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Study of information search strategies used in the CAPES Portal of E-Journals

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Abstract: The present research evaluated the search strategies used by faculty in the CAPES Portal of E-Journals. The faculty selected for carrying out this research were distributed throughout 17 Brazilian federal universities. Data was collected by means of a web-survey which used a mainly quantitative methodology, with some qualitative data. Users received four questionnaires via email. The present study selected responses for one question (number 14) of the second questionnaire which were quantitatively analyzed . The analysis revealed that 79,2% (4100) of the respondents), when searching for a subject, initially search a reference database in the Portal to identify articles or journals and, only after that, access the full text journal databases to obtain the full text. The research also analyzed qualitative data in the open field of question 14 where users cited other search strategies used in the Portal. Categories that emerged from the analysis of the content went through successive refinements. The analysis subdivided 507 comments into eight initial categories, which were regrouped into three main categories according to their content similarity: (1) Users search for bibliographic references and full text using the CAPES Portal of E-Journals interface; (2) Users search for bibliographic references and full-text directly in the databases websites without using the CAPES Portal of E-Journals interface; (3) Users search for bibliographic references in other electronic resources, and then use CAPES Portal of E-Journals interface to obtain the full text. It was found that category (3) stood out with the highest percentage (49,5%) of the valid comments, while category (1) obtained 33% of the comments, followed by category (2), which contained 17,5% of the comments. The results obtained in qualitative analysis, show that a part of the users do not use the CAPES Portal search capabilities to find the article, but only as a mean to obtain free access to the full text of the publications. The article presents recommendations of further research and actions to improve use of the Portal and other similar information resources.

Keywords: Search strategy; Information searching behavior; User studies; Electronic journals; CAPES E-Journals Portal.

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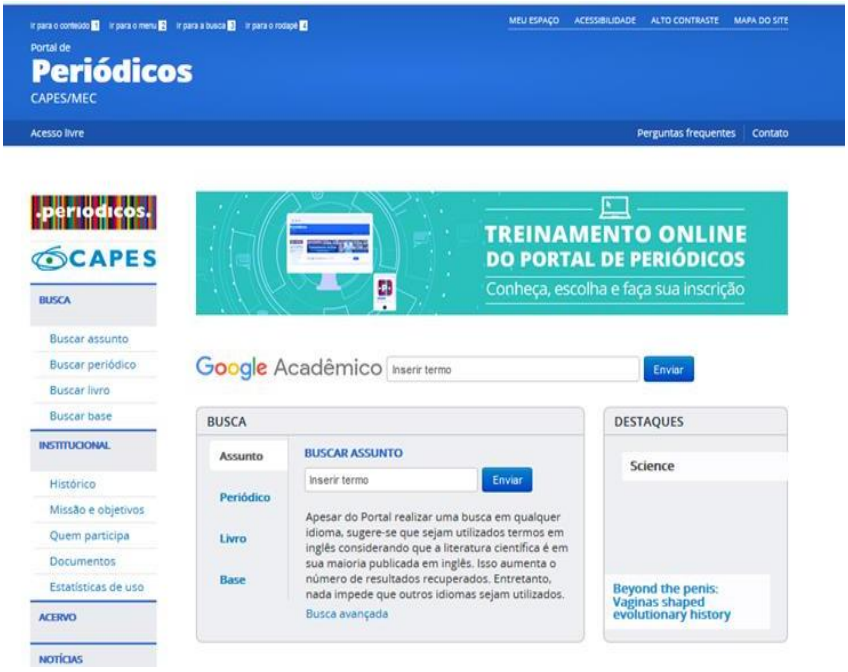
1. Introduction

Digital libraries and Portals are information resources increasingly important for the academic community. In addition to being information resources, they are information retrieval systems which offer search features and capabilities. Governmental, educational and research institutions frequently invest large sums of money to make available, maintain and continually improve these resources and information retrieval systems to the communities they serve. Therefore, research that seeks to understand if and how these information resources are utilized is relevant.

