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METHODS FOR EVALUATION OF WEBOMETRIC INDICATORS OF INFORMATION LIBRARY CENTERS

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ABSTRACT

This article provides a general understanding of the methods for determining and evaluating webometric indicators in information library centers. Also included are the criteria for expert evaluation of websites and their values. The author offers comprehensive mathematical methods of multi-criteria evaluation of websites while researching the evaluation coefficients of the system for determining webometric indicators of the websites of information library centers.

KEYWORDS: Method, public library, assessment, webometrics, website, value, expert evaluation

INTRODUCTION

Technical capabilities and Internet websites are growing in number as the world progresses. Determining webometric indicators for providing information to users through library websites and assessing their visits is one of the pressing issues of today. The growth of public library in current society is influenced by the globalization of activities, which raises the significance of intellectualization and technology [1]. Websites are regarded as libraries' essential network and serve primarily as a virtual representation of the institution and a network that reflects the resources and services it offers. Nowadays, there are an increasing number of distinct websites. Websites are regarded as libraries' essential network and serve primarily as a virtual representation of the institution and a network that reflects the resources and services it offers [2]. Scientists are currently creating a variety of scientific studies and tools to assess the increasing number of websites in the world [3].

The website of public libraries is considered their lifeline, and websites are mainly used as a virtual image of the library and an advertising platform for the information and services provided by the library [4]. According to the analysis, analytical tools for effectively evaluating the activities of library websites on the web are becoming increasingly popular today. In particular, webometrics is a tool for measuring websites, web pages, phrases on web pages, website visits, hyperlinks, web search engine results and web aspects [5]. Webometric tools and their current state include four main areas of webometric research [6]: web page content analysis [7]; web link structure analysis [8]; website usage analysis (including users' search and browsing behaviour) [9]; web technology analysis (search engine performance) [10,12].

Finding all the criteria at once and keeping them in a faultless system is the primary challenge when identifying the webometric indicators of a library website. Furthermore, not all websites can be evaluated using the same webometric indicators, and some studies have distinct goals or applications. Each of them has used a different approach to handle the challenge. In order to determine the webometric indicators of library websites, it is now important to create an ideal system for researching and assessing both subjective and objective criteria in a variety of methods.

METHODS AND MATERIAL

The purpose of this research is to develop the method for analysing public library websites in order to improve their monitoring efficiency and provide fast and high-quality remote services to users. evaluation standards of public library websites had been developed due to generalization of webometric indicators, based on the performed analysis and preliminary information processing. The criteria have been first of all processed by means of experts and the assessment coefficient of the device for figuring out webometric indicators of library websites turned into calculated. The criteria for the general criteria of this evaluation are indicated (number of M-criteria):

M1. Completeness of library website content:

M2. Reliability of using the library website:

M3. Accessibility of library website content:

M4. Using the search engine on the website:

M5. Availability of information about regulatory documents:

M6. Library news coverage:

M7. Availability of language support:

M8. Online book delivery:

M9. Criteria for information about regional libraries:

M10. Information about events held in the library:

M11. Library website design:

M12. Interactive queries on the library website:

Statistics gathered from a variety of sources should be taken into consideration when evaluating the popularity of public library websites. The expert evaluation approach is one of the best ways to assess and track overall outcomes based on webometric data.

The expert evaluation method is an analytical approach based on the opinions of highly qualified specialists to assess the quality, functionality, and user-friendliness of a particular system, service, or information resource. In this method, the evaluation is carried out according to pre-defined criteria and does not require direct user involvement. Expert evaluation is considered an important tool, particularly in assessing the quality of library systems and their web-based resources.

In this method, experts assess the existing features of a website or system, the ease of use, navigational structure, design solutions, technical performance, and the relevance of the content. Each criterion is evaluated either using a scoring system or descriptive analysis, and the process results in the identification of shortcomings along with practical recommendations for improvement.

The expert evaluation method has the following advantages:

- It allows for in-depth and professional analysis within a short period of time;
- It helps to identify potential usability issues before users encounter them;
- It provides clear and evidence-based recommendations for improvement.

RESULTS AND DISCUSSION

These days, assessing library websites is crucial for enhancing their functionality and ongoing improvement. Since all of the evaluated methods only use one criterion, we have merged a number of appropriate multi-criteria approaches, and with the help of other library-specific experts, we will examine approaches for multi-criteria website evaluation. There are four steps in the suggested expert evaluation process for evaluating library websites based on many criteria. The formation of the expert group is an important stage of the expert assessment methodology, since the validity and reliability of the results largely depend on the qualifications and impartiality of the selected experts.

In order to ensure a comprehensive assessment within the framework of this study, we selected 3 experts from different fields to form the panel.

- Library and information science expert;
- Web developers or IT specialist;
- Web designer.

