



# The Use of OPAC in a Large Academic Library: A Transactional Log Analysis Study of Subject Searching

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**The analysis of user searches in catalogs has been the topic of research for over four decades, involving numerous studies and diverse methodologies. The present study looks at how different types of users effect queries in the catalog of a university library. For this purpose, we analyzed log files to determine which was the most frequent type of search conducted among different user types. Results show that searches by browsing are similar in frequency to the analytical queries, and that only 14 percent of queries actually specify the subject heading.**

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## INTRODUCTION

Measuring the effectiveness of the use of computer catalogs has been a steady realm of study for some decades now. This has led us ever closer to perceiving how data extraction systems might be improved, to better satisfy the informational needs of real users. A number of studies have shown that the Online Public Access Catalog (OPAC), present in most libraries, can prove a source of problems when consulted, particularly in the area of subject access.<sup>1</sup>

The methodology applied to assessing catalog use is varied. Some authors<sup>2-7</sup> have carried out exhaustive analyses of these tools, which can be summed up as: surveys, controlled experiments, group interviews, protocol analyses, transactional analyses, measures of the effectiveness in retrieval, and assessments of user satisfaction. Each orientation has its pros and cons, and none is excluding; that is, the bulk of results will guide us toward the specifications that should be incorporated for improving information retrieval. This, the implicit objective of all proposed methods to date, it is also our main concern here, focusing on the transactional analysis of log files registered in OPACs.

Transactional analysis is a relatively new data gathering technique. It allows us to record and study human behavior in a non-intrusive fashion.<sup>8,9</sup>

For Peters,<sup>10</sup> transactional analysis is the study of interactions registered electronically between online systems of information retrieval and the persons who search for information contained in these systems. A transaction consists of a question put forth by the user and a response given by the system. Therefore, transactional analysis is a technique for observing user conduct and a means of reconstructing how the user interacts with the catalog, and whose final objective is to contribute to an improvement in the designs of the system.

The present contribution describes a research study based on the analysis of transactional files, so as to characterize the behavior of users in their online catalog searches.

## LITERATURE REVIEW

The evaluation of catalog use first became a reality when OPACs were introduced into libraries in the mid 1980s. Transactional Log Analysis (TLA) of the operations carried out by

OPAC users, arose at the end of the 60s, and truly took off in the 80s and 90s, with considerable research surrounding TLAs and different aspects of user interaction with the OPAC.

Subject searching has been identified as the type of search presenting most problems for the user. Many are the alleged culprits: the query software, the interface, the system and policy behind indexing, the lack of knowledge on the part of users regarding the list of subject headings, and the shortcomings of the Boolean model.

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The first large-scale study was undertaken by the U.S. *Council on Library Resources*<sup>11</sup>; and one of its major revelations was that the surveyed libraries tended to use subject searches in the online setting despite the fact that they were the ones considered as most problematic for the user, and research also shows that success rates are surprisingly low. Yet ironically, they are the top preference for this setting;<sup>12-14</sup> so subject searches must be better directed in online catalog environment.

Most catalog studies to date have focused on subject searches, rather than on the searches for known items. This is logical given that the former type is more difficult for the user. Larson<sup>15</sup> identifies the main problems of access by subject heading in the OPACs, such as the user's lack of knowledge of the Library of Congress Subject Headings (LCSH), problems of the LCSH *per se* with mechanical and conceptual aspects of the formulation of questions, searches that retrieve nothing and searches that retrieve too much, and searches whose retrievals do not coincide with what the user had in mind. In a discussion about the roads of access by subject matter, Roe<sup>16</sup> likewise underlines some of the problems described by Larson when searching by subject headings in catalogs that use Web interfaces. Yet Larson<sup>17</sup> found, as well, that subject searches were more likely to fail (giving either insufficient or excessive yields) than to succeed: in a very large university library, only 12 percent of the searches by subject recovered a number of items somewhere between one and twenty.

The variables intervening in the success or failure of a search are, then, numerous and varied. Many of the errors detected could no doubt be remedied by investigating and identifying the particular sources of trouble, on the part of the system and on the part of the user.

Familiarity with both the search domain and the catalog, for instance, can be seen as crucial for the success of the searches involving LCSH.<sup>18</sup> Authors like Drabenstott,<sup>19</sup> Novotny,<sup>20</sup> and Sihvonen and Vakkari<sup>21</sup> show how expert users in a given domain obtain better results in their searches by subjects than do the non-expert users.

Furthermore, we must consider the diverse type of users present in any given library, proceeding from different socio-cultural contexts. Users with a firm knowledge of an area are assumed to use the subject search less, and perform more searches by author or title. A survey by Frost<sup>22</sup> reveals that some 54 percent of users resorted to a subject search always or very frequently, though in using LCSH they had great difficulties in

correctly identifying the subject matter and making their terms coincide with the catalog language. Different studies carried out in this sense<sup>23-27</sup> provide discrepant figures as to query by author, by title or by subject, as seen in Table 1.

