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Effective characteristics on designing the information system of medicinal plants from users' perspective

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Abstract:

BACKGROUND: Designing information systems will increase the efficiency and effectiveness of the system according to the information needs of the stakeholders. The present study examined the effective features of designing the information system of medicinal plants from the perspective of its users as a prerequisite for the design of this system.

MATERIALS AND METHODS: This applied research was carried out using survey method and a researcher-made questionnaire. The study population consisted of two groups of information users (faculty members, students, and researchers of medicinal plants) and information disseminators (librarians), and 308 individuals were selected by cluster sampling from five universities. Data analysis was performed using descriptive and inferential statistics using SPSS software version 22.

RESULTS: The results showed that in view of the two groups of users, there was a significant difference in the search options in the database of medicinal plants and the displaying characteristics of the search results. On an average, the rank of the two groups in these two domains was largely different. In other cases, the users considered shared features for capabilities and facilities in an information system of medicinal plants.

CONCLUSION: According to the results, for obtaining the information system of medicinal herbs with better capabilities and facilities, it is essential for designers to pay attention to all elements and objections in the interaction of the human and the system, especially in the field of search.

Keywords:

Characteristics, information system, medicinal plants, users

Introduction

For years, plant scientists have been describing, naming, and classifying the life of plants on the Earth. A huge amount of information relies on the morphological complexity, distribution, and other aspects of their biology.[1] Researchers need to achieve a large and varied amount of information sources of medicinal plants in order to carry out scientific research.[2] Most of this information has been published since the early 17th century in the *Flora Leaflet* that lists the scientific data of plants in specific geographic regions with information about them.[3] In recent years, information and communications technologies have made available extensive domain of new information tools; information systems are one of the most widely used, and the usage of information systems to store and retrieve this information has extremely increased.[4] The Uttarakhand Medicinal Plants Database (UMPDB) Medical Information System: The UMPDB and the TCMSP: A database of systems of pharmacology for drug discovery from

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herbal medicines is an example of these systems that provides a list of medicinal herbs that facilitates the sharing of scientific information.[5,6] A herbal medicine information system can play a critical role in making information available to researchers. In this regard, the information system of medicinal herbs is expected to be designed in such a way that it is based on the needs of the users, and users can interact well with the system and desirably access their information.[7,8] Research has shown that the design of the information system is generally under the umbrella of a topic called human–computer interaction, which appears in various texts. The accessibility and applicability of information systems are largely dependent on the characteristics, capabilities, and limitations of the information system. The features of the modern interactive information systems that utilize human needs can be more flexible for the user, creating a more natural interface and broader computer paradigms.[9] Research results from Jordan *et al*. showed that search and navigation criteria include variations in search practices, display of search results, ordering presentation of information, simple design without ambiguity and complexity, and accessibility at any time and place, which are features of the design of information system for medicinal plants.[10] Yanuar *et al*. found that, in designing information of medicinal plants in Indonesia, in the view of users, structural and technical characteristics of the system, the compliance of the system with regard to the ability to display information based on the needs of users, input criteria, and processing and output were of high importance.[11] Other researches have discussed information categorization and ordering, information displays as full text, information coverage, information validity, and accuracy of information, being up to date, navigation, accessibility, and user-friendliness.[12,13] Regarding the assessment of the information system of medicinal plants, the results showed that the designers' negligence with regard to the features of the system in accordance with the needs of users in the field of applicability (language diversity, presentation of various forms of information, the variety of search and browsing facilities, the way of displaying different information levels, information validity, accuracy of information, user interface simplicity, presence of useful links, etc.), availability, general and specialized guidelines (the use of different names and titles and user preference settings), and providing user-friendly training (perceivability of information, software flexibility, content comprehensibility, etc.) has made the access to the information problematic for users.[14-17]