To verify how the search interface and capabilities of the CAPES Portal of E-Journals was being utilized, this research analysed the use of search strategies by faculty in Brazilian federal universities when accessing the Portal. The CAPES Portal of E-Journals stands out in the scenario of Brazilian university libraries as an important information resource for providing access to current and high quality sources of information. Created in 2000, the Portal offers free and open access to the contents of its collection to the community of faculty, researchers, students, technical and administrative personnel in member institutions nationwide. The largest of its kind in Latin America (Costa 2007), its collection consists, at the date of this writing, of over 38,000 e-journal titles, more than 126 reference databases in all areas of knowledge, eleven patent databases, statistics, encyclopedias and technical standards (CAPES 2016).

Accounting for more than 750 million accesses, the relevance of the CAPES Portal and the expressiveness of its use justifies research to analyse its use. Studying the search strategies of the users of the Portal might contribute to improve this information system. Furthermore, the study results will add to other findings about the information search behavior of portal and digital library users increasing the body of research on the use of digital libraries of scientific journals.

The present study is part of a broader research study about the use of the CAPES Portal of E-Journals. This web-survey consisted of four questionnaires containing a total of 71 questions sent to approximatelly 15,000 faculty in various areas of knowledge spread over 17 Brazilian federal universities. The current study analyzed responses for question 14 of the second questionnaire (about information behavior). Responses were qualitatively and quantitatively analyzed with regard to search strategies of users of the CAPES Portal of E-Journals.



The CAPES Portal of E-Journals has established itself as a useful resource for teaching and research in Brazil, offering numerous advantages (Cendón and Ribeiro 2008), such as:

- Ease of access to scientific information. The Portal provides its users with publications of excellence recognized all over the world gathered in a single virtual space;
- Democratization of access to information. Since the Portal is available throughout the country, a researcher in an educational or research institution located in any part of the vast Brazilian territory will have access to the same national and international scientific publications.
- International insertion of the Brazilian scientific production. With better access to high quality international research, Brazilian scholars gain deeper knowledge in their area, increasing the consistency and quality of their research, thus facilitating the dissemination of their production at the international level.

3. Information Search Behavior

According to Wilson (2000), information behavior is how an individual behaves in relation to the sources and channels of information, including the active search when an individual acts to find information, and the passive search when there is not an intention of seeking for the information, such as watching a television advertisement.

Search behavior begins when the individual realizes that the information he has is less than the desired on the subject to be searched, and then starts to act to find what he wants (Krikelas 1983; Crespo and Caregnato 2006).
Wilson (1999) points out that information behavior,, considered the more general field of research, includes the subfield information-seeking behavior, which, in turn, comprises the subfield information search behavior in information systems. Thus, information seeking is a layer in which the user performs the mental processing of search, which sets the stage for planning and formulation of the search, that is, the process of intentional search for information on a specific need. Information searching, a subset of information seeking, is the smallest field defined by the relationship between the user and the information system, with or without intermediary, with regard to the individual's behavior to make the search and retrieve information in a given system, whether at the level of human-computer interaction (clicks on the pages, use of the mouse) or at the intellectual level (search strategies using Boolean operators, selection criteria for placement of books on the shelves) to judgements of the relevance of retrieved information (Wilson 2000; Casarin 2012; Brum and Barbosa 2009). The focus of the present research is on the information search behavior subfield which centers on the micro level search behavior, in which the user interacts directly with the information systems.

4. Search strategies

Considering the increasingly complex and diverse nature of current technology based information resources, in order to contribute to its improvement, it is important to understand how users search these resources. Information retrieval systems have the capacity to hold a huge amount of information and the user must restrict the subject to be sought to have an effective information retrieval (Meadows, 1999). The solution for the restriction or expansion of the search is to create strategies in order to filter the results so that they are relevant (Bertholino1999).
The search strategy is a set of decisions and procedures adopted during a search in order to find the requested information. With the formulation of a search strategy, one can establish the match between the question and the information stored in an information system (Rowley 1994; Lopes , 2002).
A search strategy consists of a plan of activities at different levels characterized by movements and tactics that make up the process of seeking information. In this regard a movement is identified as the stage in which actions or thoughts are promoted to search for information; and a tactic consists of a movement or series of movements incorporating search options and actions that can cause users to make progress in the process of searching for information. Therefore, a search strategy is a pattern of sequential tactics employed by users in planning the search information, and also in the changes that occur throughout the search process, with regard to the general plan of the search, while a search tactics acts with the movements used in a search (Bates 1979, 1990; Marchionini 1995; Xie , Joo 2010) .