Ferl and Millsap,<sup>28</sup> in studying the way that the users of the MELVYL catalog of the University of California focused their searches, confirm that non-professional users effect subject searches around 51 percent of the time, while professors, graduate students and library staff use them on just 15 to 20 percent of occasions.

This suggests that, regardless of the degree of knowledge of an area and the search skills of the individual user, the strategies actually applied entail familiar terms; that is, known author and/or title. Wyly,<sup>29</sup> who identifies the points of access of the bibliographic records that users reported as “most useful”, discovered subject headings to be used in only 26 percent of searches.

The bulk of literature has thus far focused on students as catalog users, neglecting other populations. Clearly, a more complete panorama of catalog use is needed. The contribution of Frost<sup>30</sup> is enlightening for instance, revealing that only 27 percent of surveyed professors utilized the subject search, with a very low use of LCSH. Similarly, Tagliacozzo and Kochen,<sup>31</sup> as well as Ciliberti et al.,<sup>25</sup> conclude that the better the background knowledge of the user, the fewer the searches by subject, and the greater those by known item (author or title). A further study, in this case with the online catalog of the University of Wisconsin-Madison<sup>32</sup> to identify the strengths and weaknesses of the system from the user's perspective, distinguishing between undergraduate students, graduate students, and professors, found that the graduate students and professors used the subject searching as a last resort, whereas the undergraduates made a more habitual use of it.

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**“The bulk of literature has thus far focused on students as catalog users ... [this study] makes an effort to provide new information about the behaviour of the different user types of a large library in the queries through its OPAC.”**

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Such is the background of the present study, which makes an effort to provide new information about the behavior of the different user types of a large library in the queries through its OPAC; our log file analysis during a two-month time period will serve to support, undermine, or shine light on the results of previous authors.

This research was focused on the transactional analysis registered in the system with the following objectives in mind:

1. Analyzing the level of use of the catalog of a large academic institution.
2. Examining the type of search (browsing or querying search) that is performed most frequently, by the academic community and by outside users.
3. Investigating, from a sample of search transactions made by browsing, which correspond to queries by author, title, or subject.

**Table 1**  
**Query by Author, Title, or Subject**

	Kaske (1988)	Peters (1989)	Hunter (1991)	Zink (1991)	Wyly (1996)	Ciliberti, et al. (1998)	Holloman (1999)	Sridhard (2004)
Number of searches analyzed	165,083	9565	3707	6118	795,810	441	5479	–
Author	24.10%	22.3%	21.4%	13.4%	13%	44%	5.7%	26.8%
Title	28.51%	34.3%	25.5%	19.3%	25%		11%	38.3%
Subject	47.36%	31.9%	51.8%	49.3%	26%	56%	83.3%	30.7%

4. Analyzing, by major areas of knowledge, the type of search conducted within each, so as to establish some behavioral patterns of users.

### MATERIALS AND METHODS

The Library of the University of Granada (LUG), founded in 1531, has the main mission of facilitating bibliographic and documentary material geared toward research and teaching by the university community. The University of Granada occupies some thirty buildings within the city of Granada, most of them concentrated in two basic campus areas, yet also takes in smaller satellite universities in Ceuta and Melilla.

The organizational structure of the LUG is that of a system of libraries, formed by the Central Library and the different libraries of the Schools and Departments of the university district. There are a total of twenty-one libraries, containing collections from mainly all disciplines, each library housing the materials specific of the area of knowledge imparted there.

The bibliographic collections, at the time our study began, amounted to 841,766 monographs; in addition to periodical publications, rare books, and other collections in a variety of formats. The aggregate of library users comprises all the members of the university community, which can be broken down as:

- Professors: 3232
- Students: 61,747
- Administrative and service staff: 1745

The automated catalog allows browsing searches (by author, title, or subject) and querying.

The policy governing subject indexing developed by the LUG is based on the use of the LSCH, in its Spanish version, under the auspices of the Organization of American States (OAS), with slight modifications. For instance, it was decided to transform subjects to descriptors in order to avoid duplications of the different types of subheadings that would appear with the use of a precoordinated system.

#### Use of the LUG Catalog

Our objectives were fourfold:

1. To analyze the levels of use and effectiveness of the OPAC.
2. To examine what type of search strategy (browsing or querying search) was carried out most frequently, both by the university community and by the outside users.

3. To investigate – on the basis of a sample of search transactions made by browsing – the proportions of queries by author, title, and subject.

4. To analyze, by major areas of knowledge, the kind of search carried out to observe the behavioral parameters of users.

A comprehensive analysis of authors, titles, and subjects consulted was beyond the scope of the present study due to the unavailability of this information. It is our hope that in the future these data may be fully registered by the system, thus permitting its study and evaluation. This limitation does not only affect the LUG catalog, but also OPACs in general, complicating research.