The websites of 14 regional public libraries in the Republic of Uzbekistan were selected for this research.

Table 1.

Information and library centres websites

№	Library Centers	Website Addresses
r1	Information and Library Center of the Republic of Karakalpakstan	http://nukus.natlib.uz/
r2	Andijan Region Information Library Center	https://andijan.natlib.uz/
r3	Bukhara Region Information Library Center	http://bukhara.natlib.uz//
r4	Jizzakh Region Information Library Center	http://jizzaxakm.uz
r5	Navoi Region Information Library Center	http://navoi.natlib.uz
r6	Namangan Region Information Library Center	https://namangan.natlib.uz/
r7	Samarkand Region Information Library Center	https://samarkand.natlib.uz

r8	Surkhandarya Region Information Library Center	https://termiz.natlib.uz/
r9	Syrdarya Region Information Library Center	https://sirdaryo.natlib.uz/
r10	Tashkent Region "Turon" Information and Library Center	https://turon.natlib.uz/
r11	Tashkent City "Bilim" Information and Library Center	https://bilim.natlib.uz/
r12	Fergana Region Information Library Center	http://fergana.natlib.uz/
r13	Khorezm Region Information Library Center	https://xorazm.natlib.uz/
r14	Kashkadarya Region Information Library Center	https://karshi.natlib.uz/

Each website is evaluated based on criteria selected by 3 experts. The evaluated indicators are calculated step by step using the following mathematical methods.

Stage 1. Rating Method.

Experts use the rating method to evaluate library websites, determining the importance coefficient of each of the n criteria. The proposed methods for multi-criteria evaluation of library websites were tested on a sample of 14 identical public library websites. All criteria are randomly selected by 3 experts in the evaluation. There are n criteria for l expert evaluation of library websites, each of them gives a score for each criterion in the range from 1 to *n*.

First, $\|a_{lm}\|$ is table of the ratings assigned to l experts on n criteria, where $a_{lm}-$ is the rating given to m- criterion, l - expert, r-websites, $l=\overline{1,3}$, $m=\overline{1,12}$.

In the next step, we consider the sum of the ratings given by all l experts for each of the n criteria [11, 12]:

$$a_m=\sum_{l=1}^{l} a_{lm} \tag{1}$$

from this, $m=12$. Using the following formula, we calculate the overall score of 14 websites by 3 experts across 12 criteria:

Table 2.

