# Evaluating User Interfaces of Some Digital Libraries Worldwide for Proposing Criteria for User Interface of Digital Library of Payame Noor University

**Saeed Ghaffari**

**Masud Baktiari**



**Abstract**

The purpose of this research is to evaluate user interface in English web pages of selected national digital libraries based on the existent criterias in the resources for proposing a suitable interface for digital library of Payame Noor University. The method of research was according to survey and descriptive methods. A check list included 10 main criterions and 114 minor criterions used to evaluate. The statistical population included digital libraries from different countries include America, Austalia, France, Swiss, Newzeland, Netherland, Poland, Japan, India and Italy. SPSS software and Excel were used to analyse data . The theory and questions were tested by t-testand Friedman-test. The conclusions suggested that 50% of criterions were considered by 50% of libraries. American library was the first one with 70/40% in considering the criteria. France with 62/07% and Swiss with 40/12% were the second and the third one in considering the criteria, respectively. Also interface language with 6/68% used more than the other criterions. User control used with 6/68% used less than the other criterias.

**Keywords**: Digital library, User interface, Evaluation research, Evaluation criteria.

## Introduction

In recent decades, the emergence of new information and communication technologies has had tremendous effects on all aspects of life. These effects have been more impressive in information environments. Libraries, as main information centers have not been far from these effects. The effects of these technologies in libraries have led to the creation of digital libraries. The mission of digital libraries is to provide new resources and services for users, access to appropriate information without time and place restrictions, multi-purpose and multimedia usability, and in order to do this, resources and services need to be provided to users through the World Wide Web (Radfer, 2018). Setting up digital libraries is a sign of paying attention to the needs of users in new dimensions. In order to meet these needs easily and quickly in the digital environment, there is a need to design an environment that allows the interaction between the user and the system to be taken place easily. This environment is called user interface. The user interface is an environment in computer systems, including sites, databases, software, and so on, which creates interaction between the machine and the human user, that is, the transfer of information from the user to the system and vice versa (Yu, 2002). A good user interface makes the database or site attract many users and not lose them during use or in later stages. In fact, a good user interface is the most important factor in the success or failure of an information system (Baker et al., 2002). Alijani and Dehghani (2016) believe that since the user interface has a great mental and objective effect on the user and makes the user able to gain correct knowledge from the databases and use it appropriately, attention should be paid to its features during its design. It is necessary, because a good user interface makes users better identify their path in the database and has a significant impact on their performance. In fact, in the recovery process, the user interface is the only communication bridge that connects the user with information recovery systems.

The more users' needs are considered in the design of digital library pages, the more the user's interaction with the system will be and the goal of obtaining more information resources will be achieved. In fact, the more appropriate criteria are considered in the design of the user interface of digital library pages, the more successful the library is in communicating with

its users. Due to the rapid progress of computer science and new designs in web pages, we see rapid changes in the user interface of these pages. Therefore, designers of digital library pages should continuouslyimprovethe user interfaces of libraries. Therefore, the need for continuous evaluation seems necessary in this field. Nowrozi (2018) introduces one of the levelsof evaluation of digital libraries, the interface level. In fact, at this level,thegoal is to determine to what extent the user interface of the digital library is accessible, searchable, navigateable and supportive.

The effectiveness of the user interface plays an important role in the success of Payam Noor University digital library platform, and the design and quality of a user interface directly affects the retrieval of desired information from it. In this research, an attempt has been made to evaluate the user interface of some digital libraries to achieve a pattern for Payame Noor Digital library.

Libraries of Payam Noor University have a worthy share in the transmission of information and its digital libraries are forced to reconsider their duties and maybe in the future, and their situation should be such that they leave a deep impact on the development and evolution of libraries and information in the country. As a result, they are forced to develop digital libraries to accompany these functions. But creating a suitable digital library for Payam Noor University requires a practical model. Lack of a single standard or model in this field has caused problems for users in using these systems. Considering the importance mentioned in the design of a suitable user interface and the placement of digital libraries of Payam Noor University, the necessity of research in this field is obviouse. In this research, by examining the user interface of digital libraries of selected digital collections that have English web pages and comparing them with the criteria found in texts and sources, the richest library among the studied community has been identified in terms of user interface. so that by using it, an objective model in this field can be provided to the designers of digital libraries

and especially to the designers of the digital library of Payam Noor University.

## Literature Review

Chu and Rosenthal (1996) in a research compared three search engines Alta Vista, Excite and Laikas in terms of search capabilities (Boolean operators, field search and phrase search) and retrieval performance, and finally, it was determined that the search engine Altavista performs better than the other two engines in terms of search ability and retrieval performance.

Zeng and Cheng (2003) evaluated criteria in 20 metaserach engines and made tables in the categories of coverage, display of results, search logic, performance and search control options. Then they compared all the engines based on the tables and finally, after identifying the strengths and weaknesses of the search engines, they came to the conclusion that they introduced Carto and Inforgrid metasearch engines as the chosen ones.

