

## Evaluating the Speed and Performance of the Websites of Hospitals and Specialty and Super-specialty Clinics of Hamadan University of Medical Sciences by GTmetrix

Heidar Mokhtari<sup>1</sup> , Mohammad Karim Saberi<sup>2</sup> , Mohammad Reza Amiri<sup>3</sup> ,  
Hossein Vakilmofrad<sup>4</sup> , Zahra Moradi<sup>5</sup>

1. Associate Professor, Department of Library and Information Science, Payame Noor University, Tehran, Iran. E-mail: [mokhtariazad@gmail.com](mailto:mokhtariazad@gmail.com)
2. Corresponding author, Associate Professor, Department of Medical Library and Information Sciences, School of Paramedicine, Hamadan University of Medical Sciences, Hamadan, Iran. E-mail: [mohamadsaberi@gmail.com](mailto:mohamadsaberi@gmail.com)
3. Assistant Professor, Department of Medical Library and Information Sciences, School of Paramedicine, Hamadan University of Medical Sciences, Hamadan, Iran. E-mail: [m.r.amirilib@gmail.com](mailto:m.r.amirilib@gmail.com)
4. Associate Professor, Department of Medical Library and Information Sciences, School of Paramedicine, Hamadan University of Medical Sciences, Hamadan, Iran. E-mail: [vakili\\_hn@yahoo.com](mailto:vakili_hn@yahoo.com)
5. MSc student, Department of Medical Library and Information Sciences, School of Paramedicine, Hamadan University of Medical Sciences, Hamadan, Iran. E-mail: [moradi.zahra.114@gmail.com](mailto:moradi.zahra.114@gmail.com)

### Article Info

#### Article type:

Research Article

#### Article history:

Received January 22, 2022

Received in revised form April 25, 2022

Accepted April 28, 2022

Published online June 25, 2022

#### Keywords:

Webometrics, Websites, Hospitals, Clinics, GTmetrix

### ABSTRACT

**Objective:** Medical websites are useful tools for training and informing patients, their families, and the public about diseases, procedures, drugs, and healthy life. Speediness and performance are of main criteria for evaluating these websites. This study aimed to evaluate the speed and performance of the websites of hospitals and specialty and super-specialty clinics of Hamadan University of Medical Science by GTmetrix.

**Materials and Methods:** In this cross-sectional descriptive study, the speed and performance of 15 websites of hospitals and specialty and super-specialty clinics affiliated with the Hamadan University of Medical Science, Hamadan, Iran, were analyzed by using GTmetrix tool and extracting data in its two sections: GTmetrix Grade and Web Vitals. Data were described and analyzed in SPSS and Excel.

**Results:** 14 studied websites (93%) were very weak in page loading speed scores. In performance scores, all websites were rated fewer than 50 percent. The first and last ranks in the structure score belonged to Imam Hasan Mojtaba Hospital and Omid Clinic in common with 55 percent and Besat Hospital with 26 percent, respectively. All studied cases (but Shahid Heidari Hospital of Nahavand) ranked much longer than recommended in their LCPs. All cases were within the good threshold in their TBT scores. The majority of the cases (13 out of 15) are in the CLS threshold of much longer than recommended.

---

**Conclusion:** It is suggested that website designers and ICT administrators in hospitals and medical clinics in Iran, especially ones affiliated with UMSHA, be familiar with website measures such as GTmetrix and train in detecting the defects causing low performance, speed, and structure of websites as well as the procedures for removing them.

---

**Cite this article:** Mokhtari, M., Saberi, M.K., Amiri, M.R., Vakilimofrad, H., & Moradi, Z. (2022). Evaluating the Speed and Performance of the Websites of Hospitals and Specialty and Super-specialty Clinics of Hamadan University of Medical Sciences by GTmetrix. *Informology*, 1(1), 57-66.



© The Author(s).

Publisher: Informology Center.