The OPAC of the LUG is a union catalog that services the entire University of Granada, and has been functioning since 1989. Like any other union catalog, it allows querying from any part of the University, regardless of where the bibliographic material is actually located, and attends to queries made from outside the institution, being available on Internet since 1998.

The catalog is accessed by the computers (OPACs) in all centers belonging to the University of Granada, with a graphic interface to facilitate use (<http://adrastea.ugr.es>). Fig. 1 shows the page at the time of our study, on the left; and the current aspect, on the right.

At the time of the study, there were two search options for catalog use:

- Browsing searches: either by author, title or subject, and through their respective authority control files.
- Querying searches: they allow simultaneous queries, in several fields at once.

The catalog also offers the possibility of accessing monographs and documents from the database in other formats. It likewise facilitates searching by subcatalogs of the collections in a specific library.

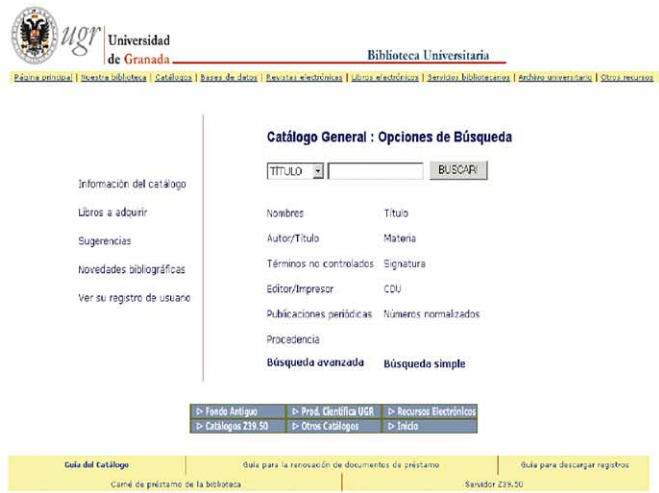
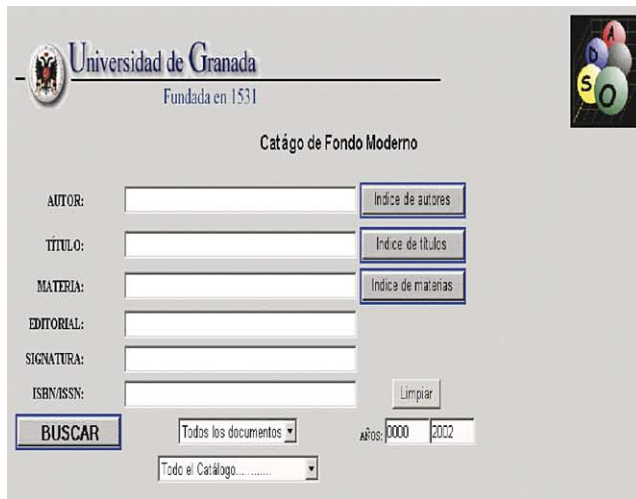
The data of study correspond to the log files of OPAC queries made between February 2001 and February 2002, with a total of 1,114,720 transactions. The information contained in the log files included the type of transaction made by the user and the IP (Internet Protocol) address of the computer from where it was made, as shown in Table 2.

The centers of study, divided into administrative buildings and teaching centers, came to a total of 27.

For the purposes of the study, the different computers of each center were grouped according to the type of user. Thus:

- a) Professors, in the offices of the University Professors.
- b) Library, in all the libraries and available to all users.

**Figure 1**  
**University of Granada Search Page—Before and After**



- c) Classrooms, which may be used by teachers or students.
- d) Library staff, in the offices of University Library personnel.

Log file analysis has a number of useful aims, though it also has its share of limitations.<sup>10,33,34</sup> One traditional use has been to study the failure rates of users in their searches, yet it does not offer a general scheme of user behavior.

Another useful application is as a management tool, to enhance the development of collections, search modes, authority control management, and the yield of online systems, as well as user success with them. Remarkably, however, very little use is made of this type of file. Overall, few libraries utilize these files.

Log file analysis entails a problem of uncertainty about the precise beginning and end of every transaction; and so it is difficult to determine how many interactions each user engages in. This has repercussions for the recount and the processing of these files. As shown in Table 2, the log files note the exact time when the transaction takes place, but this datum is not discriminatory enough to establish, without a doubt, the query sessions of each user. In our study, therefore, the variable “time of consultation” was excluded.

Log file analysis should be complemented with other techniques to provide optimal results for the study of OPAC use. We chose to look into both GET and POST transactions. GET is a method defined in http protocol for obtaining resources

such as files; and when applied to OPACs, it identifies the connections made with the catalog. The POST method is used to send a set of data to the server for processing, and in our case these transactions were generated by the system each time an OPAC operation was carried out. The latter proved more useful in the sense that it allowed us to identify exactly how the catalog was employed, and therefore can also provide reliable parameters to help designers introduce necessary improvements.

