Analysis and Evaluation of Navigation Structure of the Websites of Central Libraries of Iranian Public Universities Accredited by MSRT

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Abstract

The main objective of this research is to determine the status of navigation tools in the websites of central libraries of Iranian public universities accredited by the Iranian Ministry of Science, Research and Technology (MSRT) based on items specified in the checklist for identification of weaknesses and strengths of their webpages to improve the provision of services to remote users. This research was conducted as a descriptive survey. The statistical population included all websites of Iranian public universities. Thirty-six out of one hundred thirty nine central library websites of Iranian public universities had a separate and acceptable webpage, which were studied in this research. Out of 36 central libraries of Iranian public universities with a separate webpage, 34 libraries (94.5%) have fixed navigation tools. User navigation and ease of access to target contents on the website increase the user's stability and site visits. Therefore, designing a good navigation system is essential for users. For navigation, users can use various features on the website.

Keywords

Introduction

Concerning information explosion and advancement of information and communication technologies, various organizations and institutions have sought to communicate with users through websites to make information and services more accessible via the Internet. The aim of designing webpages in higher education centers and universities is to provide the possibility of more effective accessibility to information of these centers with minimum time and cost.

The Web has increased the availability and accessibility of scientific and technical information. Therefore, in this way, academic libraries must establish an effective, dynamic and user-friendly website. Academic libraries and information centers are not exception to this, and there are a few libraries that do not design a website. From the mid-1990s, most libraries and information centers have initiated developing websites and services (Ryan, 2003).

The websites of libraries play a significant role as an important tool for providing information and community services. Indeed, in addition to the utilization of the Internet, libraries can introduce themselves and provide services. Therefore, librarians, as the main specialists shall have the required capabilities in building and designing libraries' websites. Library websites should be designed based on some criteria and standards to meet the needs of users and get their satisfaction in the shortest possible time.

One of the main tools in website designing that attracts audiences is the "*navigation*" tool which as a panel guides the users through different parts of website. Therefore, the libraries are inevitable to include a good and efficient navigation tools on their websites which is an undeniable fact. In fact, "Navigation Bar" is one of the most important parts of website designing. Although home page is the most important part of a website which contains most access points to website content, a fixed navigation tools should be always present on all pages as a permanent roadmap to enable the visitor to find its way through different and main sections of a website from wherever he is, without ant need to go back to the first page to change its path toward his required data and pages. What matters here is the type of links that must be included in the fixed navigation tools on all pages of a library website (Izadi, 2011).

The investigation of the log files related to user navigation on websites indicates that when users try different paths to achieve their objectives or when a circuit is created during user navigation, it means that the user has encountered problems in finding his target page. Moreover, sometimes because of the link placement in an inappropriate location on the page or because of its vagueness, the user cannot guess the location of the content and therefore cannot reach the target page. Website administrators try to facilitate the user's navigation through improvement of website structure. The proposed solution should create the least changes in the current structure of the website so that the users who are familiar with the website are not confused (Barzegar, 2017).

Proper navigation will make it easy to use and access site facilities and services, avoid users' confusion and waste of time and help them find information faster. If the menu structure and website navigation tools are not well-designed and seem as confusing by the users, the users would not be able to find the main content of the website and would be tired very soon. The dynamics and stability of library websites depend on the rate of users' application (Karimi, 2011).

On the other hand, one of the criteria for assessment and ranking of universities in various ranking systems is their libraries websites and, one of the criteria for evaluating websites is the navigation or navigational tools used on the website. Moreover, the evaluation of library websites through navigation tools is one of the methods used to assess the usefulness of websites and their efficiency.

The main objective of this research was to determine the status of navigation tools in the websites of central libraries of Iranian public universities accredited by the Iranian Ministry of Science, Research and Technology (MSRT) based on items specified in the checklist for identification of weaknesses and strengths of their webpages to improve the provision of services to remote users. The specific objectives are:
- o Identify the central libraries of Iranian public universities that have a dedicated website;
- o Identify the websites of central libraries of Iranian public universities that have used fixed navigation tools on their pages;
- o Identify types of technologies and layouts that have been used in the fixed navigation tools of central libraries of Iranian public universities; and
- o Identify types of links that have been made to allow users in a fixed navigation tools and home pages of the central libraries.

Review of literature

Websites are one of the essential tools for libraries to connect with users, and homepage is the starting point for steering library researches of users to get accessible resources (Osorio, 2001). Therefore, the designing of a website should be done in such a way as to make the user's access to the services, resources and facilities of the library as easy and quick as possible. To increase the effectiveness and functionality of the website, as well as to provide better remote services to users, it is necessary to be aware of the type of links that must be necessarily included in homepage of library website, especially in fixed navigation tools. Moreover, as far as the first pages of each website, or the main pages, are indicative of the content, value, organization, subject matter, and the main structure of the website, the review and evaluation of webpages is necessary. The study of university websites began in the mid-1990s through different point of views (Ryan, 2003).

Studies on websites have generally focused on topics such as design principles, identification of website designing objectives, the content of websites, the organization, the use of links, and the validity of websites. There are various local and foreign studies on website navigation which will be referred to.