Villar and Zomer (2005) in a research of the user interface of 4 databases, Science Direct, ProQuest Direct, Ebsco Host and Amaraldra, compared and investigated based on the general features of the interface, database selection, manipulation of results and help options. The findings of the research show that due to the commercial nature of all four systems, there is a lot of similarity between the user interface of these databases, but some differences are also observed. In the category of general features, the possibilities of Science Direct and ProQuest Direct are more. In the category of database selection, ProQuest has more facilities and in the category of manipulation of results and help options, Science Direct and ProQuest are the best. Finally, researchers have mentioned that all four sites have quality user interface facilities.

Intezariyan and Fatahi (2008) conducted a research with the aim of analyzing, explaining and identifying the strengths and weaknesses of important elements and features in the interface of information databases of the Regional Science and Technology Information Center and Research Institute of Information and Scientific Documents, The compatibility of the interface environment of the investigated websites with Nielsen's 10 components, the basic problems of the interface environment of these websites and also the difference between the level of understanding of expert and beginner users were measured. The findings showed that the degree of concordance of the interface of the Research Institute's database with Nielsen's 10 components is generally average and that of the Regional Center's database is slightly above the average. Both databases have basic problems in some components of the Nielsen's model.

Faraj Pahlo and Zavarghi (2013) have done a research on 6 Web OPACs of Public Libraries Foundation in terms of display features and user interface. In terms of performance, Pars Azarakhsh won the first place with 98.2 points, then Noosa with 93.6 points, Piam with 89.4 points, Arakel with 77.6 points, Irandoc with 68.2 points, and Ganjineh with 36 points were ranked second to sixth, respectively. In terms of user interface, Pars Azarakhsh, Noosa, Payam, Arakle, IranDoc and lastly Ganjineh were placed.

Mohajeri and Mohammad Salehi (2013) in evaluating the features and constituent elements of Rasa software came to the conclusion that in the design of the user interface of this software according to the ten components of the check list; 64% of the necessary criteria have been observed; Aesthetic field has the highest agreement with 90% and error prevention has the least agreement with 70%.

Nowrozi and Alipourhafezi (2018) by reviewing the texts that have studied the topic of user interface, after specifying the criteria mentioned in various texts (such as navigation, search, design,

guidance, error correction, information display, learning ability , user control, comprehensiveness, language, feedback, simplicity, compatibility with the external environment, personalization, user support, interaction, compatibility, viewing the system status, user background, flexibility) concluded that among these criteria, criteria such as navigation, search, design and guidance are the most important in terms of the frequency of repetition among the studied texts and sources, and criteria such as compatibility, system status observation, user background and flexibility are less important than other criteria.

Monirul et al (2022) with a Data and Information Management they paid. The purpose of the study is to present a model plan for developing an effective digital maintenance system with the help of institutional repository software in university library premises. The researchers investigated the university and university website and found that only 11% university libraries were active in preserving their digital resources while 89% of university libraries were either in the dark or less reluctant to adopt the system. esearchers realized that due to lack of proper guidelines and an ideal model plan, most of the university libraries were far behind in adopting a repository system for safeguarding their intellectual outputs. Hence this study describes a model plan for the university libraries of Bangladesh to create a sustainable preservation system easily and effectively. The model plan in this study was based on observation and review of the literature in the concerned field. All university authorities can follow the mentioned model for sustainable maintenance of their intellectual digital assets.

Funmilola, Omotayo, and AbdulRasaq (2022) The Journal of Academic Librarianship with The Journal of Academic Librarianship they paid. This study, therefore, investigated task-technology fit of digital libraries in three Nigerian Universities and identified factors influencing use of digital library by the students. Survey design guided the study and a questionnaire was used to collect data from 402 students. The study found a high usage of digital library among the

students. A moderate positive correlation and significant relationship was found between the independent variables (task characteristics, technology characteristics, attitude, computer self-efficacy and task-technology fit) and use of digital library. The study validates the TTF model which posits that for an information system to be utilised, it must be a good fit for the tasks it supports.

Mohammad Ismail and Kazemi Kohbanani (2022) with a comparative evaluation of the usability of the websites of the national libraries of the Islamic Republic of Iran, Iraq and Turkey based on 160 components relying on a hypothetical website with 663 points, determined that the website of the Islamic Republic of Iran National Library with 594 points ranked in the first and Turkey ranked second with 485 points and Iraq ranked third with 330 points.