Through the study of these variables, the first objective of our research was achieved. For other objectives, we proceeded to analyze a sample of 200,000 catalog transactions made during two months (January and February of 2002).

To study searches by areas of knowledge, we grouped together the teaching centers belonging to the same major realm of knowledge, computing the transactions of each, then calculating by area. Table 3 shows the students of all the schools of the University of Granada regrouped by general area of knowledge.

The log files were exported to an Access database for processing. After cleaning up the files, queries were generated to extract numerical results and produce the corresponding graphic representations.

Finally, statistical analysis of the results was performed, with the “chi” squared ( $\chi^2$ ) test. As mentioned by authors Moya, López, and García,<sup>35</sup> this test determines whether the frequencies of the values of any given variable of study obtained

**Table 2**  
**OPAC query log files**

IP	Date	Type	Query
213.99.225.XXX	18/09/01 22:20:46	HEAD	cgi-bin/cgi-bin/wrap HTTP/1.0" 404 0
213.99.225.XXX	29/09/01 0:34:03	GET	cgi-bin/cgiforum.pl HTTP/1.0" 404 280
213.99.225.XXX	29/09/01 0:33:57	GET	cgi-bin/cgiforum.pl HTTP/1.0" 404 280
150.214.18.XXX	20/11/01 10:48:05	POST	cgi-bin/combina HTTP/1.0" 200 1
150.214.39.XXX	05/10/01 13:54:43	POST	cgi-bin/combina HTTP/1.0" 200 1

**Table 3**  
**Areas of Knowledge at the University of Granada**

Experimental Sciences	Engineering	Humanities	Health Sciences	Social Sciences and Law
Sciences	Architecture	Arts	Nursing	Law
	Technical Architecture	Information Science	Pharmacy	Economics & Business
	Civil Engineering	Education	Medicine	Sports Science
		Philosophy	Dentistry	Public Administration
		Translation		Psychology
				Social Studies

empirically differ, to a significant extent, with those that would be derived from a certain set of theoretical assumptions. The applied formula is:

$$\chi^2 - \left( \sum_{ij} \frac{O_{ij}^2}{E_{ij}} \right) - T$$

where  $O_{ij}$  represents the observed frequencies,  $E_{ij}$  the expected frequencies, and  $T$  the total frequency. In this way, the internally homogeneous groups are determined, as well as those differing significantly in their proportions.

**RESULTS AND DISCUSSION**

The magnitude of the transactions made in an OPAC gives a rough idea of the usefulness of this tool. We give the results of the 1,113,904 transactions involving the LUG OPAC.

**Level of Use and Effectiveness of the Opac**

Table 4 shows the total values and percentages of the UGR transactions along with the levels of success. We distinguished between queries initiated within the University of Granada and those originating elsewhere in Spain or abroad.

A GET transaction identifies the number of connections made to the catalog, whereas the POST transaction indicates the number of operations that were made once connected. This is the reason for the much higher figure for POST transactions: one GET operation can result in several POST transactions.

As seen in Table 4, the success rate for both types of transactions is quite high, indicating that the OPAC was quite consistently available for consultation, from within or beyond the University premises.

	<b>Table 4</b> <b>Total of Get and Post Transactions</b>			
	<b>Get</b>		<b>Post</b>	
	<b>Total</b>	<b>Successful</b>	<b>Total</b>	<b>Successful</b>
University of Granada	124,693 (78%)	116,872 (81.92%)	828,612 (86.85%)	825,392 (86.96%)
External searches	35,160 (22%)	25,798 (18.13%)	125,439 (13.29%)	123,796 (13.04%)
Total	159,853 (100%)	142,673 (100%)	954,05 (100%)	949,188 (100%)

*Get and Post Transactions by Terminal*

The mean percentage of participation according to terminal location is shown in Table 5.

The following observations can be made:

- a) In order of use, the computers most often connecting with the catalog are: Library, Professors, Library staff, and Classrooms.
- b) The School of Library and Information Science is the one with the highest figure for catalog connections from the Classroom computers. There are two reasons for this: firstly, the characteristics of these studies call for greater access to the OPAC; and secondly, the student is more familiar with this tool and more likely to use it.

As for the POST transactions broken down by computer location, the greatest proportion stems from Libraries (72.07 percent), followed by Professors (31.35 percent), Library staff (17.34 percent) and Classrooms (10.62 percent). Most connections were made from the libraries (mean values of 57.19 percent for GET and 72.07 percent for POST), followed in importance by Professors (mean of 41.66 percent for GET and 31.35 percent for POST), Library personnel (17.15 percent for GET and 17.34 percent for POST), and finally Classrooms (11.73 percent and 10.62 percent, respectively). This leads us to:

1. The perception of these tools as a support for research and teaching is determinant in their use. The user is accustomed or predisposed to go to the library for connection, and proceeds first to conduct the search, then tries to find the desired book on the library shelves. This is also pointed out by Ercegovic<sup>36</sup> and Hsieh-Yee,<sup>37</sup> who showed that between 86 percent and 88 percent of the population resorts to the physical space of the library for catalog searches.