Zarghani et al. (2017) found that the bulletin or bulletin board is the largest item on the website of libraries and navigation services and links to publishers' websites are the most commonly items not included on websites. This research was a descriptive-survey and the research population included 36 medical universities with central library websites. The research tool was a researcher-made checklist based on previous studies. The checklist included two parts, the first part included the library information (library name, website address and review date), and the second part included the main information of the research in several parts: available resources (10 titles) referral services (12 titles), reference services and modern technologies (23 titles) Educational Services (5 titles).

Chen and Ryu (2013) proposed a mathematical programming model with minimal changes to its current structure to improve user navigation on the website. They have defined effective management based on the compliance of the website's organized information with the expectations of the user. The purpose of this article was to improve the structure of the website by applying the least changes to the current structure to facilitate user navigation; moreover, in so far as the importance of the webpages is determined concerning their depth in the hierarchical structure, it can be a good way for users to quickly find targeted pages.

Nagi et al. (2011) proposed a new method based on the association rules to generate rules for linking webpages that are mostly searched by the users with the aim of maximizing user satisfaction and therefore increasing the number of website visitors.

Wang et al. (2011) proposed a graphical structure called the transaction path chart to record information about the navigation paths of website visitors. In order to introduce this method, first a definition of web navigation patterns has been presented which is called Total Search Patterns (TSPs). Then, according to the sessions obtained from the users' navigation, a plot is drawn and an algorithm is presented for monitoring this graph. By session, it is meant the sequence of pages that a user traverses to reach the target page.

Brower (2004) reviewed the websites of libraries of medical universities. He analyzed the homepages and sustainable navigation tools in terms of layout and design, technology, links and other general criteria through 3-page tool which he had previously designed. These websites were evaluated in 4 areas of general information of library, auxiliary tools of websites, library services and electronic services. At the end of the study, he presented a formula for determining the necessary links, which included a list of all the components that should be included in all home pages of the libraries of medical sciences universities and their management tools.

Perkowitz and Etzioni (1998) studied the automatic creation of pages that facilitate website visitor navigation. They provided a method to simplify user navigation which, without removing links or webpages, only tries to add new pages and links and create index pages; in other words, it presents a non-destructive conversion method.

Kalra and Verma (2011) evaluated 46 selected research institute library website, quantitatively and qualitatively. Usability and usefulness are two major components that the authors have covered for evaluation of the indicators.

Devi and Verma (2018) used one hundred and seventy two parameters and designed a five-point rating scale to evaluate and rank IITs and NITs library website. A detailed criterion has been developed with two variables" Yes" and "No" while conditional and additional scenarios were added as per the requirement. This study was carried out on the library website/ webpage of the 19 IITs and 29 NITs. The study reveals that the score point of IIT Kanpur library website placed in the first position and NIT Agartala placed in the last position among all the engineering institution taken for the study. The study further suggested that the evaluation of libraries website must be done frequency so as to check the structure and information available in the website as well as to keep the website updated.

Raward (2001) explains that designing will be successful when user-oriented designing pattern is applied in development and completion of university libraries' webpages. He believes that two essential factors of the number of users and information needs in university should be taken into account in designing university libraries' websites. He recommends finding some information on the content, layout, sitemap, search, updated information, information credit, recommendation and comments page, users' support activities including question and answer and the capability of reviewing pages for development and completion of webpages of university libraries.

Shukla and Tripathi (2010) examined the contents of the library website and made a comparative study among the 20 central universities and 19 institutes of national importance including the IITs and IIMs. They established a method to measure the overall website performance calculation (OWPC) and criteria-wise website performance calculation (CWPC).

The investigation has shown that there are many foreign studies on website navigation; however, there is rarely any local study in this field. Therefore, concerning the value and significance of navigation tool, it is required to carry out more research in this regard.

Research hypotheses

H1: In designing websites of the central libraries of Iranian public universities, more than half of the criteria and components of public information on home pages and fixed navigation tools have been respected.

H2: In designing websites of the central libraries of Iranian public universities, more than half of the criteria and components of tools and facilities on home pages and fixed navigation tools have been observed.

H3: In designing websites of the central libraries of Iranian public universities, more than half of the criteria and components of library services on home pages and fixed navigation tools have been respected.

H4: In designing websites of the central libraries of Iranian public universities, more than half of the criteria and components of web-based resources of the library on the home pages and fixed navigation tools have been observed.

Materials and Methods

The research was conducted as a descriptive survey. The statistical population includes all websites of central libraries of Iranian public universities accredited by the Iranian Ministry of Science, Research and Technology (MSRT). The list of these universities was extracted from the website of the MSRT which included 139 universities. All websites of these libraries were studied and no sampling was done. SPSS 23 was used for data analysis. Thirty-six out of one hundred thirty nine central libraries of Iranian public universities had a separate and acceptable webpage, which were studied. Others did not have a separate website or could not be checked for being under construction or for some other weakness which were excluded. For evaluation of the weakness or acceptability of website, five-point Likert scale (poor, moderate, good, and very good) was used. The methodology includes observing and filling the questionnaire by the researcher.