## Research summary

According to the review of the background of the researches carried out in the present research, we found some things. In the research of Intezirian and Fattahi, the degree of concordance of the interface of the research institute's articles database with Nielsen's 10 components is generally average, and in the regional center's articles database, it is slightly more than average. Both databases have basic problems in some components of the Nielsen model. Faraj Pahlo and Zavarghi, who have researched on 6 Web APKs of Public Library Foundation in terms of display features and user interface, and in terms of user interface, Pars Azarakhsh, Noosa, Payam, Erakleh, Iran Doc and lastly Ganjineh were placed. Mohajeri and Mohammad Salehi, in evaluating the features and elements of Rasa software, came to the conclusion that in the design of the user interface of this software, according to the ten components of the checklist, the area of aesthetics had the most agreement with 90%. And Alipour Hafezi, in the review of user interface criteria, criteria such as navigation, search, design and guidance were recognized as the most

important. Similarly, Mohammad Ismail and Kohbani ranked first, Turkey ranked second, and Iraq ranked second in the evaluation of the usability of the website based on 160 components of the National Library. Chu and Rosenthal also showed that Altavista's search capability is superior to other engines and more. Similarly, other researchers introduced Carto and Inforgrid metasearch engines as chosen ones.

## Methodology

**Research questions and hypotheses**:

1. To what extent has each of the criteria and components considered in this research been observed in the user interface of the studied digital libraries?
2. Which one of the studied digital libraries, in total, has observed the general criteria studied in this research more?
3. Which one of the criteria studied in this research is observed more in the studied digital libraries?

And the research hypothesis was:

More than half of the studied digital libraries, in the design of their user interface, have observed the evaluated criteria at a level of more than 50%.

In this study, an attempt has been made to conduct the present research by combining literature review with a descriptive survey, Delphi and evaluative methods. The lliterature review was used to prepare the check list, and after reviewing the researches on the texts and sources, the research of Nowrozi (2008) was selected as the basis and it was adapted for the current research by using other researches. A Delphi panel was used in the research and a descriptive survey method was used to evaluate the libraries. Data collection was done using the direct observation method, in such a way that each component was

evaluated on the desired web page and the desired score was entered. The statistical population of this research was the 10 digital libraries of different countries. The addresses of libraries that have digital libraries or digital resources were extracted. Then, the final list of libraries was selected from the addresses that had English web pages, which were selected after searching in Europe, North and South America, Asia and the Pacific Occean countries for digital libraries. The titles of selected digital libraries are given in table 1. It should be mentioned here that there were some digital libraries where only the first page (home page) was in English or they were in a non-English language, which were excluded from the selected population of this study. In addition to these, it is possible to mention cases such as databases such as dissertations, etc., which were introduced as digital libraries in some cases, and these cases were also excluded from the statistical population. In other words, it can be said that these cases were not consistent with the definition of digital library in the present study.



Table 1. Selected digital libraries, and their Internet addresses

| Name of the library | Internet address |
|---|---|
| National library of Australia (Digital collection) | http://www.nla.gov.au/digicoll/ |
| Ntional library of America (American memory) | http://memory.loc.gov/ammem/index.html |
| National library of France (Digital library) | http://gallica.bnf.fr/?&lang=EN |
| National library of Swiss (Digital collection) | https://www.ehelvetica.nb.admin.ch/pages/main.jsf |
| **National Digital Heritage Archive** (NDHA) | http://ndha-iki.natlib.govt.nz/ndha/pages/Bugs |
| National digital library of Poland | http://www.polona.pl/dlibra?action=ChangeLanguageAction&language=en |
| Naional library of Netherland (The memory of the Netherland) | http://www.geheugenvannederland.nl/?/en/homepage |
| National Diet Library (digital library of Japan) | http://www.ndl.go.jp/en/ |
| Indian national digital library in engineering science and technology | http://paniit.iitd.ac.in/indest/ |
| Italian Digital Library | http://www.iccu.sbn.it/opencms/opencms/en/main/bdi/index.html |

Data about user interfaces is usually done in two ways: users' judgments and researchers' judgments (based on expertise) (Villar, 2005). In judging by users, a group is usually selected who express their opinions about the user interface after the initial training. In judging by researchers, the researcher studies the user interface. The judgments made by researchers can lead to the discovery of errors, improvement of the user interface and providing guidance for conducting similar research and designing similar user interfaces. In this regard, the current research is of the second type, in the sense that the data was collected based on the personal judgment of the researchers. To conduct this research, data collection was done using direct observation method and checklist. In preparing this checklist, many sources and checklists were studied and finally a checklist was selected. After reviewing the researches, Nowrozi research (2008) was selected as the basis and adapted for the current research by using other researches. The desired list was first extracted the most frequent criteria and components after studying the available texts and sources in this field and then using the opinions of experts and finalized it using the Delphi method. Due to the fact that this list was the most complete research in terms of the number of evaluated criteria and the mentioned components in the field of user interface of digital libraries, this model was used for the present research. Also, its validity has been justified by the Delphi method, and as a result, the researcher decided to use the mentioned model in examining the user interface of the digital libraries in question. Validity and reliability of criteria considering that the criteria used in this research are the criteria used in Norouzi's doctoral dissertation (2008), the result of this research is reliable. Also, the validity of the criteria is confirmed using the Delphi panel. In the recent years, this confirmation method has also been used for validity (Tabibi, Melki and Delgoshaei, 2018). The minimum number of panel members to obtain a reliable result depends on the research design. In ideal conditions, even groups of four can perform well. One of the advantages of Delphi is content validity and designing programs with the relative support of participants (Ahmadi, Nasiriani & Abazari, 2017).