---

## Introduction

The Net and Web space is converted into the main part of people's daily life. They try to use the Web for accessing information and fulfilling their information needs. All information and service-based organizations tend to remain in this environment for survival (Alipour-Hafezi et al., 2015). Websites are connection points and communication nodes for electronic information on the Net (Mardaninezhad et al., 2013). They are collections of structured data of all types, aiming to present information (Zahedi, 2010). Organizations use websites for training, health, and business. They try to provide one having better communication with their users (Ansari & Khajouei, 2016). With a certain goal, websites have been created for different individual or business goals.

The Net has become one of the most important information resources for patients and their families to search for health information. It is estimated that about 45 percent of web searches worldwide are related to health information embedded in health-related websites (Salarvand et al., 2016).

Hospitals are organizations that use the Web to provide their services (Amiri et al., 2016). Hospital websites provide information on the hospital, its services, and health staff. They are useful tools for training patients, their families, and the public about diseases, procedures, drugs, and healthy lifestyles (Alhuwail et al., 2018). Hospital websites are extensively used by the public and patients for getting information, training and communicating (Bach et al., 2019).

One of the important issues in these websites is the existence of criteria such as loading speed and better performance for attracting users. Immediate access to or expectancy for speedy loading of a webpage is the main criterion for users. A web page with a low downloading speed and high expectancy time for loading makes users unsatisfied (Dastani & Atarodi, 2016). Low-quality websites and ones with low loading speeds prevent users from re-visiting them (Farrahi et al., 2018). One second delay in opening a webpage results in an 11 percent decrease in visitors, a six percent decrease in user satisfaction, and a seven percent decrease in purchases (Deniper, 2021).

Despite high investment in designing and developing health-related websites, their performance has not been heavily considered. Hospital websites need to be analyzed and evaluated by webometric indicators to detect their strengths and weaknesses (Nematollahi et al., 2016). One of the powerful tools for doing this is named GTmetrix.

As a powerful online tool, GTmetrix analyzes a website regarding its loading speed and optimal performance. Its criteria for this evaluation include website optimization power, webpage rating, loading-related files, and Google and Yahoo algorithms. It provides information on the optimization rates of all files, website survey history and so on (Deniper, 2021).

Health-related websites' performance has been evaluated by applying GTmetrix and similar tools. In evaluating hospital websites in hospitals located in Razawi Khorasan province, Iran, it was found that the studied websites were at an inappropriate level (Dastani & Sattari, 2017). Out of 94 active websites of Iranian medical universities, 55 percent were weak or very weak in their downloading speed based on GTmetrix (Dastani & Atarodi, 2016). In evaluating the websites of 18 Iranian medical science universities (type III), it was found that lower than half of the universities considered the main criteria included in the prepared study checklist in designing their websites (Shabankareh et al., 2016).

In evaluating 397 Indian hospital websites by TAW tool, it was revealed that they had low readability due to not being multi-lingual as well as low security due to editable content and consequent low continuous accessibility (Kaur et al., 2017). Evaluating ten websites of Indian universities by GTmetrix showed that 70 percent of them had low or very low performance in their page loading speed (Sreedhar, 2014). Analyzed websites of some selected universities in Bangladesh by Html Toolbox and Webpage Analyzer showed weaknesses in their design, interfaces, and performance and consequent user dissatisfaction (Islam & Tsuji, 2011).

As accessibility and downloading speed are of main features of hospital websites, this exploratory study aimed to evaluate the speed and performance of the websites of hospitals, specialty clinics, and super-specialty clinics under the supervision of Hamadan University of Medical Sciences (UMSHA) by applying GTmetrix.

## **Materials and Methods**

As a cross-sectional description, this study analyzed the speed and performance of all 15 websites of hospitals, specialty clinics, and super-specialty clinics under the supervision of UMSHA by applying GTmetrix. All websites were extracted from UMSHA website ([www.umsha.ac.ir](http://www.umsha.ac.ir)) in March 2022.