**Table 5**  
**Average Participation by Terminal Location**

Computer terminal	<b>Get (%)</b>	<b>Computer terminal</b>	<b>Post (%)</b>
Libraries	57.19	Libraries	72.07
Professors	41.66	Professors	31.35
Library Staff	17.17	Library Staff	17.34
Classrooms	11.73	Classrooms	10.62

2. The professors tend to see the catalog as an important tool, with both informational/academic and investigative functions. Although the non-academic staff may also be present in the Professor offices, most of the catalog queries are made from their offices.
3. Library staff engage in very few connections because they dedicate most time to other tasks. We might deduce that many connections have their origins in user requests.
4. The poor results of Classroom terminals suggest that there is a need for University Professors to heighten student awareness of the importance of research possibilities, which would entail greater catalog use. In the School of Library and Information Science the case is somewhat different, with the highest level of connections – a total of 1003 (representing 25.39 percent of the GET and 47.83 percent of the POST transactions) – higher than the larger centers such as Humanities or Science. Also deserving mention is the fact that the technological infrastructure of the LIS Classrooms is superior.

**Search Type: Browsing vs. Querying**

The interface design is an important factor that greatly influences success in OPAC searches, as well as determining the type of search that may be conducted. Retrieval tasks can be divided into two major categories:<sup>38,39</sup>

- The specific search – querying – undertaken when the user knows fairly precisely which is the sought information, and looks along the available terms of the database which would produce the desired document.
- Browsing through the files of the access points. This is an adequate mode of browsing when the information desired cannot be expressed with precision. The system must help the user, by leafing through documents, to locate the information in question.

These two search types, as understood by Marchionini,<sup>40</sup> exemplify the wide variety of search strategies and focuses that may be represented in the design of interfaces for library computer catalogs.

The analytical search strategies are more object-oriented, more systematic and formal, and therefore better planned and effected. They are used more often by experts in the area of knowledge or persons skilled with the interface. Search strategies by browsing require a lesser cognitive effort on the part of the user, and so their success depends more heavily on the potential of the interface. In addition, they imply greater interactivity and informality, and may be preferred by the less skilled users, when there is not a clear conception of the information to be located and the objectives of the search are not well defined. Marchionini<sup>40</sup> analyzes the wide variety of browsing activities, summing them up as three basic types: directed or specific browsing, semi-directed browsing, and undirected or general browsing.

**“Search strategies by browsing require a lesser cognitive effort on the part of the user, and so their success depends more heavily on the potential of the interface.”**

The OPAC of the LUG allows both analytical and browsing searches. Our research evaluated each one by centers and by facilities, in order to see whether it is possible to establish or characterize akin search behaviors among the different users of the multiple University of Granada on the premises.

Out of the total successful POST transactions (660,742) for analytical searches and browsing searches involving the University catalog (Table 6), the greatest proportion is seen to correspond to the University itself (86.39 percent), with external consultation representing 13.61 percent of searches.

If we break these results down as University vs. external searches, and for the two types of searches, we see that on the whole the University conducts a slightly greater percentage of searches by browsing. In the case of the external searches, the trend is reversed, with more searches involving the analytical options. This would suggest that the outside user in fact has a better knowledge of the catalog to be consulted.

*Types of Searches by Centers*

The total participation of the centers of the University gives a result of 570,204 searches (Table 7). Most of these were originated in the computers of the libraries (74 percent), followed by professors (11 percent), library personnel (10 percent), and classrooms (5 percent).

Despite the fact that all the facilities have computer infrastructure and that the OPAC of the LUG can be consulted from any terminal, we see that the library continues to be the most widely used scenario for any sort of query. The justification may lie in one of the following findings:

1. OPAC consultation within the library implies the immediate localization and easier access to the material sought.
2. Accordingly, the concept of virtuality is restricted by the amount of full-text digital resources that a library offers. If for instance the University library system provides for full-text monographic sources through the OPAC, the rate of consultation from outside the library itself would increase considerably.
3. The low use registered from other branch offices may be traced to specific needs on the part of different user aggregates: the professors consult journals (not included in the OPAC) more often than monographs.
4. Because the library is the center most often used for consultation, we should encourage its development within the digital setting. As Chepesiuk states<sup>41</sup>, when a user is

**Table 6  
Total Successful Post Transactions for  
Analytical/Browsing Searches**

	Post		
	Analytical search	Browsing	Total
University of Granada	278,409 (84.31%)	292,405 (88.46%)	570,814 (86.39%)
External searches	51,799 (15.69%)	38,129 (11.54%)	89,928 (13.61%)
<b>Total</b>	<b>330,208</b> <b>(100%)</b>	<b>330,534</b> <b>(100%)</b>	<b>66,0742</b> <b>(100%)</b>

**Table 7**  
**Total Participation of University Centers**

Computer terminal	Analytical search	Browsing	Total	%
Professors	27,758	35,450	63,208	11
Libraries	213,128	211,073	424,201	74
Classrooms	13,761	14,694	28,455	5
Library staff	23,762	30,578	54,340	10
Total	278,409	291,795	570,204	100
Total (percentage)	49%	51%		

asked how often he consults Internet and how often an OPAC, the response should amaze us.