The criterion for ranking websites as poor, medium, good and very good is the vertical and horizontal navigation bar, the introduction of services and activities, announcements and news, contact with library on the homepage of the library. In this research, the purpose of navigation tool is the presence of a tool on the pages of the website, which is used mostly on the top and bottom, and sometimes, vertically, on the right or left side of the page. A set of tabs and links on navigation tool as needed by the user are Contact Us, Sitemap, etc. It should be noted that in various resources, "navigation tools" have been used with different titles, such as "navigation" and "site navigation"; therefore, in this research, these two terms are used in this sense.

Results

Identifying websites of central libraries of Iranian public universities

In the website of the Iranian Ministry of Science, Research and Technology (MSRT), 139 universities and higher education institutions are listed. This list includes all large comprehensive universities, applied sciences universities, higher education centers and arts and industry training centers accredited by the MSRT.

Out of 139 Iranian public universities accredited by the MSRT, only 36 universities (26%) had a distinct and acceptable webpage for their central libraries, which are the focus of the remaining research questions. One hundred three (74%) had not any website or were so weak in this regard which made them incapable of investigation. The benchmark for acceptance of these websites is the existence of a fixed navigation tool (portrait or landscape) -library news and announcements- the introduction of library and its services.

Identifying websites of central libraries with fixed navigation tools

Out of 36 Iranian public universities with a separate webpage for the central library, 34 libraries or 94.5 percent have fixed navigation tools.

Type of layout used for fixed navigation tools

In this research, the layout of webpages is divided into four groups: vertical, horizontal, both vertical and horizontal, and none of them. The following results are obtained after viewing the websites of central libraries of Iranian public universities. As shown in Table 1, libraries mostly use horizontal arrangement. The number of libraries only using vertical or both vertical and horizontal layout is very small. This conclusion suggests that horizontal navigation tools are of great importance for website designers at central libraries of Iranian public universities.

Table 1. Frequency distribution of the layout of navigation tools on the websites of Central libraries of Iranian public universities accredited by MSRT

Row	Frequency distribution of how to arrange the navigation tool	Frequency	Percentage
1	Vertical	5	13.9
2	Horizontal	23	63.9
3	Vertical and Horizontal	7	19.4
4	None	1	2.8
	Total	36	100

Type of technologies and layouts used in fixed navigation tools

The segmentation of the technology used on websites in this study includes slider menus, cascading menus, animated images, image changes by placing mouse cursor over them and no technology other than HTML and graphics. The following results are obtained using direct observation of the websites of central libraries of Iranian public universities (Table 2).

Table 2. Frequency distribution chart of technology used in the structure of navigation tools on the websites of central libraries of Iranian public universities

Row	Frequency distribution of the technology used in the structure of the navigation tool	Frequency	Percentage
1	Slider menus	8	22.2
2	Cascading menus	22	61.1
3	Animated images	3	8.3
4	Change images by placing the mouse cursor over them	1	2.8
5	No technology other than HTML and graphics	2	5.6
	Total	36	100

On the websites of central libraries of Iranian public universities, cascading menus with a frequency of 22 cases (61.1%), followed by slider menus with 8 cases (22.2%) were most frequently used.

Links used to access public information

General information includes information that every person needs when logging in to the site to easily access the information that he needs. In this research, in order to review and evaluate general information, 13 levels have been considered. The number and percentage of observations in the websites of central libraries of Iranian public universities in each class are as follow (Table 3). Table 3 indicates that most of the websites of central libraries of Iranian public universities, that is 202 websites (43%), have not included "General Information" in their webpages. Ninety three 93 websites or 20 percent have used "General Information" in their navigation tools and homepages, which is the lowest rate and almost 37 percent or 173 websites, have included "General Information" just in their homepages.

Table 3. Distribution of general information links about the library on the websites of central libraries of Iranian public universities

Row	Links to general information about the library	Only on the homepage		Navigation and home screening tools		None	
		Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
1	Sections and subsidiaries	10	2.1	12	2.5	14	2.9
2	A guide or map to the library building	1	0.21	2	0.42	33	7
3	Library hours	33	7	2	0.42	1	0.21
4	Tutorial guide and tutorials	17	3.6	9	1.9	10	2.1
5	Link to the parent library or other subsidiary libraries	10	2.1	9	1.9	17	3.6

6	Link to the parent organization	25	5.3	1	0.21	10	2.1
7	Building plans	1	0.21	2	0.42	33	7
8	News, events, and library updates	2	0.42	33	7	1	0.21
9	Policies (policies) and processes	26	5.5	5	1.06	5	1.06
10	Mission Statement or Purpose	19	4.05	4	0.85	13	2.7
11	Service development	1	0.21	3	0.64	32	6.8
12	Staff Guide (names and phone numbers, etc.)	24	5.1	9	1.9	3	0.64
13	Virtual Visit	4	0.85	2	0.42	30	6.4
	Total	173	36.9	93	19.8	202	43.1

Links used to access facilities

For evaluation of library facilities and tools, the websites of 5 libraries were considered and examined in 36 websites of central libraries of Iranian public universities. According to Table 4, most of the websites of central libraries of Iranian public universities had not used libraries of the tools and facilities on their website (87 out of 180 cases, about 48%). Approximately 48 percent of the other surveyed websites had used tools and facilities in both navigation tools and homepage. The survey found that the e-mail address to contract website designers and authors had been presented in both navigation tool and the home page of the website by frequency of approximately 16 percent.