The problem of access to information sources of medicinal plants has always existed for Iranian researchers. Iran with more than 7500 plant species has been introduced as the source and origin of many medicinal plants. The cultivation of this kind of medicinal plants in the country is expanding, which requires a lot of research and studies. Educational centers and many research institutes are engaged in training and research in the field of medicinal plants. It is impossible to equip all these centers and institutions with all kinds of information sources of medicinal plants. In addition, information on medicinal plants in many countries exists in different languages, forms, and levels of information, and these factors make bibliographic control of medicinal plant textbooks problematic. Medical plant researchers should also be aware of the advancement of knowledge in their field of work in order to benefit from others' repeated researches and research interests. Hence, the need to consider the design of the information system of medicinal herbs by designers and also elements and features in the design of the system should be considered, and these elements and characteristics should be designed in a way to meet the needs of users in using the system.[17,18]

The history of research on information needs in Iran is not long and is limited to one or two recent decades, and accordingly, the history of research of the information needs to design or assess an information system (feature review) is less than this. However, doing cognitive researches will allow information systems to be designed to fit the needs of users. There are essentially three approaches to studying needs that include problem analysis; analyzing information behavior; and asking potential users about their needs.[19] In this research, asking potential users about their needs has been selected. Hence, designers have a clearer picture of what they are planning to design, and designing the system is done based on the needs and priorities of the users to provide the most applicability for users.

Materials and Methods

This was an applied quantitative research, and the statistical population consisted of two groups of information users including: faculty members, students, and researchers of medicinal plants and disseminators of information including librarians. To collect quantitative data as multistage clustering, the following steps were performed:

1. In the first phase, the entire provinces of the country were clustered into five clusters, namely northern, southern, eastern, western, and central provinces
2. In the second phase, the provincial centers were excluded from each cluster and clustered
3. In the third stage, students of universities under the supervision of the Ministry of Science "except for the message of light, science-applied and nonprofit" were randomly selected from the center of five provinces of the country.

Samples were selected from faculty members and masters' degree and Ph.D students in the field of

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horticulture and medicinal plants, herbal medicine specialists, and librarians at the universities under the supervision of the Ministry of Sciences (except Payame-Nur, scientific-applied, and nongovernmental universities). The sample size was calculated as 308 using the Morgan table with a sampling error of 0.05 and a confidence level of 0.95. The selected sample consisted of 256 from information consumer and producer groups and 52 from the information organizer and disseminator group from Tehran University, Ferdowsi University of Mashhad, Isfahan University, Tabriz University, and Bahonar University of Kerman.

The present study was approved by the Research Council of Hormozgan University of Medical Sciences with the code of 970230 and also Research Ethics Committee of this university with the code of IR.HUMS.REC.1398.017. Prior to data collection, research ethics such as informed consent, keeping anonymity, confidentiality, and participant's authority to leave the research were also considered.

A researcher-made questionnaire was used to collect data. The questionnaire was designed according to the research objectives, literature review, experience of experts in the field of information system design, and medicinal plants. The questionnaire comprised of seventy questions in six domains and a Likert's five-item scale (very important, important, moderate, less important, and not important). In order to ensure content validity, after setting up the questionnaire and before handing out, the questionnaire was sent to ten experts in the field of medicinal herbs and database designers, and the validity was calculated as 0.81 using the content validity ratio (CVR) method. The reliability of the questionnaire was calculated to be 0.94 using Cronbach's alpha coefficient. This questionnaire evaluated the features of medicinal plant information system in the following six areas: general information system features (8 questions), information system technical features (19 questions), search options of medicinal plant database (10 questions), search options in the database of information resources (12 questions), search tools (6 questions), and displaying search results (10 questions).

According to the CVR decision table, the minimum validity value for ten specialists is 0.62%, which is greater than the calculated value for the questionnaire, so it has the necessary validity.[20]

$$CVR = \frac{n_E - \frac{N}{2}}{\frac{N}{2}}$$

After confirmation, the questionnaire was handed out to the study participants. Data were then entered into SPSS software (version. 22); at the level of descriptive statistics, indices such as mean, standard deviation, minimum, and maximum, and at the level of inferential statistics, Friedman test for ranking items in each dimension of the questionnaire and Mann–Whitney test were used to compare the views of people in two consumer and disseminator groups, and the significance level in all analyses was considered <0.05.

Results

To design, the features of the information system of medicinal herbs in six areas including the general characteristics of the information system, the technical characteristics of the information system, the search options in the medicinal plant database, search options in the information database, search tools, and displaying of search results were evaluated. This section provides and analyzes the collected data.