Summing up:

- The user goes to the catalog only when it is needed, and does not foresee its use as a bibliographic tool. We might say that the OPAC search in the library is associated with the immediate localization of the desired material, and therefore with its accessibility.
- Accordingly, the concept of remote access is not a key issue in user awareness, judging from the low rates of catalog queries from other facilities. It would seem that the user looks to the physical space of the library for consultation, and to the nearby presence of the library personnel in order to help out when in doubt. If the library is the place where users, immersed in a world of digital resources, feel most comfortable in making queries, we should bear this in mind in conceiving new directions for the library as an institution, and adapt computerized tools and techniques accordingly. The close connection between libraries and their catalogs calls for some reflection on what type of information and services should be improved.

Technology is affecting the way that we relate to each other and the way we search for knowledge or information. At present, the localization of information is no longer conceived without the figure of the computer. The electronic environment is also producing a cognitive change in the way we interact with technical devices, and the OPAC is no exception. Marchionini<sup>40</sup> observed how people use both paper-bound encyclopedias and electronic ones; the electronic setting entailed greater difficulties, due to vast yields of information and to problems in the consultation of indexes.

The limited utilization of the current OPACs may lead us to think that they do not have such mechanisms. The library catalog has always been viewed as a tool for the location of the resources of said institution; it only offers documentary substitutes of the primary sources and the physical location, represented by topographic signatures. This is the justification behind the greater use of the library than other facilities for obtaining specific information; that is, the user resorts to the library OPAC because after query he or she may wish to consult the original document, if it has not been viewed by other means.

We believe that if another series of full-text digital resources were incorporated into OPAC records, we would be able to

claim authentic “virtuality” of the system, and the user would learn to locate information regardless of physical location.

Consultation on the part of Professors and by the Library Staff is similar in percentages (11 percent and 10 percent, respectively). It would appear that library staff only use the catalog to solve specific matters of the search for information related with their activity. Meanwhile, the low percentage of the Professors suggests that they normally carry out queries through intermediaries, soliciting the services of the library personnel or else personally going to the library to make the search, regardless of having the adequate infrastructure right in their offices for consulting the catalog on their own.

Very similar results were obtained regarding the type of consultation made: 49 percent of searches were analytical, while 51 percent were effected through browsing over the period of study.

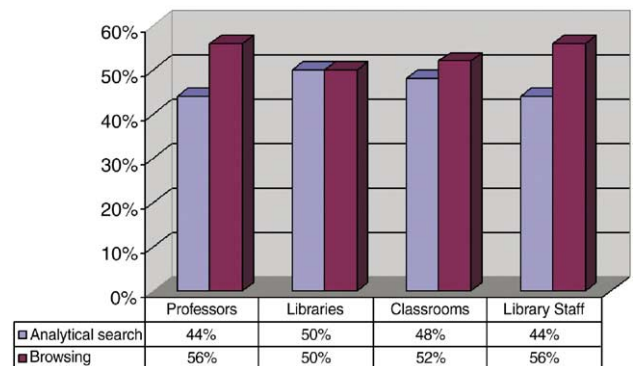
The breakdown of these results by centers, as shown in Fig. 2, reveals that browsing predominates to some degree over analytical searches in all locations except the library OPACs, with an even 50/50 percent tie.

One factor that may bear an impact on the popularity of browsing searches is the fact that most libraries have their collections at the disposal of the user in the modality of free access and organized by subject matter, making it easy for a user who simply knows the author name or the title of a work to pinpoint the information. Analytical searches require a more detailed knowledge of the information desired. Thus the user normally proceeds by locating a familiar author or title; and are largely oriented by bibliographic data supplied by professors.

Taking into consideration these findings, we ask ourselves:

1. If the library terminals are the ones most used by the university community, are there sufficient computers for the needs of all users, or should we better equip the library in terms of technical infrastructure and personnel?
2. How great is the degree of satisfaction of users with the services provided by the library on the whole?
3. Should we promote the formation of users and the awareness of professors in order to motivate the student body to acquire greater skills and view the library as a vital service for their academic and professional formation?