Table 4. Frequency distribution of links related to tools and facilities on the websites of Central libraries of Iranian public universities

Row	Links to library tools and facilities	Only on the homepage		Navigation and home screening tools		None	
		Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
1	Help (Frequently Asked Questions)	1	0.5	14	7.7	21	11.6
2	Feedback form or e-mail address to contact designers and site authors	3	1.6	29	16.1	4	2.2
3	Profile or Sitemap	1	0.5	27	15	8	4.4
4	Site Search Engine	1	0.5	15	0.11	20	11.1
5	Link to the text-only version of the site	1	0.5	1	0.5	34	18.8
	Total	7	7.7	86	47.7	87	48.3

Links used to access a variety of services

Libraries provide some facilities in their website for users to enable them easily access their services and save time. In this study, 9 items have been considered for evaluating library service links, which were studied in 36 websites of central libraries of Iranian public universities. According to Table 5, most websites of central libraries of Iranian public universities have not used library service links in their navigation tools and homepage (276 out of 324 cases, about 85%) and only 8 percent of libraries have provided services both in their navigation tools and homepage. Meanwhile, the highest rate is related to "Contact the reference librarian" or "Ask librarian" and "Forms" and the lowest rate is related to photocopy request, search request, an interlibrary borrow request that has been offered only in one library (Table 5).

Table 5. Frequency distribution of library service links on the websites of central libraries of Iranian public universities

Row	Links to library services	Only on the homepage		Navigation and home screening tools		None	
		Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
1	Link to page (forms)	6	1.8	6	1.8	24	7.40
2	Ask the reference librarian or contact of librarian	2	0.6	6	1.8	28	8.6
3	Contact the editor of the site or the editorial board	2	0.6	3	0.9	31	9.5
4	Reserve of book	1	0.3	3	0.9	32	9.8
5	Extension of resources on loan	1	0.3	3	0.9	32	9.8
6	Request a book	6	1.8	3	0.9	27	8.3
7	Copy Request	1	0.3	1	0.3	34	10.4
8	Search request	1	0.3	1	0.3	34	10.4
9	An Interlibrary Loan Request	1	0.3	1	0.3	34	10.4
	Total	21	6.4	27	8.3	276	85.1

Links used to access basic web resources

The web-based resources have been classified into thirteen parts as presented in Table 6 which have been studied in 36 websites of central libraries of Iranian public universities. According to

Table 6, most websites of central libraries of Iranian public universities, 56 percent, have not used the links related to library's web-based resources on their website. 125 libraries or 30 percent have used web-based resources link both in navigation tools and homepage.

Table 6. Frequency distribution of links to web-based library resources on the websites of central libraries of Iranian public universities

Row	Links to web-based library resources	Only on the homepage		Navigation and home screening tools		None	
		Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
1	Quick references, overloaded resources, or more general resources	5	1.15	30	6.94	1	0.23
2	Bibliographic databases, in alphabetical order of title	1	0.23	34	7.87	1	0.23
3	Bibliographic databases, links directly to each of its names	1	0.23	2	0.46	33	7.63
4	Link to eBooks	2	0.46	6	1.38	28	6.48
5	Electronic publications	1	0.23	33	7.63	2	0.46
6	Public Search Engines or Online Guides	2	0.46	2	0.46	32	7.40
7	Thematic general guides (directories)	15	3.47	8	1.85	13	3
8	Continuing Library Public Library (OPAC)	31	7.17	3	0.69	2	0.46
9	Selected online library resources	2	0.46	2	0.46	32	7.40
10	Local information (city, province)	1	0.23	2	0.46	33	7.63
11	Continuing public catalog of other libraries	1	0.23	1	0.23	34	7.87
12	Other references include dictionaries, guides, encyclopedias	3	0.69	2	0.46	31	7.17
	Total	65	15	125	28.9	242	56.1

Evaluation and ranking of websites of central libraries of Iranian public universities

To answer this question, all components have been examined in terms of presence or absence in websites. According to Table 7, about 33 percent of the checklists' information criteria are met by central libraries of Iranian public universities and about 67 percent of these criteria have not been used by their libraries on their websites. The library of Ferdowsi University of Mashhad is in first rank in terms of observing information items with 77.5 percent. Shahid Chamran University

of Ahvaz and Tarbiat Modaress University are in second ranks with 52.5 percent and Hamedan University of Technology is in the last rank with 7.5 percent (Table 7).