To formulate a search strategy in an information retrieval system, knowledge on the subject searched is necessary. Thus, the user will properly select the terms or keywords that best represent the topic searched (Guerrero 2009; Lopes 2002). An effective search strategy is not always the one that has the best search term, but the one that has a sufficient and adequte number of terms to cover all the dimensions of the searched subject. The type of search strategy undertaken in an information retrieval system is vital for measuring its efficiency and success because the system will perform well in that the user is able to make appropriate queries, and thus obtain relevant results (Mansourian 2008).

5. Methodology

This research utilized data collected in a web-survey that used a mainly quantitative methodology, but included some qualitative questions. Data were collected through 04 electronic questionnaires sent to users via email containing a total of 71 questions. The first questionnaire, sent to 14,763 participants by email, obtained 6,689 responses, and the return rate was approximately 45%. In the context of current research, the sample is composed of the 5,175 teachers who responded the second questionnaire on search behavior, corresponding to a rate of return of about 35% of valid responses. The present research analysed responses to question 14 of the second questionnaire quantitatively and qualitatively.

The description of the quantitative data was performed by frequency distribution. For the analysis of qualitative data, categories were created which described the content of messages critically, to understand their hidden meaning or explicit messages. For the categorization of qualitative data, Gil (1994) has three steps:

- Pre-analysis: prior reading of the documents with the development of indicators for the demarcation of the content to be analyzed.
- Exploration of the material: coding, classification and categorization of data through the frequency count of the content of comments, grouping them into topics according to their characteristics in common.
- Data processing: presentation and validation of data in tables, charts and figures for easy viewing and interpretation.

6. Results

When searching articles by subject (question 14), of the 5.175 respondents, 79.2 % (4,100) cited option 1 – "**I search first in the Capes Portal reference databases, identify references of articles and journals, and next I obtain the full-text of electronic journals in the CAPES Portal of E-Journals**". Option 2 – **"I browse through issues of the journals that I use the most"** was selected by 12.7% of the respondents. And 12,3% of the respondents marked both options 1 and 2. Just 1% (53) of the respondents claimed not to have understood the question (Option 3). Option 4 – "**Another strategy"** was selected by 12% (612) of the respondents. Of these, 7% (365) did not choose

options 1 or 2, while 3,6% (189) combined "**Another strategy",** with either Option 1 or Option 2. Just 1% (53) marked Options 1 and 2 and also **"Another strategy"** (Table1).

Table 1 – Search strategies in searches by subject

To find by subject, what strategy do you use?				
	Chosen Order			
	1	2	3	4
I search in reference databases in the Portal, to identify references to articles and journals, next I obtain the full-text of electronic journals in the CAPES Portal of E-Journals (1)	79,2%	0%	0%	0%
I browse through issues of the journals that I use the most (2)	12,7%	12,3%	0%	0%
I did not understand the question (3)	1%	0%	0%	0%
Another strategy (4)	7%	4%	1%	0%

The comments in the open field in question 14 were analyzed and categorized. The categories used to group messages emerged from the analysis of their content and went through successive refinements.

Of the 612 respondents (12% of the 5.175 respondents) that marked option 4 (another strategy) of question 14, 555 used the open field to describe the different search strategies used to find the articles. However, the analysis considered as valid only 507 comments which contained explanations and indications on the use of different search strategies. The comments were divided into eight (8) initial categories that describe the actions that represent search strategies used at CAPES Portal of E-Journals. These were regrouped into three higher order categories according to the similarity of their content: The following categories were determined: (1) Users search for bibliographic references and full text using the CAPES Portal of E-Journals interface; (2) Users search for bibliographic references and full-text directly in the databases websites without using the CAPES Portal of E-Journals interface; (3) Users search for bibliographic references in other electronic resources, and then use CAPES Portal of E-Journals interface to obtain the full text.