GTmetrix, as a free online tool, was used for data analysis. It analyses the speed and performance of the websites at hand. All retrieved URLs of the studied websites were entered

---

into GTmetrx site (<https://gtmetrix.com/>) and needed data was extracted in two sections and six indicators as follows (for more detailed information, see: GTmetrix Performance Blog via: <https://gtmetrix.com/blog/everything-you-need-to-know-about-the-new-gtmetrix-report-powered-by-lighthouse/>).

**GTmetrix Grade:** GTmetrix Grade is an assessment of overall page performance. It reflects, both, how fast the page loaded for users, and how well it is built for performance. It includes three indicators: page loading speed, performance, and structure. The page loading speed is rated based on a six-pointed indicator (ranging from A=very good to F=very weak). The performance score is essentially the page's lighthouse performance score, as captured by GTmetrix tests. The performance score tells how well the page performs from a user's perspective. The structure score tells how well the page is built for optimal performance. These audits and assigned point values are taken to them based on various factors, including, among others, potential savings and importance, as perceived by the GTmetrix team.

**Web vitals:** Web vitals represent a small set of core metrics that indicate whether a webpage is delivering a fast and delightful experience to visitors. Focus on these impactful metrics is needed before undertaking deeper optimizations. These are three main indicators: LCP (Largest Contentful Paint), TBT (Total Blocking Time), and CLS (Cumulative Layout Shift).

LCP measures how long it takes for the largest content element (e.g., a big image or heading text) on the page to become visible within visitors' viewport. Thresholds for LCP are measured by the render time (in seconds) of the largest image or text block visible within the visitor's viewport and ranged from good (1200 milliseconds or less) to much longer than recommended (higher than 2400 milliseconds). TBT tells you how much time is blocked by scripts during the page loading process. TBT measures the total amount of time the webpage was blocked, preventing the user from interacting with the page. Its thresholds range from good (150 milliseconds or less) to much longer than recommended (higher than 350 milliseconds). CLS indicates how much layout shift is experienced by visitors as the page loads. It is important to note that CLS is a score, not timing in milliseconds or seconds. It was conceived as good with CLS of .1 or less and much longer than recommended with CLS of 0.25 or higher. Descriptive statistics were applied for data analysis in SPSS and EXCEL.

## Results

The state of the GTmetrix grades of the studied websites in page loading speed is shown in Table 1. All studied websites are very weak (in F grade), but Shahid Heidari Hospital of Nahavand, which is weak in this regard (in E grade).

**Table 1. The grades of studied websites in page loading speed**

No.	Hospital/Clinic Name	URL	GTmetrix Grade	State
1	Shahid Heidari Hospital of Nahavand	Heidari-hosp.umsha.ac.ir	E	Weak
2	Farshchian Educational-Treatment Center	Fsh.umsha.ac.ir	F	Very weak
3	Be'that Hospital	Besat.umsha.ac.ir	F	Very weak
4	Fatemiyye Hospital	Fth.umsha.ac.ir	F	Very weak
5	Beheshti Hospital	Beheshti.umsha.ac.ir	F	Very weak
6	Emam Khomeini Clinic	Emam clinic.umsha.ac.ir	F	Very weak
7	Omid Specialty and Super-specialty Clinic	Omid.umsha.ac.ir	F	Very weak
8	Ghodduzi Hospital of Nahavand	Ghn.umsha.ac.ir	F	Very weak
9	Emam Reza Hospital of Kabudarahang	Bek.umsha.ac.ir	F	Very weak
10	Mehr Hospital of Malayer	Mehr hosp.umsha.ac.ir	F	Very weak
11	Valia'sr Hospital of Toyserkan	Valiasr.umsha.ac.ir	F	Very weak
12	Ayatollah Bahari Hospital	Bahari.umsha.ac.ir	F	Very weak
13	Farshchian Heart Hospital	Hcvc.umsha.ac.ir	F	Very weak
14	Alimoradiyan Hospital of Nahavand	Alimoradian-hosp.umsha.ac.ir	F	Very weak
15	Emam Hasan Mojtaba Hospital	Beh.umsha.ac.ir	F	Very weak