Table 7. Total frequency distribution and percentage of factors examined on the websites of central libraries of Iranian public universities

Row	Libraries	Positive answers		Negative answers	
		Frequency	Percentage	Frequency	Percentage
1	Ferdowsi University of Mashhad	31	77.50	9	22.50
2	University of Tehran	19	47.50	21	52.50
3	Tabriz University	16	40.00	24	60.00
4	Mazandaran University	12	30.00	28	70.00
5	Yazd University	17	42.50	23	57.50
6	Al-Zahra University	16	40.00	24	60.00
7	Uremia University	15	37.50	25	62.50
8	Shahid Chamran University of Ahwaz	21	52.50	19	47.50
9	Zanjan University	13	32.50	27	67.50
10	Shahed University	17	42.50	23	57.50
11	Allameh Tabatabaei University	18	45.00	22	55.00
12	Tafresh University	15	37.50	25	62.50
13	Imam Reza International University	16	40.00	24	60.00
14	Tarbiat Modares University	21	52.50	19	47.50
15	Shiraz University	14	35.00	26	65.00
16	University of Esfahan	14	35.00	26	65.00
17	Bahonar University of Kerman	10	25.00	30	75.00
18	Semnan University	17	42.50	23	57.50
19	Kharazmi University	9	22.50	31	77.50
20	Imam Hossein University	13	32.50	27	67.50
21	Shahid Madani University of Azerbaijan	15	37.50	25	62.50
22	University of Sistan and Baluchestan	10	25.00	30	75.00
23	Golestan University	14	35.00	26	65.00
24	University of Zabol	13	32.50	27	67.50
25	University of Bojnourd	12	30.00	28	70.00
26	Kosar University	15	37.50	25	62.50
27	Shahid Beheshti University	11	27.50	29	72.50
28	University of Ilam	9	22.50	31	77.50
29	University of the bozorg Mehr Ghaenat	8	20.00	32	80.00
30	Isfahan University of Technology	10	25.00	30	75.00
31	Amirkabir University of Technology	9	22.50	31	77.50
32	Sahand Industrial University	6	15.00	34	85.00
33	Sirjan University of Technology	5	12.50	35	87.50
34	Sharif University of Technology	12	30.00	28	70.00
35	Shiraz University of Technology	4	10.00	36	90.00
36	Hamedan University of Technology	3	7.50	37	92.50
	Total	480	33.33	960	66.66

1. First hypothesis: Over half of the criteria related to public information in homepages and navigation tools are met in designing websites of central libraries of Iranian public universities accredited by MSRT.

As far as the intended variables in the research hypothesis are in a nominal scale, one-sample chi-square test is used to test the ratio or frequency of the subjects in those categories. The results of this test are presented in Table 9. According to Table 8, the observed frequency for fulfillment of the criteria and public information components of library in the homepages and navigation tools is 266 and the frequency for unfulfillment of these criteria is 202. According to Table 9, (X^2= 8.752; df= 1; P=0.003) and the significance level <0.05, it can be claimed that there is meaningful difference between the observed frequency in fulfillment and unfulfillment of criteria and components of library services in homepages and fixed navigation tools. Concerning the results of data analysis in designing websites of central libraries of Iranian public universities accredited by MSRT, over half of the criteria and components of public information are met in homepages and fixed navigation tools; therefore, the first hypothesis is confirmed (Table 9).

Table 8. The observed and expected frequency indices of criteria and public information components

Variable	Observed frequency	Expected frequency	Residual
Met criteria	266	234	32
Unfulfilled criteria	202	234	-32
Total	468		

Table 9. Chi-square test

Variable	Chi-square	Df	Sig.
Web-based resources of library	8.752	1	0.003

2. Second hypothesis: Over half of the criteria related to tools and facilities in homepages and navigation tools are met in designing websites of central libraries of Iranian public universities accredited by MSRT.

In order to test the above hypothesis, one-sample chi-square is used, the results of which are presented in Table 11. According to Table 10, the observed frequency for fulfillment of the criteria and tools and facilities components of library in the homepages and navigation tools is 93 and the frequency for unfulfillment of these criteria is 87. According to Table 11, (X^2= 0.200; df= 1; P=0.655) and the significance level> 0.05, it can be claimed that there is no meaningful

difference between the observed frequency in fulfillment and unfulfillment of criteria and components of library tools and facilities in homepages and fixed navigation tools. Moreover, the hypothesis cannot be confirmed or rejected through the results of data analysis (Table 11).

Table 10. The observed and expected frequency indices related to criteria and components of tools and facilities

Variable	Observed frequency	Expected frequency	Residual
Met criteria	93	90	3
Unfulfilled criteria	87	90	-3
Total	180		

Table 11. Chi-square test

Variable	Chi-square	Df	Sig.
Web-based resources of library	0.000	1	0.655

3. Third hypothesis: Over half of the criteria related to library services in homepages and navigation tools are met in designing websites of central libraries of Iranian public universities accredited by MSRT.

