.

Figure 1: Clustering of LIASs websites



3- The third cluster (continental, European): It includes DBF which are approximately in the same geographical area and IALL.

For replying to question 6, we have attained the following results:

For a better understand co-links status of LIASs websites, we mapped the linkages of websites using multi-dimensional scaling

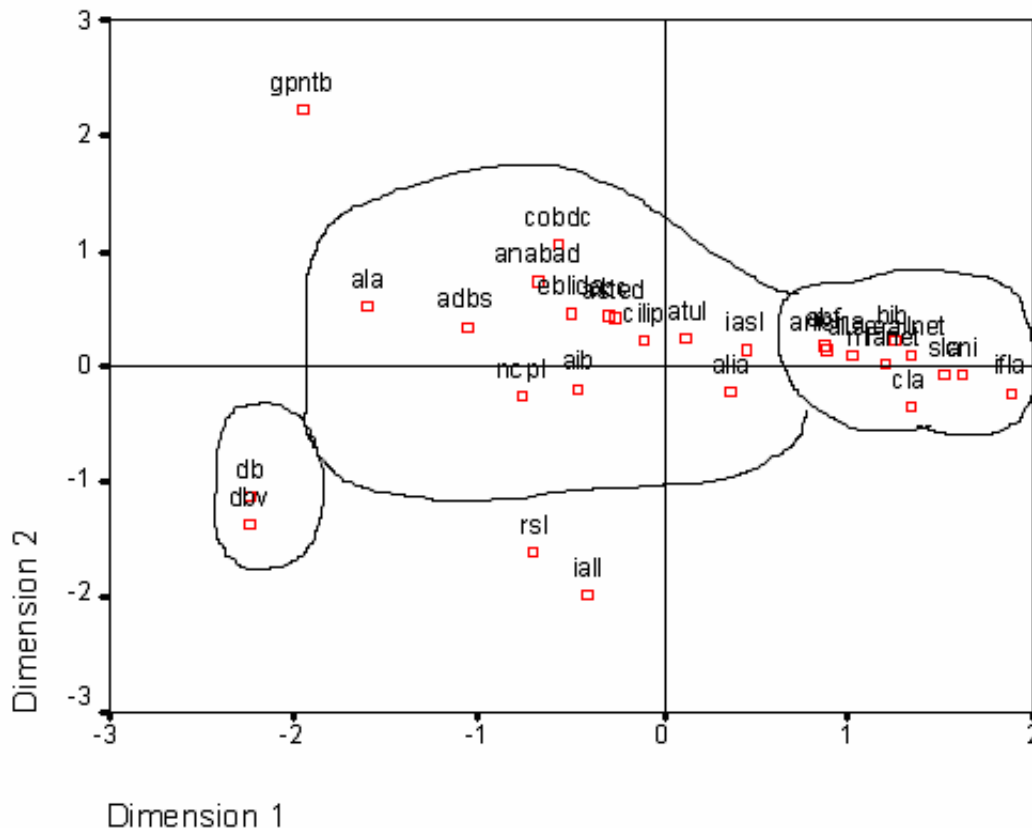
(Figure 2). As shown in the map, we can consider 3 clusters.

The first cluster is special libraries which have similar aims and activities. These special libraries are alongside IFLA and CLA. In spite of being general, special library associations have made links to these 2 important websites (IFLA and CLA). The second cluster is international in which ALA

is, thought it has placed in a distant space to other associations. Because ALA is an important website and included useful information has high in-links and low out-links. The third cluster is continental (European) which comprises DBV, DB and IALL. As can be seen, IALL-

Figure 1 with DBV, DB and IALL, have formed one cluster here is not near them in the same cluster but has become adjacent to RSL (Figure 2). As you can see in figure 2, GPNTB has not clustered with other websites and so is for from others. It may dependent on linguistic reasons.

Figure 2: Map of linkage connections of LIASs websites through multi-dimensional scaling



Discussion and conclusion

Findings of this research provide a picture of various LIASs status in terms of their website quality and performance. The present study indicated that although all websites have approximately linked to each other, but strength of co-links is deniable among some websites.

There are so many factors affecting rate of linking between websites which have been mentioned in the literature including subject area, methodology, language, news, important information resources, plans, broad information based on user's needs, structural and content information within website, full-text resources, site longevity (oldness), catalogues, frequently used catalogues and so on.

Related and co-subject resources, similar objectives and policies between LIASs have resulted in high rate of linking. In regard to co-link and its factors, we can not suggest a single consensus. Because we have little knowledge about models and motivations of linking, we can not evaluate issues on co-link and linking and so reasons of this case should prudently be discussed. Also, factors affecting the least rate of linking between websites are language barriers, political problems and formal relations among governments, changing URL or website contents and low quality of website contents, social cultural and racial problems, technical problems of websites, lack of reliable scientific information and lack of disseminating pertinent information in the electronic format.

In regard to reasons of co-link, we can use reasonings of citation

analysis. In citation analysis, it is assumed that if two articles have the same references, there is somehow content relation between them. This relation was content relation between them. This relation was put forward by Ksler (1963).

Identifying key (core) authors of one discipline is made possible through study of co-citation couples (Osareh, 2005: 278). Examination of co-links between websites reveals core sites within a field. Co-link in webometrics is equivalent of co-citation in printed resources.

When a website links to another one, it can be meant that citing website has been affected by cited website. Strength of links between websites indicates that they have the same subject and purpose.

Although link analysis of websites is not a comprehensive tool evaluating institutions, it provides interesting approach for assessing them. Because web nature is dynamic, search engines as data collection tools have some disadvantages, there is not enough knowledge about motivations and reasons of linking and other factors affecting websites evaluation, such studies and conclusions in ranking websites should prudently be performed. It is worth saying that most of LIASs are geographically in US. Thus, it can be concluded that production, distribution and publication of information relating to this field are being done in US. It is apparent that LIS has properly developed in US. On the other hand, common language used in websites is English and in principle, not only English websites more likely absorb more in-links from the non-English

websites, but also they may be retrieved and recalled more than non-English ones.

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