Table 2 - Categories for comments in the open field of the option "Another strategy"

N.	Categories	Search Estategies	Answers	
			Freq. Absol.	%
1	**User search for bibliographic references and full text using the CAPES Portal of E-Journals interface.**	1. Users search in CAPES Portal of E-Journals by subject	106	20,9%
		2.Users search in CAPES Portal of E-Journals by databases / editors	16	3,2%
		3.Users search in CAPES Portal of E-Journals by journals titles	45	8,9%
		Subtotal	**167**	**33%**
2	**User search for bibliographic reference and full-text directly in the databases websites without using the CAPES Portal of E-Journals interface.**	4.Users search directly in the websites of databases to obtain the full text	89	17,5%
		Subtotal	**89**	**17,5%**
3	**User search for bibliographic references in other electronic resources, and then use CAPES Portal of E-Journals interface to obtain the full text.**	5.Users search for bibliographic references directly in the websites of the databases, and the access the CAPES Portal of E-Journals to obtain the full text	12	2,4%
		6. Users search for bibliographic references directly in the websites of electronic journals, and then access the CAPES Portal of E-journals to obtain the full text	51	10,0%
		7. Users search for bibliographic references in the other search engines, , and then access the CAPES Portal of E-journals to obtain the full text	110	21,7%
		8. Users search for bibliographic references in lists of references or receive bibliographic alerts, and then access the CAPES Portal of E-journals to obtain the full text	78	15,4%
		Subtotal	**251**	**49,5%**
	Total		**507**	**100%**

Table 2 shows that category (3) stood out with the highest percentage rate of 49.5 % of the valid comments, while category (1) obtained 33 % of the comments, followed by category (2) , which showed 17.5 % of comments.

Category 1 - Users search for bibliographic references and full text using the CAPES Portal of E-Journals interface.

This category lists search strategies mentioned in the comments of respondents who use the CAPES Portal as their main means of formulation of searches and obtaining the document. The option search by subject is the most used by respondents, with 20.9% of responses. The search by subject is formulated by keywords, as noted in the following comments: "I do keyword combinations", "I search for keywords", "I look for keyword" and "I use keywords". The second search option most used by respondents is the search by title of journals, with 8.9% of the comments. Most respondents access journals directly by the title, and after entering the journal, check the summary to find the item they need, as mentioned in these respondents' comments: - "I search journals of my interest by their names" and "I will go directly to the journals that interest me and I search in the summary of each issue". But some respondents use the feature advanced search which allows you to search by area of knowledge, ISSN, publisher, etc. to find the journals, as in the case of those respondents who carry out this search form: "I'll go right to the advanced search" or "I perform the advanced search for journals". The third way to search, by editors / database received 3.2% of the comments. Respondents perform the query for the

title of the database or publishers they most use. This is the form of research showed in the comments that follow: “I look for specific publishers (Elsevier, for example)”, “I enter the Portal, and then go straight to the publisher's website” and “I search by the editor in the Portal. Another way to search performed by these respondents is through the full alphabetical of databased list to locate databases, as seen in the comments of some respondents: “I go to the page with the full list of databases and afterwards I locate articles” and “I search the full list by the initial letter of the base name”.

Category 2 - Users search for bibliographic references and full-text directly in the databases websites without using the CAPES Portal of E-Journals interface.

17.5% of the comments reports on searches for articles directly in databases already familiar to the user, without accessing the CAPES Portal. Respondents claim that they do not use the Portal in their searches because they are already familiar with other databases interfaces, as shown by these comments: “I use the interface available by SBOT as I always search in this database” and “usually I go straight to the Web of Science”. Other respondents state that they continue to use other databases that they have access because they consider searching the Portal difficult and confusing: “I search in other bibliographic databases, because the CAPES Portal is very complicated” and “I use individual search engines of each publisher because it is easier”. However, other respondents justify not using the Portal interface due to the limited scope of its content for their area, as this respondent cites: "As the CAPES Portal is limited I use mostly other bases, via foreign universities”.

Category 3 - Users search for bibliographic references in other electronic resources, and then use the CAPES Portal of E-Journals interface to obtain the full text.

This category included respondents who carry out searches on other websites, and after obtaining the reference, access the CAPES Portal to obtain the article in full text. Search engines in general (Google, Bing), representing 21.7% of the comments, are the search tool most used by these respondents. For example, “I access Google first and then access the portal that is a bit complicated”; “I search the subject on Google and then seek the journals in the Portal”. The other most common form of obtaining the reference is through bibliographic alerts received by email, or obtained by consulting the list of references in articles or books (15.4%), as illustrated in this comment “I consult the references in other publications and then search the Portal”. 10% of respondents search for references in the sites of e-journal, and then access the Portal to obtain the full text of the article, as evidenced by these respondents: “I take the bibliographies of articles, and then access the CAPES Portal”; “In general I do searches in journals that I use, and only then enter the Portal”. And finally, 2.4% search for reference in databases, and then seek the article in the Portal CAPES, as exemplified by the following comment: “I search the databases first by

keyword, identify items and then access the CAPES Portal to obtain the full text".