In order to test the above hypothesis, one-sample chi-square is used, the results of which are presented in Table 13. According to Table 12, the observed frequency for fulfillment of the criteria and components of library services in the homepages and navigation tools is 48 which differs from the expected frequency about -114 units; and the frequency for unfulfillment of these criteria is 276 which differs from the expected frequency about 114 units. According to Table 13, (X^2= 160.444; df= 1; P=0.000), there is meaningful difference between the observed frequency in fulfillment and unfulfillment of criteria and components of library services in homepages and fixed navigation tools. The results indicate that over half of the criteria and components of library services in the homepages and navigational tools are not fulfilled; therefore, the third hypothesis is rejected (Table 13).

Table 12. The observed and expected frequency indices related to criteria and components of library services

Variable	Observed frequency	Expected frequency	Residual
Met criteria	48	162	-114
Unfulfilled criteria	276	162	114
Total	324		

Table 13. Chi-square test

Variable	Chi-square	Df	Sig.
Web-based resources of library	160.444	1	0.000

4. Fourth hypothesis: Over half of the criteria related to web-based resources in homepages and navigation tools are met in designing websites of central libraries of Iranian public universities accredited by MSRT.

As far as the intended variable in this research hypothesis are in a study is nominal, one-sample chi-square test is used to test the ratio or frequency of the subjects in those categories. The results of this test are presented in Table 15. According to Table 14, the observed frequency for fulfillment of the criteria and components of web-based resources of library in the homepages and navigation tools is 190 which differs from the expected frequency about -26 units; and the frequency for unfulfillment of these criteria is 242 which differs from the expected frequency about 26 units. According to Table 15, (X^2= 6.259; df= 1; P=0.012), there is meaningful difference between the observed frequency in fulfillment and unfulfillment of criteria and components of web-based resources in homepages and fixed navigation tools. The results indicate that over half of the criteria and components of web-based resources of library in the homepages and navigational tools are not fulfilled; therefore, the fourth hypothesis is rejected (Table 15).

Table 14. The observed and expected frequency indices of criteria and components of web-based resources of library

Variable	Observed frequency	Expected frequency	Residual
Met criteria	190	216	-26
Unfulfilled criteria	242	216	26
Total	432		

Table 15. Chi-square test

Variable	Chi-square	Df	Sig.
Web-based resources of library	6.259	1	0.012

Discussion

As far as website of a library is considered the interface of users, libraries and library resources, it is required to especially take into account the points and features which increase the dynamism of library website and better relation of users in designing and management. Moreover,

concerning the significance of libraries' websites of universities in fulfillment of the objectives of affiliated universities in students' research and education, the evaluation of these websites is the main task and concern of librarians.

The present study aimed at evaluation of homepages and navigation tools of the websites of libraries of Iranian public universities. Based on the findings, out of 139 universities of Ministry of Science, only 36 universities, or 26 percent, have a distinct and acceptable webpage for central library and 103 libraries, or 74 percent, have not any website at all or have a low level and non-verifiable website. However, in comparison with central libraries of Medical Science Universities of Iran, as studied by Izadi et al., (2012), 25 out of 40 Iranian Medical Science Universities (62%) have separate webpages for their libraries and 15 universities or 38 percent do not have website for libraries.

The investigations showed that the cascading menus (22 cases or 61.1%) and sliding menus (8 cases or 22.2%) have been the most frequently applied technology and layout as used in navigation tools. It seems that the reason preferring cascading menus by website designers is the users' convenience in using these tools, provision of coherent information based on differing needs of users and low space of this menu in homepage of website. The result of present study on the used technology and layout in Iranian libraries' website are in line with the results of Izadi et al. study.

34 out of 36 central libraries of university of the MSRT (94.5%) that had separate websites had fixed navigation tools. As far as navigation tools in website facilitate the users' accessibility to services, resources and facilities of website and through which all required links are visible to user, a high percentage of studied websites have utilized this tool. The results of present study on the presence of fixed navigation tool in Iranian libraries websites are in line with the results of Izadi et al., (2012) study.

The findings indicated that 43 percent of the websites of libraries of Iranian public universities accredited by the MSRT have not included "General information" in their webpages. Moreover, 33 libraries (7%) have not included "Guide" and "Map of Library Building" in their navigation tools and homepages. Almost 37 percent of "General Information" items have been used by site designers only in homepages. 20 percent of library websites have used "General Information" in navigation tools and homepages which is the lowest rate. The study of library websites of present study indicated that the "Working hours" of library has been included in homepage of 33 websites of university library (7%) for users' information. The results of present study on the evaluation criterion of "General Information about Library" are not in line with Izadi et al. (2012) study.

Izadi et al. (2012) study on evaluation of navigation tools of the websites of libraries of medical science universities showed that the studied websites have included almost 49 percent of the

intended links both in their homepage and navigation tools. This indicates that according to Izadi et al. (2012) study, the users of Iranian Medical Sciences universities have the possibility of observing "General Information" both in homepage and navigation tools up to 49 percent; while, the results of preset study are contradictory in this regard. The websites of libraries investigated in the present study have not used, in average, 49 percent of the links related to "General Information" in their webpages.