**Figure 2**  
**Total Searches by Computer Terminals**



**Table 8**  
**Comparison Between Computer Terminals (a)**

Computer terminal	Author	Title	Subject	Total	%
Professors	3745	3603	749	8097	13
Libraries	16,153	21,360	6807	44,320	72
Classrooms	837	757	217	1811	3
Library staff	2201	4586	512	7299	12
Total	22,936	30,306	8285	61,527	100
Total (percentage)	37%	49%	14%		

(a) Extracted from the total of University searches 61.527.

4. Would it be necessary or beneficial to integrate into the catalogs some other type of digital resources in order to capture the attention of those groups that scarcely use library services?

In view of our results it seems so; and while not many studies come to support this hypothesis, we are convinced that this would be one way to get users to access the catalog for the first time and discover the amount of informative resources therein.

When both the academic community and the Library community gain awareness of the great importance of the library, and of its catalog as a catalyzing instrument for the needs of its users, we will be able to conclude that we are doing our job as teachers and library staff.

**Searches by Browsing: Author, Title, and Subject**

Having looked at the analytical searches vs. browsing searches, we now consider the results of the use of the LUG catalog in its different browsing search options: author, title, or subject.

Despite fairly commonplace use of the subject search in the online environment, it presents a number of problems.

The earliest large-scale research on OPACs, undertaken by the Council on Library Resources in the early 80s, showed the search by subject to be of great value to users.<sup>11</sup> This and later studies indicated that subject access was one of the predominating areas of interest in the OPAC realm. Yet as databases grew, many of the searches gave less precision in retrieval, more and more often serving up far too many documents, leaving the user with a sense of frustration.

Work in this area suggests that these are the two main problems requiring our attention: failures in searching, and overloads of information.<sup>42,43</sup> They are also the reason why subject searches, while highly valued by users, are little used today in comparison with the author or title searches.

*Breakdown by User Aggregates*

Table 8 represents the total percentages of queries made using the different browsing options over the total queries made to the catalog from the University of Granada.

From the total queries executed under this fashion (61.527), those made from the Professor and Library terminals represent a homogeneous group insofar as the total percentage of queries goes (13 percent and 12 percent, respectively), with a significant difference between Library and classroom use (72 percent and 3 percent, respectively). This means that whereas the Professors make the same use of the catalog, the libraries

are the places with the greater percentage of usage, and the classrooms the least used. These results come to support those shown in Table 7.

In general, and differentiating by type of search through browsing, the results conclude that the LUG user first attempts search by title (49 percent), then by author (37 percent) and as a last or least frequent resort, the subject search (14 percent).

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Larson,<sup>15</sup> in identifying the main problems of access by subject in current OPACs as the lack of user knowledge of the subject headings, and conceptual obstacles in the formulation of queries, also came to the conclusion<sup>17</sup> that the subject search yielded the lowest probability of success—12 percent, whereas Seal, Bryant and Hall<sup>44</sup> saw that 17 percent of queries were subject searches.

Our findings with the LUG catalog are along these same lines: despite improvements in catalogs over the years, the user continues to encounter major problems in information retrieval by this means.

*Global Analysis of Facilities by Type of Search*

The breakdown of these results (Table 9) reveals that the Professors use similarly author searches (46 percent) and title searches (45 percent); these percentages are very close in the case of connections made from the classrooms (46 percent for authors and 42 percent for titles), whereas the Library staff and library users look more often by title (63 percent and 48 percent, respectively). In all the groups analyzed, the subject search is the least used, ranging between 7 percent and 15 percent.

The reasons behind this low rate of search by subject would be:

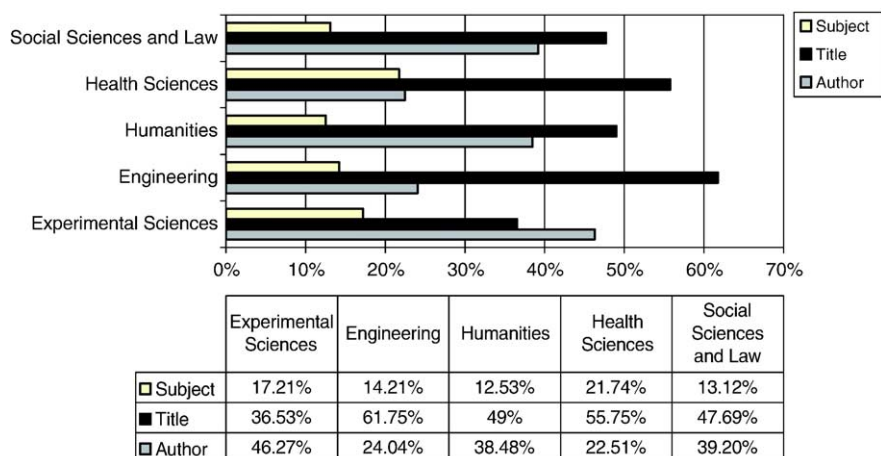
1. The underdevelopment – lack of elaboration and updating – of the lists of subject headings in the LUG. The policy for assigning subjects in the catalog may be responsible, leading to an indexing that is too general, with a low number of subjects assigned to documents overall.