Descriptive statistical methods have been used to analyze the data of this research. Data was also analyzed using SPSS and Excel software. The basis of the analysis was prepared list information, which scores are based on yes (1) and no (0). Also, due to the quality of some of the sub-components, it was possible that the studied libraries did not comply with them equally, or in other words, absolute presence or absence could not be applied to them. Regarding these components, in addition to the two levels, i.e. zero and one, a score of 50% equivalent to the average has also been used. The score obtained by each of the studied libraries in relation to each of the components is multiplied by the average coefficients obtained (weighted average) by the components from the Delphi panel. It should be noted that the weighted average of each of the components is given in the relevant tables in front of the sub-components related to each of the ten criteria.

**Findings**

Table 2 shows the status of studied libraries regarding the sub-components and criteria of digital library user interface. The results of the search criterion showed that the French library has a better situation than other libraries with 126.43 points (84.89%) in this criterion, then the Australian libraries are in the second and third places with 78.63% compliance with the criteria. The Italian library scored 9.49 points (6.36%) compared to other libraries. Indian libraries are ranked ahead of India with 41 points (27.48%). Among the 10 libraries examined, 9 libraries have met more than 50% of the search criteria (more than 50% of libraries). Also, among the components related to the search criteria, the degree of compliance with the components of "simple search capability" and then "natural search capability" and "phrase search capability" has been higher than other components, which shows the necessity of these components in library user interface design. The components of "proximity search capability", "suggest related keywords" and "marking of search results" have received less attention than all the components. These components are specialized components in the field of digital libraries, and their absence is a sign of the weakness of library user interface design in terms of search criteria. The "suggest related keywords" component is effective in reducing the user's memory load and saving time.

Table 2. Search criteria components in studied libraries

| Row | Search criteria components | Country | | | | | | | | | | weighted average |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Italy | India | Japan | Poland | Netherlands | New Zealand | Switzerland | France | America | Australia | |
| **1** | Simple search capability | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 9/49 |
| **2** | Advanced search capability | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 10/0 |
| **3** | Ability to search poly | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 1 | 8/89 |
| **4** | Proximity search capability | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 7/95 |
| **5** | Phrase search capability | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 9/0 |
| **6** | Ability to search images | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 1 | 6/55 |
| **7** | Natural search capability | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 8/29 |
| **8** | Field search capability | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 8/49 |
| **9** | The ability to shorten search terms | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 8/02 |
| **10** | The ability to limit the search | 0 | 0 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 8/55 |
| **11** | Ability to suggest related keywords | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6/69 |
| **12** | Ability to rank search results | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 8/75 |
| **13** | Ability to bookmark search results | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 7/95 |

Continue table number 2:

| Country | |
|---|---|

| Row | Search criteria components | Italy | India | Japan | Poland | Netherlands | New Zealand | Switzerland | France | America | Australia | weighted average |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 14 | Ability to save search results | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 1 | 8/39 |
| 15 | Ability to send search results | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 7/69 |
| 16 | Possibility of establishing a link from search results to related information | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 8/8 |
| 17 | Ability to search results | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 1 | 7/95 |
| 18 | Ability to change the search language | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 8/75 |
| Sum of points | | 9/49 | 41/02 | 78/6 | 96/29 | 101/77 | 69/63 | 74/0 | 126/73 | 99/09 | 117/39 | 149/5 |
| % of points | | 6/36 | 27/48 | 58/56 | 64/50 | 68 | 46/65 | 63/51 | 84/89 | 66/37 | 78/63 | 100 |



As Table 3 shows, the total number of points related to the ten criteria examined in this research is 923/97 points. Among the 10 libraries examined, 6 libraries have managed to get more than 50% points. Digital Library of America with 99/09 points (66/37%), France with 126/73 points (84/89%) and Switzerland with 74/0 points (63/51%) are in the first three positions, respectively. The digital library of Italy is in the last place with 9/49 points (6/36%).