According to Table 1, from the viewpoint of both groups of information users (professors, students, and researchers in the field of medicinal herbs) and information disseminators (librarians) providing information in Persian, the existence of electronic information, displaying information in full text, and access to the information system of medicinal plants are among the top four priorities of users at any time and place. In addition, the information was only displayed bibliographically, and providing information in English was at the end of the user rankings.

From the perspective of both user groups, possibility to search, browse, supporting full text, and link to research centers' websites are the most important technical features of the system. In addition, possibility to communicate with the site builder was in the last priority. The possibility to use the thesaurus and to communicate with the librarian was more important for the disseminator user group. For both groups, accessories were of lesser priority [Table2].

Based on Table 3, searching through the scientific name and browsing through the name of the category, genus, species, and variety were important for both user groups to reach the target plant. The search through the local name, origin, distribution, and life cycle was at the end of the ranking of the two groups.

Table 4 shows that search through the title, browsing through keywords, and search through keywords are the most important search options in resources from the users' point of view. Search through the publisher, the date of publication, and the place of storage was less important for both user groups. The prioritization of the two user and disseminator groups varies greatly in the context of browsing through the tree structure, browsing

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Table 1: The mean rank of general characteristics of medicinal plant system based on Friedman test

Variable	User group	Minimum-maximum	Mean	SD	Mean of rating
The existence of electronic data of medicinal plants	Producer and consumer	1-5	3.1108	1.57718	4.42
	Distributor	1-5	3.3129	1.64674	4.54
Providing information in Persian	Producer and consumer	1-5	3.2802	1.71371	4.79
	Distributor	1-5	3.1863	1.30152	4.65
Display information in full text	Producer and consumer	1-5	2.2619	1.76019	4.31
	Distributor	1-5	2.6152	1.93612	4.35
Access to information system of medicinal plants at any time and place	Producer and consumer	1-5	2.6247	1.72786	4.39
	Distributor	1-5	2.6431	1.95161	4.22
Presence of printed information of medicinal plants	Producer and consumer	1-4	1.7311	0.81488	3.48
	Distributor	1-5	1.8581	0.93227	3.43
Providing information in English	Producer and consumer	1-3	1.7211	0.10629	1.64
	Distributor	1-5	1.6305	0.06371	1.57
Displaying bibliographic information with abstract	Producer and consumer	1-5	1.9998	0.42256	2.53
	Distributor	1-3	1.9841	0.50157	2.42
Displaying information only in bibliographic terms	Producer and consumer	1-3	1.1166	0.28330	1.34
	Distributor	1-4	1.4713	0.20572	1.45

SD=Standard deviation

the authors, and/or search of builder, and guide number. It seems that the role and expected functions of the two user groups in this section are greater.

Based on Table 5, using Boolean operators, shortcut, and selectable neighborhood in the search menu as well as searching through a search box for users in the first group and search with the ability to add commands for librarians by the explorer was important for the groups.

According to Tables 6 and 7, for the producer and user groups, displaying the search results bibliographically with abstract, sorting the search results by title, highlighting the search term in the results, and for the disseminator group, displaying the search results bibliographically with abstract, sorting the search results by relevance, and sorting the search results according to the user's needs were more important. In order to make a final decision about the characteristics and capabilities of the information system of medicinal plants, it is necessary to consider whether there is a significant difference between the views of consumer and disseminator groups of this system.

For this purpose, the Mann–Whitney U-test was used.

If the P value in each case is <0.05 ($P \leq 0.05$), there will be a significant difference between the views of the two groups. As the results of the survey show, the two user groups that use and disseminate the information system of medicinal herbs in the search options in the database of medicinal herbs and the characteristics of the search results are the most different.

Discussion

The process of designing the information system for medicinal plants is so complicated that it is understandable by studying the exact needs of the user in dealing with the system, and the needs must be considered in the design and evaluation process of such systems.[17,21] Such a view to design issue will not only gives a more comprehensive approach but can also be considered as an effective factor in the design, development, and evaluation of information systems.[22] The results of the research showed that in both user groups, providing information in Persian, electronic information of medicinal plants, displaying information in full text, and accessing the information system of medicinal plants at any time and place are the most important general features of the system.