Table 2 shows the state of studied websites in performance and structure scores. Considering the former, Shahid Heidari Hospital of Nahavand ranked first with 63 percent, followed by Emam Khomeini Clinic with 47 percent. The last rank belonged to Fatemiye Hospital with 34 percent. Considering the structure score, the first and last ranks belonged to Imam Hasan Mojtaba Hospital and Omid Clinic, in common with 55 percent, and Besat Hospital with 26 percent, respectively.

**Table 2. The state of studied websites in performance and structure scores**

No.	URLs	Performance (Rank)	Structure (Rank)
1	Beh.umsha.ac.ir	40% (5)	55% (1)
2	Omid.umsha.ac.ir	44% (3)	55% (1)
3	Mehr-hosp.umsha.ac.ir	37% (8)	48 (2)
4	Fth.umsha.ac.ir	34% (10)	47 (3)
5	Heidari-hosp.umsha.ac.ir	63% (1)	47 (3)
6	Ghn.umsha.ac.ir	40% (5)	45 (4)
7	Alimoradian-hosp.umsha.ac.ir	38 (7)	44 (5)
8	Emam clinic.umsha.ac.ir	47 (2)	40 (6)
9	Beheshti.umsha.ac.ir	37 (8)	40 (7)
10	Fsh.umsha.ac.ir	40 (5)	40 (7)
11	Valiasr.umsha.ac.ir	42 (4)	39 (8)
12	Bek.umsha.ac.ir	37 (7)	38 (9)
13	Bahari.umsha.ac.ir	39 (6)	34 (10)
14	Hcvc.umsha.ac.ir	39 (6)	33 (11)
15	Besat.umsha.ac.ir	35 (9)	26 (12)

Table 3 shows the state of studied websites in LCP scores. The first and last ranks belonged to Shahid Heidari Hospital of Nahavand with 2.3 seconds and Besat Hospital with 10.5 seconds,

respectively. All studied cases (but Shahid Heidari Hospital of Nahavand) ranked much longer than recommended in their LCPs.

**Table 3. The state of studied websites in LCP scores**

Rank	URLs	LCP (in seconds)	LCP thresholds
1	Heidari-hosp.umsha.ac.ir	2.3	Longer than recommended
2	Emam clinic.umsha.ac.ir	2.4	Much longer than recommended
3	Fsh.umsha.ac.ir	4.0	Much longer than recommended
4	Alimoradian-hosp.umsha.ac.ir	4.5	Much longer than recommended
5	Omid.umsha.ac.ir	4.8	Much longer than recommended
6	Fth.umsha.ac.ir	5.7	Much longer than recommended
7	Mehr-hosp.umsha.ac.ir	6.0	Much longer than recommended
7	Valiasr.umsha.ac.ir	6.0	Much longer than recommended
7	Beheshti.umsha.ac.ir	6.0	Much longer than recommended
8	Bek.umsha.ac.ir	6.4	Much longer than recommended
9	Beh.umsha.ac.ir	7.0	Much longer than recommended
10	Hcvc.umsha.ac.ir	7.2	Much longer than recommended
11	Bahari.umsha.ac.ir	8.1	Much longer than recommended
12	Ghn.umsha.ac.ir	8.5	Much longer than recommended
13	Besat.umsha.ac.ir	10.5	Much longer than recommended

Table 4 shows the state of studied websites in TBT scores. Ten websites had TBT of 0 millisecond. All cases were in the good threshold in their TBT score.