Table 3: The total scores of the studied digital libraries from the general criteria

| | Italy | India | Japan | Poland | Netherlands | New Zealand | Switzerland | France | America | Australia | Total score for each criterion |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Search criteria | 9/49 | 41/02 | 87/6 | 96/29 | 101/7 | 69/63 | 94/10 | 126/73 | 99/09 | 117/39 | **149/5** |
| Search criteria | 59/15 | 63/35 | 56/8 | 56/8 | 48/4 | 56/8 | 56/8 | 56/8 | 56/8 | 56/8 | **63/35** |
| guidance | 8/09 | 50/35 | 50/35 | 8/75 | 33/95 | 72/78 | 56/75 | 75/68 | 93/14 | 41/66 | **116/21** |
| Information display standard | 39/31 | 17/59 | 40/66 | 17/59 | 42/73 | 64/45 | 48/73 | 54/66 | 34/09 | 78/87 | **94/66** |
| Page design criteria | ۹۴/۳۵ | ۱۲/۲۵۱ | ۱۳/۶۱۶ | ۱۲/۸۸۳ | ۱۲/۳۶۴ | ۱۲/۲۵۱ | ۱۳۶/۵ | ۱۳۲/۰۳ | ۱۳/۳۶۴ | ۹۶/۹۶ | **۱۶۲/۹۶** |
| Leadership standard | ۷۹/۷۸ | ۶۵/۱۶ | ۸۶/۵۰ | ۷۵/۸۳ | ۶۴/۶۵ | ۶۹/۳۶ | ۱۱/۸۷۲ | ۱۰۲/۳۱ | ۹۳/۴ | ۸۵/۹۷ | **۱۵۱/۶۴** |
| User control criterion | ۰ | ۰ | ۰ | ۴/۴ | ۰ | ۱۷/۳۵ | ۰ | ۱۷/۳۵ | ۸/۶ | ۰ | **۵۶/۰۸** |
| Standard user interface language | ۲۹/۹۹ | ۳۴/۲۵ | ۳۴/۲۵ | ۳۴/۲۵ | ۳۴/۲۵ | ۳۴/۲۵ | ۳۴/۲۵ | ۳۴/۲۵ | ۳۴/۲۵ | ۳۴/۲۵ | **۳۴/۲۵** |
| Error correction standard | ۰ | ۳۱/۵۹ | ۲۲/۶ | ۰ | ۲۲/۶ | ۰ | ۳۸/۱۱ | ۲۹/۷۹ | ۴۷/۴۵ | ۳۶/۷۷ | **۴۵/۶۵** |
| Simplicity criterion | ۴۱/۹۵ | ۵۰/۰۵ | ۴۱/۶۵ | ۳۳/۵۵ | ۴۱/۶۵ | ۴۵/۹۵ | ۵۰/۰۵ | ۴۱/۶۵ | ۵۰/۰۵ | ۵۰/۰۵ | **۵۰/۰۵** |
| Total points of all criteria | ۳۶/۵۰۶ | ۴۷/۴۵۴ | ۵۵۶/۵ | ۴۴/۱۰۶ | ۵۱/۵۹۳ | ۵۵/۴۶۱ | ۵۶/۰۷۹ | ۵۷۳/۵۶ | ۵۹/۶۸۸ | ۵۶۰/۳۸ | **۹۲۳/۹۹** |
| % points | ۴۰/۱۴ | ۵۱/۳۷ | ۶۰/۲۳ | ۴۸/۳۷ | ۵۵/۵۴ | ۵۹/۷۰ | ۶۱/۵۹ | ۶۲/۰۹ | ۷۰/۴۲ | ۶۰/۶۷ | ۱۰۰ |

A suitable test was determined to rank the libraries of the countriesunder study in accordance with the criteria. Table 4 shows the results of the ranking of the countries based on Friedman's test. The Digital Library of Americawith an average rank of 9.01, France with an average rank of 9.00 and Switzerland with an average rank of 8.81 are in the first to third ranks, respectively. The digital library of Italy with 41.6 is one of the three libraries at the bottom of the table.

Table 4. Ranking of countries based on Friedman's test

| Digital libraries | Average rating |
|---|---|
| America | 9/.1 |
| France | 9/00 |
| Switzerland | 8/81 |
| Australia | 8/86 |
| Japan | 8/21 |
| New Zealand | 7/79 |
| Netherlands | 7/96 |
| India | 7/81 |
| Poland | 7/27 |
| Italy | 6/41 |

As can be seen in Table 4, there is a significant difference between the standards in the digital libraries of the countries. Also, the validity of thetest based on the Friedman test is 0.000, which means it is less than 0.5. Therefore, it can be said that the ranking of these factors is different, that is, countries are different in terms of meeting the criteria.

As Table 5 shows, after calculating the average of each criterion, the percentage of points obtained for each criterion has been calculated. The total score of the criteria is 1195.54. From the obtained information, it is clear that among the ten criteria, the user interface language criterion has the highest level of compliance among the criteria by obtaining 98.35% of the criteria's points. Another criterion that is in the next position is the criterion of simplicity. Compliance with the components of this standardalso seems necessary in terms of facilitating the user's communication with the desired library.