These results suggest that users seek for a full-text Persian system of medicinal plant information that will enable them to access information at any time and place, making them independent of referring to other sources. On the other hand, the presentation of bibliographic information and providing them in English had the lowest mean rate from the point of view of the both groups. It seems that the inability to understand English words and the lack of knowledge on the usefulness of using bibliographic information to identify different aspects of the subjects have led users to not emphasize on its necessity. The results of the research conducted by Jordan *et al*., a part of the results of the study by Yanuar *et al*. and Chen *et al*., point to the feature of displaying full-text information and access levels and multilingual user interfaces as effective steps in information system design.[10,11,14]

Regarding the technical features of the system, because they are a very important step in the system design process that provides the base of a successful information and search process, it was not unexpected that the both groups emphasized the possibility of searching and

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Table 2: The mean rank of the technical characteristics of the medicinal plant system based on Friedman test

Variable	User group	Minimum-maximum	Mean	SD	Mean of rating
Search possibility	Producer and consumer	1-5	3.2941	1.33489	4.69
	Distributor	1-5	3.1297	1.62755	4.57
The possibility of browsing	Producer and consumer	1-5	3.4167	1.62688	4.44
	Distributor	1-5	3.3648	1.70938	4.52
Supporting full-text display	Producer and consumer	1-5	3.4311	1.79331	4.45
	Distributor	1-5	3.4839	1.76902	4.41
Website in English	Producer and consumer	1-4	1.4381	0.87722	2.61
	Distributor	1-4	1.5333	0.93710	2.61
Possibility of printing information	Producer and consumer	1-4	1.5849	0.78719	2.53
	Distributor	1-3	1.5161	0.62562	2.41
Links to research centers' websites	Producer and consumer	1-5	3.7041	1.93289	4.34
	Distributor	1-5	3.6774	1.04521	4.32
Access to the electronic texts of seminars	Producer and consumer	1-5	2.7419	0.74156	3.59
	Distributor	1-5	2.8165	0.79244	3.43
Link to related websites	Producer and consumer	1-5	2.7732	1.00525	3.56
	Distributor	1-4	2.7419	0.85509	3.49
New information advertising on the front page of the site	Producer and consumer	1-5	1.7938	0.17205	2.65
	Distributor	1-4	1.8642	0.15470	2.57
Possibility to post ads	Producer and consumer	1-5	1.7222	0.45429	2.54
	Distributor	1-3	1.6414	0.67521	2.43
Supporting play of related videos	Producer and consumer	1-4	1.9785	0.95529	3.48
	Distributor	1-4	2.3226	1.07663	3.46
Creating user groups to support team work	Producer and consumer	1-5	2.1727	1.08112	3.47
	Distributor	1-4	2.1667	1.01287	3.42
Help link	Producer and consumer	1-4	2.0168	1.00070	3.47
	Distributor	1-4	2.5700	1.83215	3.99
Resume of researchers in medicinal plants	Producer and consumer	1-5	2.2211	1.34622	3.60
	Distributor	1-5	2.6183	1.24271	3.49
Existence of site map	Producer and consumer	1-5	1.3785	0.12667	2.08
	Distributor	1-5	2.9350	1.59	3.95
Possibility to use the thesaurus	Producer and consumer	1-3	1.6138	0.18741	2.49
	Distributor	1-5	2.3871	1.61522	4.09
List of frequently asked questions	Producer and consumer	1-5	1.7542	0.19523	2.44
	Distributor	1-4	1.1831	0.84486	2.40
Possibility to contact the librarian	Producer and consumer	1-4	1.0222	0.25401	2.41
	Distributor	1-5	3.1290	1.14723	4.01
Possibility to contact the site builder	Producer and consumer	1-4	1.0012	0.38572	1.45
	Distributor	1-4	1.1041	0.13063	1.41

SD=Standard deviation

browsing, supporting full-text display and linking to research centers' websites.