**Table 4. The state of studied websites in TBT scores**

No.	URLs	TBT (in milliseconds)	TBT Threshold	Rank
1	Omid.umsha.ac.ir	0	Good - nothing to do here	1
2	Heidari-hosp.umsha.ac.ir	0	Good - nothing to do here	1
3	Emam clinic.umsha.ac.ir	0	Good - nothing to do here	1
4	Bek.umsha.ac.ir	0	Good - nothing to do here	1
5	Ghn.umsha.ac.ir	0	Good - nothing to do here	1
6	Beh.umsha.ac.ir	0	Good - nothing to do here	1
7	Bahari.umsha.ac.ir	0	Good - nothing to do here	1
8	Fth.umsha.ac.ir	0	Good - nothing to do here	1
9	Alimoradian-hosp.umsha.ac.ir	0	Good - nothing to do here	1
10	Valiasr.umsha.ac.ir	0	Good - nothing to do here	1
11	Hcvc.umsha.ac.ir	6	Good - nothing to do here	2
12	Beheshti.umsha.ac.ir	7	Good - nothing to do here	3
13	Besat.umsha.ac.ir	16	Good - nothing to do here	4
14	Mehr-hosp.umsha.ac.ir	26	Good - nothing to do here	5
15	Fsh.umsha.ac.ir	117	Good - nothing to do here	6

The state of studied websites in CLS score is shown in Table 5. The first and last ranks belonged to Emam Reza Hospital of Kabudarahang with .03 and Farshchiyan Heart Hospital with 1.41, respectively. Only, the former hospital is in the good threshold. Most cases (13 out of 15) are in the CLS threshold of much longer than recommended.

**Table 5. The state of studied hospitals and clinics in their CLS score**

No.	URLs	CLS score	CLS Threshold	Rank
1	Bek.umsha.ac.ir	.03	Good - nothing to do here	1
2	Omid.umsha.ac.ir	.11	OK, but consider improvement	2
3	Beheshti.umsha.ac.ir	.27	Much longer than recommended	3
4	Heidari-hosp.umsha.ac.ir	.30	Much longer than recommended	4
5	Bahari.umsha.ac.ir	.33	Much longer than recommended	5
6	Valiasr.umsha.ac.ir	.37	Much longer than recommended	6
7	Ghn.umsha.ac.ir	.42	Much longer than recommended	7
8	Fth.umsha.ac.ir	.45	Much longer than recommended	8
9	Alimoradian-hosp.umsha.ac.ir	.53	Much longer than recommended	9
10	Fsh.umsha.ac.ir	.54	Much longer than recommended	10
11	Emam clinic.umsha.ac.ir	.56	Much longer than recommended	11
12	Besat.umsha.ac.ir	.68	Much longer than recommended	12
13	Mehr-hosp.umsha.ac.ir	.68	Much longer than recommended	12
14	Beh.umsha.ac.ir	.83	Much longer than recommended	13
15	Hcvc.umsha.ac.ir	1.41	Much longer than recommended	14

## Discussion and Conclusion

In this study, the state of the websites of the hospitals and clinics affiliated with the UMSHA was analyzed by GTmetrix tool and its six indicators. All studied websites were weak and very weak in their page loading speed. In studying the state of Iranian medical university websites, in line with this finding, it was found that more than half of the websites (55%) were weak or very weak in this regard (Dastani & Atarodi, 2016).

The studied websites' performance was lower than expected. This is true in their structure, as well. This showed their inappropriate performance and structure. In a related study, the mean rate of structure dimension among hospital websites of Tehran medical universities amounted to 64.5 percent, while the mean rate of their content indicator amounted to >50 percent (Abdekhoda et al., 2016).