Table 5. Total scores of the examined criteria in digital libraries

| Digital library | Simplicity | Error correction | Interface language | Control | management | Page design | Show information | guidance | Cohesion criterion | search criteria |
|---|---|---|---|---|---|---|---|---|---|---|
| Australia | ۵۰/۰۵ | ۳۶/۷۷ | ۳۴/۲۶ | ۰ | ۸۵/۹۷ | ۹۶/۹۶ | ۷۸/۸۷ | ۵۸/۱۵ | ۵۶/۸ | ۱۱۷/۳۹ |
| America | ۵۰/۰۵ | ۴۷/۴۵ | ۳۴/۲۵ | ۸/۶ | ۹۳/۴ | ۱۳۴/۳۶ | ۳۴/۰۹ | ۹۳/۱۴ | ۵۶/۸ | ۹۹/۰۹ |
| France | ۴۱/۶۵ | ۲۹/۷۹ | ۳۴/۲۶ | ۱۷/۳۵ | ۱۰۲/۳۱ | ۱۳۲/۰۳ | ۵۴/۶۶ | ۷۵/۶۸ | ۵۶/۸ | ۱۲۶/۸۳ |
| Switzerland | ۵۰/۰۵ | ۳۸/۱۱ | ۳۴/۲۶ | ۰ | ۱۱۲/۷۷ | ۱۳۶/۵ | ۴۸۸۳ | ۵۶/۷۵ | ۵۶/۸ | ۹۴/۱۰ |
| New Zealand | ۴۵/۹۵ | ۰ | ۳۴/۲۶ | ۱۷/۳۵ | ۶۹/۳۶ | ۱۲۱/۲۵ | ۶۴/۴۵ | ۷۲/۸۸ | ۴۰/۱۵ | ۶۹/۶۳ |
| Netherlands | ۴۱/۶۵ | ۲۲/۶ | ۳۴/۲۶ | ۰ | ۶۴/۶۵ | ۱۲۴/۳۶ | ۴۲/۸۳ | ۳۳/۹۵ | ۴۸/۴ | ۱۰۱/۷ |
| Poland | ۳۳/۵۵ | ۰ | ۳۴/۲۶ | ۴/۴ | ۷۵/۸۳ | ۱۲۳/۸۸ | ۱۷/۵۹ | ۸/۷۵ | ۵۶/۸ | ۹۶/۲۹ |
| Japan | ۴۱/۶۵ | ۲۲/۶ | ۳۴/۲۶ | ۰ | ۸۶/۵۰ | ۱۳۶/۶۱ | ۴۰/۶۶ | ۵۰/۳۵ | ۵۶/۸ | ۸۷/۶ |
| India | ۵۰/۰۵ | ۳۱/۵۹ | ۳۴/۲۶ | ۰ | ۶۵/۱۶ | ۱۲۱/۲۵ | ۱۷/۵۹ | ۵۰/۳۵ | ۶۳/۳۵ | ۴۱/۰۲ |
| Italy | ۴۱/۹۵ | ۰ | ۲۹/۹۹ | ۰ | ۷۹/۷۸ | ۹۴/۳۵ | ۳۹/۳۱ | ۸/۰۹ | ۵۹/۱۵ | ۹/۴۹ |
| Standard score | ۵۰/۰۵ | ۴۵/۶۵ | ۳۴/۲۶ | ۵۶/۰۸ | ۱۵۱/۶۳ | ۱۶۲/۹۶ | ۹۴/۶۶ | ۱۱۶/۲۱ | ۶۳/۳۵ | ۱۴۹/۵ |
| Total points | ۶۸۴/۰۷ | ۳۸۶/۱۰ | ۵۰۵/۰۸ | ۵۶/۲۱ | ۱۰۲۷/۱۱ | ۱۸۰۷/۱۱ | ۶۰۰/۲۰ | ۶۶۹/۱۶ | ۸۳۳/۴۱ | ۱۱۹۵/۵۴ |
| average score | ۴۵/۶۲ | ۲۵/۷۸ | ۳۳/۶۹ | ۳/۷۷ | ۸۵/۶۱ | ۱۲۰/۵۴ | ۴۰/۰۳ | ۴۴/۶۲ | ۵۵/۶۰ | ۷۹/۷۲ |
| The percentage of points earned | ۹۱/۱۷ | ۵۴/۵۸ | ۹۸/۳۵ | ۶/۷۰ | ۵۶/۴۷ | ۷۲/۹۹ | ۴۳/۲۹ | ۳۸/۴۱ | ۸۷/۷۸ | ۵۳/۴۰ |

Research hypothesis was thar more than half of the studied digital libraries, in the design of their user interface, have observed the evaluated criteria at a level of more than 50%. In order to test this hypothesis, t-test

was used. According to Table 6, it can be seen that the value of the test statistic is equal to 2.34 and it is more than 1.66, which means that the null hypothesis of the above statistic is not accepted. Therefore, it can be said with 95% certainty that more than half of the studied national digital libraries, in designing their user interface, have followed the evaluated criteria at a level of more than 50%, so the assumption is confirmed

Table 6. Test statistic values for testing the hypothesis

| Critical value | t-statistic value | Average | Number of observations (components) |
|---|---|---|---|
| 1/66 | 2/34 | ·/59 | 114 |



## Discussion and Conclusion

It can be said that more than half of the studied digital libraries, in designing their user interface, have followed the evaluated criteria at a level of more than 50%. As mentioned earlier, the general standards followed by these libraries have made the scores of these libraries acceptable in complying with these components and increasing the compliance of the components by most of the libraries. Digital libraries should be able to improve and speed up information access methods. The existence of various components of search functionality facilitates this possibility. The presence of various search capabilities is effective in more user interaction. The interaction steps should be in such a way that the loading of the memory is low and short.