Bai *et al*. and Noraziah *et al*. also considered the importance of a variety of search and browsing capabilities and the presence of useful links (link to other related websites which are related, and guide links) from users' point of view.[15,17]

Another part of the results showed that librarians prioritized the possibility of using a thesaurus and communicating with a librarian. Given that the technical features of the system are influenced by the user's knowledge of a particular subject area, the computer space, the information system, as well as the degree of information seeker's confidence to the infrastructures and capabilities, the reason for this can be the familiarity of information disseminators (librarians) with the usefulness and application of thesaurus in relation to the limited search and familiarity of information-consuming users (faculty members, students, and researchers of medicinal plants) with thesaurus capabilities and knowledge of the features that are used for the desired search (keywords and specialized topics accepted whether general, specific, or relevant, as well as spelling and grammatical form of the words used). Furthermore, as librarians are beneficiary on the issue, this is important for them. **Lamesch** *et al*. and Pawar *et al*. pointed to the fact that it is important to consider the thesauri in successful searches of medicinal plants

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Table 3: The mean rank of search options in medicinal plant system based on Friedman test

Variable	User group	Minimum-maximum	Mean	SD	Mean of rating
Search through scientific name	Producer and consumer	1-5	3.6700	1.99548	4.43
	Distributor	1-5	3.5484	1.89461	4.39
Browse through the name of the category, genus, species, and variety to reach the desired plant	Producer and consumer	1-5	3.4522	1.67292	4.47
	Distributor	1-5	3.4483	1.53168	4.41
Searching through chemical compounds	Producer and consumer	1-5	3.1131	1.04637	4.53
	Distributor	1-5	3.1168	1.07563	4.47
Search through the therapeutic properties	Producer and consumer	1-4	3.0571	1.02685	3.66
	Distributor	1-5	3.4839	1.25131	3.47
Search by English name	Producer and consumer	1-4	3.0081	1.05303	3.53
	Distributor	1-5	3.0710	1.17592	3.52
Browsing through the name of the university or research institute to view a list of plants under research in each institute	Producer and consumer	1-5	2.2247	0.72566	3.60
	Distributor	1-4	2.2069	0.64034	3.48
Search by local name	Producer and consumer	1-5	1.6837	0.68250	2.59
	Distributor	1-5	1.6129	0.51933	2.46
Search through the origin	Producer and consumer	1-4	1.4320	0.41801	1.53
	Distributor	1-5	1.6903	0.62643	2.44
Search through distribution	Producer and consumer	1-4	1.1454	0.36017	1.51
	Distributor	1-4	1.0667	0.16511	1.50
Search through the life course	Producer and consumer	1-5	1.2167	0.11917	1.48
	Distributor	1-4	1.0355	0.00269	1.40

SD=Standard deviation

Table 4: The mean rank of search options in medicinal plant information system based on Friedman test

Variable	User group	Minimum-maximum	Mean	SD	Mean of rating
Search by title	Producer and consumer	1-5	3.5833	1.67784	4.35
	Distributor	1-5	3.1935	1.67745	4.30
Browsing by keywords	Producer and consumer	1-5	3.4946	1.62811	4.32
	Distributor	1-5	3.0968	1.73882	4.36
Search by keywords	Producer and consumer	1-5	3.5979	1.34742	4.57
	Distributor	1-4	3.2258	1.29730	4.42
Browsing by the title list	Producer and consumer	1-4	2.9681	0.18641	3.07
	Distributor	1-5	2.9999	0.11542	3.55
Browsing by the tree structure (subject based)	Producer and consumer	1-4	1.4565	0.34584	2.16
	Distributor	1-5	3.6452	1.05035	4.18
Browsing by the author's name	Producer and consumer	1-4	2.6630	1.44707	2.44
	Distributor	1-5	3.8667	1.77608	4.01
Search by builders	Producer and consumer	1-4	1.7957	0.21189	2.13
	Distributor	1-5	2.9355	0.81386	3.95
Search by publication type	Producer and consumer	1-4	1.0330	0.84770	2.69
	Distributor	1-5	1.2903	0.70161	2.38
Search by the date of publication	Producer and consumer	1-5	1.1809	0.08318	1.63
	Distributor	1-5	1.5806	0.00888	1.04
Search by the place of storage	Producer and consumer	1-4	3.2308	0.03044	1.10
	Distributor	1-5	1.6774	0.04654	1.34
Search by the ID Number	Producer and consumer	1-4	1.4239	0.17888	1.48
	Distributor	1-5	2.5806	0.99244	3.39
Search by publisher	Producer and consumer	1-5	1.5889	0.20760	1.37
	Distributor	1-5	1.0645	0.36469	1.54