LCP scores of the studied websites were all longer and/or much longer than recommended, reflecting their unsatisfactory level. However, the scores of TBT of the studied websites were all at the appropriate (good) level, with 10 ones having TBT of 0ms. The majority of the websites (12 out of 14) were inappropriate (much longer than recommended) in their CLS scores. In total, the websites of the studied hospitals and clinics were weak in achieving GTmetric criteria and need more consideration for development and optimization. Nowadays, hospitals and clinics tend to use the Web and its facilities for providing information and making communication and interactions. They consider the existence of a secure user-friendly environment for their patients and potential users, as well (Serati Shirazi & Goltaji, 2014). Therefore, health-related websites of hospitals and clinics have been ever-increased in recent years. Hospitals have taken long steps in using the Web comparing other industries, and hospital websites have been widely developed. However, they have not fully succeeded in optimizing and standardizing their websites. Health

information and communication specialists in Iran have studied and evaluated hospital websites from different perspectives. They concluded that these websites are inappropriate in their performance and structure and need to be qualitatively and qualitatively improved (Mohammadzadeh et al., 2020; Saberi et al., 2011; Soltani-Nejad et al., 2020).

In conclusion, it is necessary that hospital and clinic administrators consider the optimization of their websites. It is suggested that website designers and ICT administrators in hospitals and medical clinics be familiar with website measures such as GTmetrix and the defects causing low performance, speed, and structure, as well as the procedures for removing them. These all result in the quality and quantitative improvement of the websites and consequently increase user satisfaction in fulfilling their information needs and having continuous communication and interaction with them.

### **Author Contributions**

Conceptualization, All Authors; Methodology, M.K.S. and Z.M.; Formal Analysis, H.M., M.K.S. and Z.M.; Investigation, All Authors; Writing–original draft, H.M., M.K.S. and Z.M.; Writing review & editing, All Authors; Funding acquisition, M.K.S.; Resources, H.M., M.K.S. and Z.M.; Supervision, M.K.S.

### **Data Availability Statement**

Not applicable

### **Acknowledgments**

Not applicable

### **Ethical considerations**

This study has been ethically approved by the Ethics Committee of Hamadan University of Medical Sciences with code number: IR.UMSHA.REC.1400.987

### **Funding**

The study was funded by Vice-chancellor for Research and Technology, Hamadan University of Medical Sciences (No. 1401010948).

### **Conflict of interest**

The authors declare that they have no competing interests.