The results of study on the use of links for users' accessibility to facilities in fixed navigation tools and homepages of the websites of studied libraries showed that 48 percent of the websites of central libraries of Iranian public universities have not used the tools and facilities in their websites and the same rate, i.e. 48 percent of websites have used tools and facilities both in navigation tools and homepages. Moreover, this study indicated that the Email address to contact website designers and authors has been presented both in navigation tools and homepages up to 16 percent. Furthermore, 34 library websites (18.8%) have not included the link to text-version of website in none of their navigation tools. The results of present study are in line with the results of Izadi et al. (2012) study. Moreover, Raward (2001) recommends finding of some information including the content, layout, sitemap, search, user support activities such as question and answer and the capability of reviewing websites for development and completion of webpages of university libraries.

Eighty-five percent of the websites of central libraries of Iranian public universities have not used the links related to library services in their navigation tools and homepages. The highest rate is related to photocopy and search requests (10.4%) which were not used in the university websites. Only 8 percent of libraries have presented services both in navigation tools and homepages and the highest rate relates to "Contact with Reference Librarian", "Ask Librarian" and "Forms" (1.8%). The lowest rate relates to "Photocopy request", "Search request", "Interlibrary borrowing request" which were provided by just one library. The results of present study are in line with the results of Izadi et al. (2012) study. The results of Izadi et al. (2012) study showed that most websites of libraries of Iranian Medical Science universities (82%) have not used the evaluation criteria of studied websites' services. Only 18 percent of libraries of Iranian Medical Sciences universities have presented these services both in their navigation tools and homepages. The results of Brower (2004) study indicated that "Contact Website Editor" link has been presented by 73.2 percent and "Contract Reference Librarian" or "Ask Librarian" by 46.4 percent.

In overall, concerning the role of university libraries in presenting services to users, it seems that the presence of some links such as "Search request", "Extending references", "Book request", "Book reserve", "Contact reference librarian", or "Ask librarian" are necessary in presenting better services to clients in websites of university libraries; although, the university libraries might present these services to their member users.

Conclusion

Based on the findings, it can be concluded that 56 percent of the websites of central libraries of Iranian public universities of have not used the links related to web-based resources in their website. The number of libraries that have used the link of web-based resources both in their navigation tools and homepages is 30 percent out of which the highest rate is related to bibliography databases, sored by title (in 34 library websites, 7.87 percent), electronic journals (in 33 library websites, 7.63 percent) and quick references, frequently requested resources or general resources in 30 library websites (6.94 percent). The results of Izadi et al. (2012) study showed that 14.2 percent of libraries of Iranian Medical Science Universities have used web-based resources both in their navigation tools and homepages. The results of Brower (2004) study showed that the highest rates are related to link of "Electronic journals" (85 percent) and "Electronic books" (51 percent) and the lowest rate is related to "Local information" (city, province) which is 7.4 percent. Insofar as most information resources in on the Internet are electronically presented, this type of information transmission has been considered by university libraries concerning the unique features such as being up-to-date, low cost, providing quick access and etc. Therefore, most websites, especially the university websites have presented electronic services such as link to electronic journals, bibliographic databases and frequently requested electronic resources in their websites in addition to traditional services".

All components have been studied in websites of Iranian university libraries in terms of absence or presence. About 33 percent of information criteria of checklist have been met by central libraries of Iranian public universities and about 67 percent of these criteria have not been used by the intended libraries in their websites. The central library of Ferdowsi University of Mashhad is in the first rank in terms of observing all studied information items by 77.5 percent and in the next rank are Shahid Chamran University of Ahwaz and Tarbiat Modarres Universities by 52.5 percent and in the lowest rank is Hamedan Industrial University by 7.5 percent.

In overall, all studied websites such as websites of libraries of Iranian Medical Sciences Universities in Izadi et al. (2012) study have been weak in terms of designing homepages and presenting the intended links in fixed navigation tools.

Suggestions

As far as user navigation and easy access to target content on the website are of great importance and lead to increased stability of user and site visits, designing a good navigation system is essential for users. Various facilities of the website can be utilized in navigation tools. Moreover, "Navigation bar' is an important component of websites which provides easy use. The following are suggested for making a proper and effective navigation bar:

Use clear and easy navigation.

The place of navigation bar on the website is an important factor in increasing the duration of a user's presence in website and his interaction with it. The navigation bar structure needs to be clean, clear, fixed, and easy to access to provide a good experience for the user. The menus should be accessible and in the place where the user expects so he is not required to search the page. Usually the main menu is designed on the top of the page horizontally or on the right side of the page vertically, and the user expects to find it in these two places. If the menu of website is not accessible by the user and is not immediately found, it will create a feeling of frustration and make the user leave it. It is necessary to make users view the menus and elements of the navigation in your website as quickly as possible so that they do not feel confused. Moreover, the designing of the navigation bar should be flexible enough so that any new change can easily be applied such as links and new pages that will be added in future.

Place the menus in a fixed place

Site menus should be placed in a fixed location and with the identical appearance in all pages of the website. The shape and status, the font type and the color of the menu should be the same on all pages which makes the user feel comfortable with the web design. If in the designing of the website, the menu suddenly flips to the right from the top of the page, disappears, or if its color and appearance in each part of the website changes, it will confuse the user and make him eventually leave the website.