Regarding the use of advanced search features, the qualitative answers in question 14, showed that few respondents cited this type of search. Respondents showed little familiarity with advanced search features, considering them difficult to use. The comments below illustrate this: "advanced search confuses me", "I think advanced search is complicated and requires many steps or paths" "I do not know all the features of advanced search".

7. Summary and Conclusions

The quantitative analysis of data, based on pre-defined answers for how users searched the CAPES Portal of E-Journals revealed that of 5,175 respondents, 79.2% (4,100), when searching the Portal by subject initially search the reference databases subscribed by the Portal to identify references of articles or journals and only then access the journals in the Portal to obtain the full text. This result unveiled that the user is more sophisticated than expected, as they use the Portal reference databases to locate articles instead of going straight to the journals. Quantitative results show that the majority of users understands how to search the Portal.

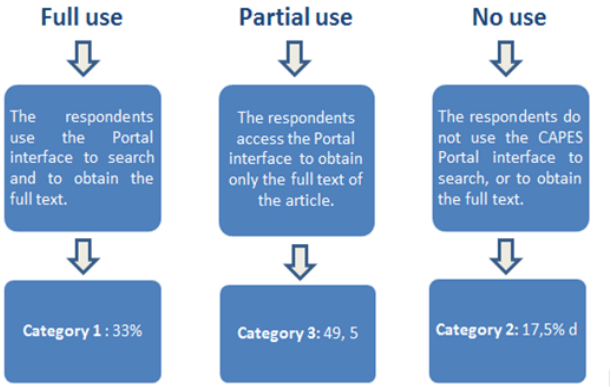
On the other side, the qualitative data in the open field of question 14 showed three modes of searching and obtaining the full text in the Portal. Respondents in Category 1 (33%) of the qualitative analysis use the Portal interface to search and to obtain the full text. The Portal interface is being used, and respondents show they know how to use some search fields available in the Portal, for example, search by subject, by database / publishers and by journal titles.

Respondents in Category 2 (17.5%) of the qualitative analysis do not use the CAPES Portal interface to search or to obtain the full text, as they access directly the database websites where they also obtain the full text. Such an approach demonstrates not only the lack of use of the Portal interface and of the resources it offers, but may indicate that the user lacks knowledge about how access to the portal works or about other resources it offer. Some users may be unaware that access to the Portal is accomplished automatically without the need for password and / or login when they are using a terminal at their institution. They can only access the full text of articles in a not free database, such as the Web of Science, without passing through the CAPES Portal of E-Journals interface, because their university is part of the Portal consortia. Thus, when they access directly a journal or database that is subscribed by the Portal, access to the portal is accomplished indirectly and the user seem not to be aware of this.

Respondents in Category 3 (49.5%) of the qualitative analysis do not use the CAPES Portal search features available in the Portal interface to formulate search strategies, as they find their references elsewhere, and later access the Portal to obtain only the full text of the article. In this perspective, the CAPES Portal of E-Journals is seen as a space for the access of information stored, and not as a place perform the search (Barreto 1996).

The results of the qualitative analysis of the comments from 12% (612) of the total number of respondents, who selected the option "other strategies" show that the majority of those who commented (49.5%) does not perform the search for the article reference in the CAPES Portal, and only uses the Portal to access the full text. Therefore, a part of the users of the CAPES Portal do use the Portal interface or use it partially. On the other side, the same data shows that a larger part of the users are accessing and using the CAPES Portal even if partially and that a smaller part of the users sometimes prefer not to access the CAPES Portal (Fig.2).

Figure 2 – Use of the interface of the Capes Portal of E-Journals



Some results of the present study led to some suggestions to improve the use and disclosure dissemination of the Portal in the consortia institutions and also for further research are:

- Intensify the training on the use of the CAPES Portal, and increase dissemination of information about how to use its interface and the available search resources.
- Conduct research on evaluation of the performance of CAPES Portal search engine and interface;
- Conduct studies to evaluate and promote the restructuring of training about the use of the Portal training .

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