SD=Standard deviation

and various researches retrieval as an efficient web-based crawler.[23,24]

On search options, search by scientific name and browse by category, genus, species, and type to reach the plant in the Medicinal Plant Database and search by title, browse through keywords, and searching by keywords in the Medicinal Plant Database was a top priority for all users. These results are in line with the findings of Latief *et al*. and Chen *et al*., who showed

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Table 5: The mean rank of search tool optimization in different types of sources information from the perspective of two groups based on Friedman test

Variable	User group	Minimum-maximum	Mean	SD	Mean of rating
Search through a search box	Producer and consumer	1-5	1.3474	1.78236	4.47
	Distributor	1-4	1.6207	0.77523	3.35
Search with the possibility to add commands by the explorer	Producer and consumer	1-5	2.7527	0.88041	3.12
	Distributor	1-5	3.3000	1.53498	4.39
Search the menu in different fields	Producer and consumer	1-4	1.9011	0.07954	1.54
	Distributor	1-4	1.6207	0.07884	1.61
Selectable Boolean operators in the search menu	Producer and consumer	1-5	3.5172	1.04946	4.42
	Distributor	1-5	3.2903	1.00643	4.48
Applying shortcut to search menu	Producer and consumer	1-5	3.5185	1.70002	4.45
	Distributor	1-5	3.5161	1.81121	4.35
Selectable neighboring operators in the search menu	Producer and consumer	1-5	3.6429	1.78004	4.47
	Distributor	1-5	3.5161	1.67958	4.55

SD=Standard deviation

Table 6: The mean rank of search results displaying characteristics from the perspective of two groups based on Friedman test

Variable	User group	Minimum-maximum	Mean	SD	Mean of rating
Display the search results as bibliographic information	Producer and consumer	1-5	2.4946	1.09249	3.99
	Distributor	1-5	2.6774	1.07663	3.56
Display the search results as bibliographic information and abstract	Producer and consumer	1-5	3.5833	1.85430	4.43
	Distributor	1-5	3.2581	1.57548	4.55
Bolding the search phrase in the results	Producer and consumer	1-5	3.8914	1.95822	4.65
	Distributor	1-5	2.9000	1.02889	3.41
Providing searchable retrieval results	Producer and consumer	1-5	1.6237	0.90786	2.52
	Distributor	1-4	1.6129	0.84370	2.54
Ordering the search results by the user's desire	Producer and consumer	1-5	2.6632	0.98511	3.47
	Distributor	1-3	3.5333	3.81931	4.50
Ordering the search results by relevancy	Producer and consumer	1-5	1.8842	0.20162	3.13
	Distributor	1-4	3.5667	1.04000	4.62
Ordering the search results by publication date	Producer and consumer	1-3	1.4255	1.78096	2.71
	Distributor	1-5	2.1000	1.18467	2.56
Ordering the search results by title	Producer and consumer	1-4	3.6667	1.11135	4.39
	Distributor	1-3	2.7097	0.69251	3.42
Ordering the search results by the authors name	Producer and consumer	1-5	1.0440	0.29882	2.29
	Distributor	1-4	1.2581	0.06357	2.27
Browsing the search history	Producer and consumer	1-5	2.0066	0.30791	2.49
	Distributor	1-4	1.0258	0.95602	2.11

SD=Standard deviation

Table 7: Mann-Whitney U-test results for the difference significance between the views of the two groups

Variable	Mean of rating difference	U value of Mann-Whitney*	Significant level
Features of the information system - generalities	0.78	1776.50	0.191
Information system features - technical	0.06	808.000	0.018*
Search options on medicinal herb database	0.04	925.50	0.071
Search options in the database of medicinal plants	93.16	503.000	0.001*
Search tools	0.41	1285.50	0.248
Displaying features of search results	121.60	860.000	0.000*