## References

- Abdekhoda, M., Ghazimirsaeed, S. J., Alibyek, M., & Ershad-Sarabi, R. (2016). Assessment of Hospital Websites of Medical Universities in Tehran, Iran, Based on Information Necessary for Attracting Medical Tourism. *Health Information Management*, 13(2), 102-107. [in Persian]
- Alhuwail, D., AlMeraj, Z., & Boujarwah, F. (2018). Evaluating hospital websites in Kuwait to improve consumer engagement and access to health information: a cross-sectional analytical study. *BMC Medical Informatics and Decision Making*, 18(1), 1-11.
- Alipour-Hafezi, M., Karimi, M., & Tofighi, S. (2015). Hospital portal assessment: Suggested checklist. *Health Information Management*, 12(3), 367-378. [in Persian] [http://him.mui.ac.ir/article\\_11422.html?lang=en](http://him.mui.ac.ir/article_11422.html?lang=en)
- Amiri, M. R., Karami, S., Farhadi, A., Rezaei, N., & Zareian, S. (2016). Evaluation of hospitals' Websites of Hamedan University of Medical Sciences based on webometrics criteria in 2014. *Pajouhan Scientific Journal*, 14(2), 53-61. [in Persian]
- Ansari, R., & Khajouei, R. (2016). Evaluating the Quality of Websites of Research Institutes Affiliated to Iranian Universities of Medical Sciences. *Health Information Management*, 13(5), 320-325. [in Persian]
- Bach, M. P., Seljan, S., Jaković, B., Buljan, A., & Zoroja, J. (2019). Hospital websites: from the information repository to interactive channel. *Procedia computer science*, 164, 64-71.
- Dastani, M., & Atarodi, B. A. (2016). Measuring the Speed and Performance of Websites in All Iranian Universities of Medical Sciences with Gtmetrix Tool. *Caspian Journal of Scientometrics*, 3(1), 7-13. [in Persian]
- Dastani, M., & Sattari, M. (2017). Assessing the Quality of Hospitals' Websites in Khorasan Razavi Province. *Depiction of Health*, 8(1), 50-56. [in Persian]
- Deniper (2021). Ads and Digital Marketing. <https://deniper.com/fa/subnews>
- Farrahi, R., Gilasi, H., Khademi, S., & Chopannejad, S. (2018). Towards a comprehensive quality evaluation model for hospital websites. *Acta Informatica Medica*, 26(4), 274. [in Persian]
- Islam, A., & Tsuji, K. (2011). Evaluation of Usage of University Websites in Bangladesh. *DESIDOC Journal of Library & Information Technology*, 31(6).
- Kaur, A., Dani, D., & Agrawal, G. (2017). Evaluating the accessibility, usability and security of Hospitals websites: An exploratory study. Paper presented at the 2017 7<sup>th</sup> International Conference on Cloud Computing, Data Science & Engineering-Confluence.
- Mardaninezhad, A., Farhadi, I., Khanjani, T., & Amirimoghadam, M. (2013). Evaluating the qualities of virtual websites of the medical science universities. *Strides in Development of Medical Education*, 9(2), 179-190. [in Persian]
- Mohammadzadeh, Z., Saeidnia, H. R., & Ghorbi, A. (2020). Identification and classification of desirable web-based services from the perspective of website users of Iran's Hospitals based on Kano model of customer satisfaction. *Journal of Payavard Salamat*, 14(3), 215-227. [in Persian]
- Nematollahi, M., Fallahnejad, E., Niknam, F., Nadri, K., & Khademian, F. (2016). Evaluation of the structure of websites of educational hospitals of Fars province in 2016. *Journal of Health Management & Information Science*, 3(4), 132-137. [in Persian]
- Saberi, M. K., Isfandyari-Moghaddam, A., & Mohamadesmaeil, S. (2011). Web citations analysis of the JASSS: The first ten years. *Journal of Artificial Societies and Social Simulation*, 14(4), 22.

- Salarvand, S., Sheikh Abumasoudi, R., Kashani, F., Samadbeik, M., & Salarvand, H. (2016). Assessing the necessitate quality indicators of hospitals' websites (A literature review). *Journal of Hospital*, 15(1), 87-100. [in Persian]
- Serati Shirazi, M., & Goltaji, M. (2014). A Webometric Study of the Websites of the World's Top Hospitals. *Librarianship and Information Organization Studies*, 24(2), 160-182. [in Persian]. [http://nastinfo.nlai.ir/article\\_76.html?lang=en](http://nastinfo.nlai.ir/article_76.html?lang=en)
- Shabankareh, K., Tahmasebi, R., & Hamidi, A. (2016). Content and technical evaluation of Type III Iranian medical universities' websites. *Iran South Med J*, 19(2), 267-283. [in Persian]
- Soltani-Nejad, N., Taheri-Azad, F., Zarei-Maram, N., & Saberi, M. K. (2020). Developing a model to identify the antecedents and consequences of user satisfaction with digital libraries. *Aslib Journal of Information Management*, 72(6), 979-997. <https://doi.org/10.1108/AJIM-04-2020-0099>
- Sreedhar, G. (2014). Analyzing Download Time Performance of University Websites in India. *Engineering and Scientific International Journal (ESIJ)*, 1(1), 1-6. [http://irdp.info/journals/j1/volume1/ESIJ\\_5.pdf](http://irdp.info/journals/j1/volume1/ESIJ_5.pdf)
- Zahedi, S. S. (2010). Assessing quality of websites: Instrumentation and criteria. *Journal of Development & Evolution Management*, 1389(4), 5-16. [In Persian]