The use of fixed menu at the top of website can help user navigation. In normal mode, the user logs in to one page, scrolls down the page, and if he wants to go to another page, he should go up. If the main menu of the website is fixed at the top of the page and automatically scrolls down and up with the scroll, the user will be more comfortable accessing other pages of the site.

Use clear and explicit topics for menus.

The selection of complicated topics for menu should be avoided since it makes the user search for the subject he is looking for. The menu topics should be explicit and clear. Expressions such as "Library Services", "About Us," or "News" are good examples to be used in the website bar.

Organize links based on their importance.

Users should be able to easily access the information they want; so it is required to classify the content in different categories. For example, important links are better to be placed at the top of the site and the rest on the right or left side.

Introduce related links.

"Related links" is very important in designing website. When a user visits a page, he will certainly read the information on that page. By displaying related content, some offers could be

presented to him so that he can read more pages on the topic for which he has logged into and spend more time in website. By doing so, the information that the user needs is easily accessible to him which increases the user's loyalty to the website. Today, many websites use this method to maintain user stability and, as a result, reduce the falling rate of visitors.

Design the website in such a way that the user knows where s/he is.

Designing website should be such that when a user leaves the homepage and enters one of the internal pages, he knows exactly where he is. If the website has more than one group and subgroup, then the user must at any time be able to return to the higher group with one click.

References

Barzegar A., Tahaiori, H., & Mousavi S .M .R. (2017). Providing a way to improve user guidance on information websites. Paper presented at the *Third International Conference on Web Research*, Tehran. Retrieved March 28, 2019, from https://www.civilica.com/Calendar-IRANWEB03

Brower, S.M. (2004). Academic health sciences library website navigation: an analysis of forty-one Websites and their navigation tools. *The Journal of the Medical Library Association* .92(4), 412-420.

Chen, M., & Ryu, Y. U. (2013). Facilitating Effective User Navigation through Website Structure Improvement. *IEEE Transactions on Knowledge and Data Engineering*, 25 (3), 571-588.

Devi, K. K., & Verma, M. K. (2018). Content analysis based evaluation of library websites: A case study. *Annals of Library and Information Studies (ALIS),* 65 (4), 239-251.

Izadi, S., Radad, I., & Moghaddam, H. S. (2012). *Analysis and evaluation of navigation tools of Central libraries' websites of Medical universities in Iran.* M.A Thesis, Payame Noor University, Mashhad, Iran. [In Persian]

Kalra, J., & Verma, R. K. (2011). Evaluation indicators of library websites of selected research institutions in India. *Annals of Library and Information Studies*, 58, 139-150.

Karimi, R., & Sulaimaniyah, R. (2012). Content analysis and web site service reviews of Iranian academic libraries to faculty members. *Library and Information Science*, 15 (3), 243-270.

Nagi, M., ElSheikh, A., Sleiman, I., Peng, P., Rifaie, M., Kianmehr, K., & Alhajj, R. (2011). *Association rules mining based approach for web usage mining.* Paper presented at the IEEE International Conference on Information Reuse & Integration. (3-5 Aug 2011).

Osorio, N. L. (2001). Web sites of science-engineering libraries: An analysis of content and design. *Issues in Science and Technology Librarianship*, 29(2). Retrieved March 28, 2019, from http://www.istl.org/01-winter/refereed.html

Perkowitz, M., & Etzioni, O. (1998). *Adaptive Web sites: Automatically synthesizing web pages. Proceedings of the Fifteenth National/Tenth Conference on Artificial Intelligence/Innovative Applications of Artificial Intelligence*, Madison, Wisconsin, USA.

Raward, R. (2001). Academic library web design principles: Development of a checklist, *Australian Academic and Research Libraries*, 32 (2), 123-212.

Ryan, S.M. (2003). Library web site administration: A strategic planning model for the smaller academic library. *Journal Academic Librarianship*, 29 (4), 207-218.

Shukla, A., & Tripathi, A. (2010). Establishing content awareness evaluation criteria for library websites: a case study of Indian academic library websites. *Annals of Library and Information Studies*, 57, 403-416.

Wang, Y. T., & Lee, A. J. T. (2011). Mining Web navigation patterns with a path traversal graph. *Expert Systems with Applications*, 38 (6), 7112-7122.

Zarghani, M., Mohaqqeq, N., Alibeik, M. R., Sadeqi. T., Mohebbi. S., & Kosari R. (2017). The study of services provided on the website of central Libraries of Medical Science Universities of Iran. *Payavard*, 11 (2), 134-141.

Bibliographic information of this paper for citing:

Khademizadeh, Shahnaz, & Mohammadian, Zahra (2019).   "Analysis and Evaluation of Navigation Structure of the Websites of Central Libraries of Iranian Public Universities Accredited by MSRT." *Webology*, 16(2), Article 196. Available at: http://www.webology.org/2019/v16n2/a196.pdf