Experts' evaluation of 14 websites according to 12 criteria by using (1) formula

m-criterion	**Website assessments**

r-websites	*m1*	*m2*	*m3*	*m4*	*m5*	*m6*	*m7*	*m8*	*m9*	*m10*	*m11*	*m12*
r1	$a_{l1}=12$	$a_{l2}=7$	$a_{l13}=10$	$a_{l4}=11$	$a_{l5}=6$	$a_{l6}=9$	$a_{l7}=10$	$a_{l8}=10$	$a_{l9}=6$	$a_{l10}=8$	$a_{l11}=8$	$a_{l12}=8$
r2	$a_{l1}=9$	$a_{l2}=11$	$a_{l13}=6$	$a_{l4}=5$	$a_{l5}=10$	$a_{l6}=7$	$a_{l7}=6$	$a_{l8}=6$	$a_{l9}=10$	$a_{l10}=8$	$a_{l11}=9$	$a_{l12}=7$
r3	$a_{l1}=9$	$a_{l2}=8$	$a_{l13}=10$	$a_{l4}=8$	$a_{l5}=6$	$a_{l6}=8$	$a_{l7}=4$	$a_{l8}=7$	$a_{l9}=6$	$a_{l10}=5$	$a_{l11}=10$	$a_{l12}=11$
r4	$a_{l1}=9$	$a_{l2}=10$	$a_{l13}=7$	$a_{l4}=9$	$a_{l5}=4$	$a_{l6}=5$	$a_{l7}=9$	$a_{l8}=9$	$a_{l9}=7$	$a_{l10}=10$	$a_{l11}=6$	$a_{l12}=6$
r5	$a_{l1}=9$	$a_{l2}=6$	$a_{l13}=11$	$a_{l4}=8$	$a_{l5}=10$	$a_{l6}=4$	$a_{l7}=7$	$a_{l8}=10$	$a_{l9}=9$	$a_{l10}=6$	$a_{l11}=8$	$a_{l12}=6$
r6	$a_{l1}=10$	$a_{l2}=8$	$a_{l13}=6$	$a_{l4}=7$	$a_{l5}=6$	$a_{l6}=10$	$a_{l7}=8$	$a_{l8}=7$	$a_{l9}=9$	$a_{l10}=5$	$a_{l11}=7$	$a_{l12}=11$
r7	$a_{l1}=7$	$a_{l2}=7$	$a_{l13}=5$	$a_{l4}=9$	$a_{l5}=9$	$a_{l6}=9$	$a_{l7}=4$	$a_{l8}=7$	$a_{l9}=6$	$a_{l10}=7$	$a_{l11}=9$	$a_{l12}=9$
r8	$a_{l1}=4$	$a_{l2}=10$	$a_{l13}=9$	$a_{l4}=7$	$a_{l5}=4$	$a_{l6}=7$	$a_{l7}=3$	$a_{l8}=11$	$a_{l9}=4$	$a_{l10}=10$	$a_{l11}=7$	$a_{l12}=10$
r9	$a_{l1}=9$	$a_{l2}=7$	$a_{l13}=8$	$a_{l4}=4$	$a_{l5}=3$	$a_{l6}=4$	$a_{l7}=9$	$a_{l8}=12$	$a_{l9}=9$	$a_{l10}=7$	$a_{l11}=4$	$a_{l12}=8$
r10	$a_{l1}=10$	$a_{l2}=4$	$a_{l13}=10$	$a_{l4}=11$	$a_{l5}=11$	$a_{l6}=3$	$a_{l7}=10$	$a_{l8}=8$	$a_{l9}=12$	$a_{l10}=4$	$a_{l11}=11$	$a_{l12}=4$
r11	$a_{l1}=7$	$a_{l2}=11$	$a_{l13}=8$	$a_{l4}=9$	$a_{l5}=9$	$a_{l6}=11$	$a_{l7}=7$	$a_{l8}=4$	$a_{l9}=8$	$a_{l10}=5$	$a_{l11}=9$	$a_{l12}=9$
r12	$a_{l1}=4$	$a_{l2}=9$	$a_{l13}=6$	$a_{l4}=6$	$a_{l5}=12$	$a_{l6}=9$	$a_{l7}=4$	$a_{l8}=9$	$a_{l9}=4$	$a_{l10}=6$	$a_{l11}=6$	$a_{l12}=10$
r13	$a_{l1}=9$	$a_{l2}=11$	$a_{l13}=6$	$a_{l4}=4$	$a_{l5}=5$	$a_{l6}=7$	$a_{l7}=10$	$a_{l8}=6$	$a_{l9}=9$	$a_{l10}=6$	$a_{l11}=7$	$a_{l12}=10$
r14	$a_{l1}=6$	$a_{l2}=5$	$a_{l13}=7$	$a_{l4}=8$	$a_{l5}=10$	$a_{l6}=7$	$a_{l7}=8$	$a_{l8}=10$	$a_{l9}=7$	$a_{l10}=4$	$a_{l11}=9$	$a_{l12}=8$

Stage 2. Expert Method.

Library websites are evaluated separately by experts for each of the ***n*** criteria. We determine the ***m-*** criterion of the ***p***-experts for each website. First, for each ***r***-websites, we find the sum of their ratings. The result is a set of criteria based on the evaluation order given to each website by the experts [7]:

$$C_r^{pm} = \sum_{l=1}^{3} a_{rl}^{pm} \tag{2}$$

Here $r=14$, $p=\overline{1,3}$, $m=\overline{1,12}$

Based on the studied criteria, webometric indicators were summarized. Based on the conducted analyses, the data were pre-processed. The evaluation coefficient of the system for determining webometric indicators of library websites was calculated. These evaluation criteria and their values are reflected.

Stage 3. Calculating the Sum of Criteria.

The average value of each identified website is calculated separately for each criterion, taking into account the estimates of s experts. Then, for all r-websites, a sum of alternative ratings for the criteria is formed [11, 12]:

$$C^{pm} = \sum_{r=1}^{14} C_r^{pm} \tag{3}$$

Here $p=\overline{1,3}$, $m=\overline{1,12}$. Then, we find the ***m*** - criterion score of ***r*** website for each ***r*,** based on the ***p***-expert score:

$$V_r^{pm} = \frac{C_r^{pl}}{C^{pm}} \tag{4}$$

here $R=\overline{1,14}$, $P=\overline{1,3}$, $M=12$

However, this method also has certain limitations. Specifically, the evaluation may be subjective, meaning that the individual experience and perspective of the expert can influence the results. If well-formed panel of experts ensures a balanced, multi-perspective, and professional assessment, which increases the reliability of the assessment results and the quality of subsequent recommendations.

Stage 4. Overall Assessment.

The values of the selected websites are calculated for all criteria. As mentioned above [11], each of the ***n*** criteria has its own importance coefficient (5). Thus, the evaluation of each website, taking into account the importance coefficient of each of the ***n*** criteria [12], is calculated as follows:

$$D_r = \sum_{t=1}^{3} V_r^{tk} \tag{5}$$

Library websites can be ranked by the values of D_r, $r=\overline{1,14}$.