Due to the fact that the information society is developing rapidly, the time validity of information may also change rapidly, so it is necessary to mention the date of updating on the pages of digital libraries. The non-activation of library links is another reason for the library not being up-to-date. Therefore, it is recommended to include the update date on all pages.

The characteristics of digital libraries are the expansion of self-service, so proper guidance of the library helps in this goal. Another feature of digital libraries is the elimination of human factors. As a result, it is necessary to have options to ask the librarian. The digital library should be able to provide appropriate guidance to users to enable them to obtain the information they need in desired formats.

Using the right combination of colors, fonts, shading options to distinguish them from nearby options, using clear images and symbols,

etc., all affect the user's understanding of the system, which is relatively well observed in the studied libraries. has been But some options require more attention.

Determining mandatory information entry fields allows the user to easily get the desired results, which, based on the findings of this research, has not been observed by any of the libraries. The use of graphics, sound and images is effective on the user's understanding and makes the environment more enjoyable.

Personalization, due to the fact that it identifies the user's needs and successfully solves them, establishes a satisfying relationship between the user and the system, therefore, it should be considered in the design of digital libraries. Users of a computer information system may be different in terms of physical and cognitive abilities, personality traits and cultural factors.

The characteristics of digital libraries are the expansion of self-service, so proper guidance of the library helps in this goal. Another feature of digital libraries is the elimination of human factors. As a result, it is necessary to have options to ask the librarian. The digital library should be able to provide appropriate guidance to users to enable them to obtain the information they need in desired formats.

Using the right combination of colors, fonts, shading options to distinguish them from nearby options, using clear images and symbols, etc., all affect the user's understanding of the system, which is relatively well observed in the studied libraries. has been But some options require more attention.

Determining mandatory information entry fields allows the user to easily get the desired results, which, based on the findings of this research, has not been observed by any of the libraries. The use of graphics, sound and images is effective on the user's understanding and makes the environment more enjoyable.

Personalization, due to the fact that it identifies the user's needs and successfully solves them, establishes a satisfying relationship between the user and the system, therefore, it should be considered in the design of digital libraries. Users of a computer information system may be different in terms of physical and cognitive abilities, personality characteristics and cultural factors, and these differences should be considered in the design of user interface elements and features so that different groups of users are satisfied with the computer system.

Error correction criteria, although they are important for the interaction of the user with the system and reducing the user's error during work, very little has been considered in the design of the interface in the studied libraries. The method of writing, notification

and design of error messages should be taken into consideration in order to attract the user's attention due to the elimination of human factors. However, by looking at the observed components, it is clear that most of the libraries have been successful in complying with the general criteria and most of the points obtained are related to the compliance of the general criteria that are considered in the web pages and special attention is paid to Criteria that do not include the scope of digital libraries according to the definitions As seen in the findings, the standard of interface language had the highest level of compliance. One of the reasons for observing the components of this standard in all libraries could be the fact that the language of these countries is not English, and for this reason, for the convenience and interaction of the user, it has been tried to observe the writing notes related to the pages. Also, observing the writing points and brevity of the sentences is one of the important and main categories in the design of web pages.

In sumamry, As far as the first question was concerned, the extent each of the criteria and components considered in this research were observed in the user interface of the studied digital libraries, the results are in agreement with the study by Villar and Zomer (2005) who investigated the user interface of four databases, Science Direct, ProQuest Direct, Ebsco Host and Amaraldra, where they compared and investigated based on the general features of the interface, database selection, manipulation of results and help options. Furthermore, the results are in line with Alijani and Dehghani (2016) who stated that that the user interface has a great mental and objective effect on the user and makes the user able to gain correct knowledge from the databases and use it appropriately.

Regarding the second question that examined which of the studied digital libraries observed the general criteria studied in this research more, we found that most of the libraries have been successful in complying with the general criteria and most of the points obtained are related to the compliance of the general criteria that are considered in the web pages and special attention is paid to Criteria that do not include the scope of digital libraries according to the definitions. The findings are consistent with Nowrozi and Alipourhafezi (2018) who reviewed the texts that have studied the topic of user interface, after specifying the criteria mentioned in various texts. Therefore, that criteria such as navigation, search, design and guidance are the most important in terms of the frequency of repetition among the studied texts and sources, and criteria such as compatibility, system status observation, user background and flexibility are less important than other criteria.