*shows significance level

that diversity in search fields enables users to find the needed information, while users are more dominant in search by scientific name of herbs and browsing by name, genus, species, and type.[8,16] In addition, another part of the findings showed that in the search options of the information system of medicinal plants, the option of browsing through the tree structure, authors or the creator, and the reference number was more important for the librarians. It may be judged that at the search phase, information literacy of users and their knowledge of how to select search keywords, formulate search strategies, and use capabilities are crucial. Therefore,

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the importance of paying attention to all the steps a user goes through in his or her ideal search process, as well as the types of skills and knowledge that he or she needs when searching, distinguishes the viewpoints of the two groups (consumer and promoter). As librarians master the hypertextual links in the tree structure, the authors and publishers of a bibliographic record, they experience less challenge when searching and these options are important to them. Similarly, the results of the research by Thakar *et al*. also showed that the development of a medicinal plant database requires attention to the category of hypertext links in tree structure.[25]

Le, in his review, assumed the impact of previous experience of users in the search process and the lack of familiarity of users with privileges and characteristics of the search through the tree structure as influential reasons for not using it.[26] Chen *et al*. also considered the lack of user knowledge about how to use the search facility of a database as a cause of lack of proper interaction with the database.[14] These factors can justify this difference.

The results of the research on the user friendliness of search tools indicate the fact that in addition to the search menu in different fields, other search tools are important from the perspective of the two groups in the way that selectable Boolean operators have the highest mean rank in the menu search. Because the use of Boolean, Neighborhood, and Proximity operators is well known as an effective strategy to improve search results in the use of different databases, these results were not unexpected for both groups of users. Accordingly, one may understand the importance of scientifically and purposefully designing the information system of medicinal plants, and considering the utility of the search tools and the desired interactive features, Mumtaz *et al*. and Kumar *et al*. also found that facilities for search strategy in an optimum medicinal plant information system could include Boolean operators, proximity operators, word shortening, and spelling search.[5,21] Syed and Khan stated in their research that if search tools do not meet the needs of users in a timely manner, they will be able to disappoint the user in the search and information process and cause them to revise the use of such a database that has been designed at a high cost.[27] Concerning the features of displaying search results, the findings showed that for the consumer group, displaying the search results as bibliographic information with abstracts, the sorting of search results by title, the highlighting of the search term in the results, and for the disseminated user group showing the search results as bibliographic information with abstracts, sorting search results by relevance, and sorting search results by user choice are more important. These results suggest that from the viewpoint of the two groups, the presentation of bibliographic information along with the results can help users to evaluate the relevance and validity of the retrieved findings. In the research results by Latief *et al*., Saini *et al*., and Chowdhury also, various features of search results, including highlighting search terms, displaying keywords on the results page, and displaying retrieved documents as bibliographic information and abstract references, have been suggested to help users evaluate the search results.[8,9,28]

The results showed that there is a significant difference between the consumer perspective and the disseminator of information regarding search options in the medicinal plant database and the characteristics of displaying the search results, and in other cases, users share common features with respect to the existence of facilities and capabilities in an information system of medicinal plants.

As mentioned earlier, subject and specialized knowledge of users and their skill and information literacy in utilizing database features and capabilities can play a significant role in differentiating the views of the two groups of users. Ningthoujam *et al*. believe that digital librarians pay attention to all components of a database, whether objective or perceived because of its use of a variety of databases, familiarity with web search tools, and information literacy skills.[29]

Conclusion

Regarding the results of the study, it is necessary to pay attention to the characteristics of each of the six domains, the general characteristics of the information system, the technical characteristics of the information system, the search options in the database of medicinal plants, the search options in the database of information resources, search tools, and displaying search results in the design of the information system of medicinal plants. The results also show that designing a medicinal plant information system based on the desired features of users (consumer and disseminator) can facilitate the access to information and user information and computer interactions. In this regard, it is suggested that designers of medicinal plant information system consider the demand and needs of users in the information retrieval process (selection, search, and retrieval) to design more realistic systems.

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Conflicts of interest

There are no conflicts of interest.

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