The score of each of the fourteen websites, taking into account the assessment for each of the twelve criteria, is found according to (5):

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$D_1 = V_1^{1k} + V_1^{2k} + V_1^{3k} = \mathbf{0.2449}$

$D_2 = V_2^{1k} + V_2^{2k} + V_2^{3k} = 0.2187$

$D_3 = V_3^{1k} + V_3^{2k} + V_3^{3k} = 0.2145$

$D_4 = V_4^{1k} + V_4^{2k} + V_4^{3k} = 0.2117$

$D_5 = V_5^{1k} + V_5^{2k} + V_5^{3k} = 0.2195$

$D_6 = V_6^{1k} + V_6^{2k} + V_6^{3k} = 0.2189$

$D_7 = V_7^{1k} + V_7^{2k} + V_7^{3k} = 0.2052$

$D_8 = V_8^{1k} + V_8^{2k} + V_8^{3k} = 0.2006$

$D_9 = V_9^{1k} + V_9^{2k} + V_9^{3k} = \mathbf{0.1959}$

$D_{10} = V_{10}^{1k} + V_{10}^{2k} + V_{10}^{3k} = 0.2285$

$D_{11} = V_{11}^{1k} + V_{11}^{2k} + V_{11}^{3k} = 0.2263$

$D_{12} = V_{12}^{1k} + V_{12}^{2k} + V_{12}^{3k} = 0.1983$

$D_{13} = V_{13}^{1k} + V_{13}^{2k} + V_{13}^{3k} = 0.2101$

$D_{14} = V_{14}^{1k} + V_{14}^{2k} + V_{14}^{3k} = 0.2070$Furthermore, the highest value D_r, corresponds to the first level, etc. Thus, in the example shown, the first website was rated the highest, and the ninth website was rated the lowest.

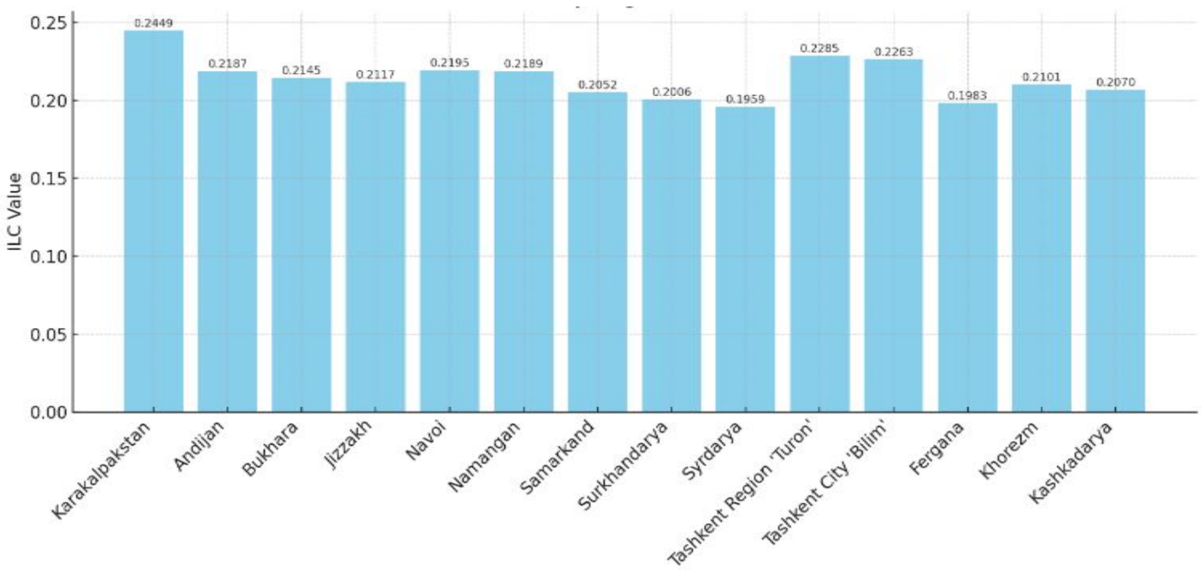

Figure 1. Diagram of evaluation results of regional websites

CONCLUSION

In conclusion, the proposed expert method for multi-criteria evaluation of websites can solve the following problems. In particular, comprehensive evaluation of websites, professional evaluation of websites based on certain standards, and exemplary library websites are of decisive importance in the ranking of websites. Libraries should offer remote services to the user and actively manage his web resources. Libraries should provide remote services that take into account the specific characteristics of different types of users, the development of technology and the availability of search functions. Therefore, library websites require constant evaluation to determine the level of quality and new directions. As part of the research, these results can be used to rank library websites and improve their efficiency. Effective use of modern information technologies, the availability of information resources and their high-quality use ensure the success of any library.

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