The third research question asked which one of the criteria studied in this research was observed more in the studied digital libraries. The results showed that 50% of criterions were considered by 50% of libraries. American library was the first one with 70/40% in considering the criteria. France with 62/07% and Swiss with 40/12% were the second and the third one in considering the criteria, respectively. Similar studies in Iranian context was done by Faraj Pahlo and Zavarghi (2013).

In reviewing the results of this research with the background of the research, it showed that the results of this research are consistent with the researches of Intezirian and Fatahi (2008), Faraj Pahlo and Zavarghi (2013) in the study of the library user interface and user interface features. Also, according to the research of Nowrozi and Alipour Hafti (2018), Mohammad Ismail and Kazemi Kehbani (2022), Chu and Rosenthal (1996), search capability and user interface criteria are in the same direction. As a result, the results of the background check are consistent with the results of the present study.

**Suggestions**

A successful digital library for Payame Noor University is a library that despite the complexity of its system, can provide information to users simply and with as little time as possible. Also, by providing various options and facilities considered in this study, it will make the user unnecessary to go to the physical library and provide maximum information for her/his needs. Therefore, based on the findings of the research, suggestions are made to improve the user interface of digital libraries planned for Payame Noor University:

1. Using artificial intelligence in libraries to improve the digital library as much as possible
2. In addition to observing the general components of the search, it seems necessary to observe the specific components such as proximity search, related keyword suggestions, search results marking, in order to save the user's time.
3. Information display criteria should be given more attention in order to make system information accessible.
4. Reducing the time spent by the user and attracting and maintaining the user need attention. Users expect the elements on the first page to be important, so the presence of a site map, and access to pages with many visitors, are among the necessities.

5. In the design of the user interface, in addition to the criteria that are considered in the design of public websites, special criteria should be given special attention.

**References**


Ahmadi, Fazallah, Nasiriani, Khadijah, Abzari, Parvaneh, Delphi technique:a tool in research, education in medical sciences, (2017), Vol. 175:8-185.

Alijani, Rahim; Dehghani, Leila, Comparison of the user interface of international book databases, Book Quarterly, (2016), No. 233:72.

Baecker, R. M... [et al]. A historicalintellectual perspective, ReadinginHuman Computer Interaction: Toward the Year 2002. (2002), San Francisco, Margan Kaufman,46:115.

Chu, Heting; Rosental, Marilyn, Search engines for the World WideWeb: comparative study and evaluationmethodology, 1996. [on-line]. available:http://www.asis.org/annual-6/ElectronicJan. (2000).

Faraj Pahlo, Abdul Hossein; Zavaraghi, Rasoul, Evaluation of web apks of Iran Foundation in terms of display features and user interface, educational and psychological studies of Ferdowsi University of Mashhad, (2013), p. 82.

Funmilola O. Omotayo, AbdulRasaq Haliru(2022) The Journal of Academic Librarianship. journal homepage: www.elsevier.com/locate/jacalib

Funmilola O. Omotayo, AbdulRasaq Haliru(2022) The Journal of Academic Librarianship. journal homepage: www.elsevier.com/locate/jacalib

Intezariyan, Nahid; Fatahi, Rahmatullah, Investigation of users' understanding of the interface environment of information databasesbased on the Nielsen model (Comparison of the electronic articles database of the Regional Science and Technology Information Center with the articles database of the Research Institute of Information and Scientific Documents of Iran, Library and Information, (2008) ), third period, Sh. 47:114.

Mohajeri, Fatima; Mohammad Salehi, Rahela, evaluation of features and constituent elements of Rasa: comprehensive software of library, document and archive center based on user interface factor, (2013), second year: 75.

Mohammad Ismail, Siddiqa, 160 components in the comparative evaluation of the usability of the websites of the national libraries of the countries of the Islamic Republic of Iran, Iraq and Turkey, Science, (2022), vol. 91:11-115.

Monirul Islam, Nurul Islam, Nasir Uddin Munshi, Mohammad Sohail Haider,(2022)Data and Information Management. journal homepage: www.journals.elsevier.com/data-and-information-management.

Norouzi, Yacoub; Alipour Hafizi, Mehdi, Digital Libraries, Book Quarterly, (2018): Sh. 85:4.

--------, Evaluation of the user interface in the Persian web pages of Iran's digital libraries and the presentation of a proposed model, doctoral dissertation in librarianship and information, Islamic Azad University,Science and Research Branch, Tehran, 2018.

¬¬¬¬¬¬---------, The development of digital libraries, the book of Mah Kaliat, (2008), August and September: 120.

Radfar, Hamidreza, introduction of the famous libraries of the world, Book Mah Kaliat, (2018), No. 123:54.

Vilar, Polona; Zumer, Maja. Comparison and evaluation of user interfaces of e-journals. Journal of Documentation,(2005), vol.61, No.2 :227

Yu, Li-chuan; Lin, Iswng-yuan, What should we consider for user interface design?, ( 2002)

Zhang,J.;Cheung,C,Metasearchengines feature analysis,(2003), online Information Review, Vol. 27, No. 6:433.