**Table 9**  
**Global Analysis of Facilities by Type of Search\***

Computer terminal	% Total University	Author (%)	Title (%)	Subject (%)
Professors	13	46	45	9
Libraries	72	37	48	15
Classrooms	3	46	42	12
Library staff	12	30	63	7
Total (percentage)	100	37	49	14

\* Extracted from the total of University searches 61.527.

**Figure 3**  
**Searches by Browsing (Author, Title and Subject) by Areas of Knowledge**



2. The lack of use of a controlled vocabulary with a strong syndetic structure to orient and guide searches.
3. Lack of familiarity on the part of the user facing the controlled vocabulary.
4. The inadequate design of the graphic user interface for the realization of this type of query.
5. Limited emphasis in courses for user formation on the acquisition of skills allowing for maximum yield from an OPAC.

*Searches by Browsing (author, Title, and Subject) by Area of Knowledge*

Fig. 3 presents the total percentual results of the searches by author, title, and subject matter for the five areas of knowledge described above. The searches by author and title are those preferred by the users of all five areas, while subject searches are the least used. The Experimental Sciences comprise the area where most searches are conducted by author (46.27 percent); and Engineering being the area where most are done by title (61.75 percent). Out of the subject searches, the area making greatest use is Health Sciences (21.74 percent), and the one using it the least is Humanities (12.53 percent).

A second look at these results, under a different perspective, shows the following.

**Professors.** In all the areas, the most solicited searches are those by author and title, and those by subject are consistently the least used (Table 10).

The Experimental Sciences are the area using author searches the most (52.06 percent); title searches are the most frequent in the Health Sciences (65 percent). Subject heading searches are the top preference in the schools of Engineering (15.98 percent) and are used the least in the Health Sciences (6.34 percent).

**Libraries.** From the terminals situated in the libraries, more queries are made in all five areas (Table 11). The author and title searches continue to be the ones preferred by users, and the subject searches the least used, ranging from 14.07 percent in the area of Humanities to 24.7 percent in the Health Sciences.

**Library Personnel.** The library staff also carries out more author and title searches than by subject heading search, as can be seen in Table 12.

The Experimental Sciences perform 69.38 percent of their author searches, while Engineering conducts 72.75 percent of

<b>Table 10</b> <b>Searches by Browsing (Author, Title and Subject) by Area of Knowledge in Professors' Computer Terminals</b>			
Area of knowledge	Author (%)	Title (%)	Subject (%)
Experimental Sciences	52.06	35.59	12.35
Engineering	32.47	51.55	15.98
Humanities	44.44	47.09	8.47
Health Sciences	28.17	65.49	6.34
Social Sciences and Law	47.35	44.69	7.95

<b>Table 11</b> <b>Searches by Browsing (Author, Title and Subject) by Area of Knowledge in Libraries Computer Terminals</b>			
Area of knowledge	Author (%)	Title (%)	Subject (%)
Experimental Sciences	38.23	40.85	20.92
Engineering	23.96	59.17	16.87
Humanities	38.66	47.26	14.07
Health Sciences	24.1	51.2	24.7
Social Sciences and Law	37.97	47.27	14.75

**Table 12**  
**Searches by Browsing (Author, Title and Subject)**  
**by Area of Knowledge in Library Personnel**  
**Computer Terminals**

Area of knowledge	Author (%)	Title (%)	Subject (%)
Experimental Sciences	69.38	23.2	7.42
Engineering	23.61	72.75	3.65
Humanities	25.68	66.9	7.42
Health Sciences	13.65	67.53	18.82
Social Sciences and Law	30.74	64.89	4.38

title searches. Within the subject search, the highest rate is seen for Health Sciences (18.82 percent).

### CONCLUSIONS

The results presented here and our interpretation thereof lead us to the following conclusions with respect to the proposed aims of our study.

1. Despite the mentioned limitations, the number of connections made to the catalog of the University during the period of analysis provides sufficient data so as to arrive at statistical inferences.
2. The search for information is not associated with the use of the library but to rather with the desire to locate a document in it. Therefore, there is a correlation between the two activities. This means that the OPAC is well consolidated as an instrument for access to key information, a role continually strengthened by the growing amount of information available through electronic formats.
3. With such a wealth of electronic resources, there is no need for libraries to be identified, generally speaking, as book depositories. The user should further develop a sense for the virtuality of information. This trend can be fostered with the integration of electronic resources through the OPACs. Therefore, the achievement of dynamic catalogs should become a fundamental objective for libraries.
4. Our data prove that, overall, there is no clear user preference with regard to browsing searches vs. querying searches.
5. The fact that the user consults the catalog more often through the modality of browsing demonstrates that he or she does not have a very clear idea beforehand of what they are looking for. If the cognitive infrastructure is not adequate, the search for information will be conducted in trial-and-error fashion, regardless of the possibilities and sophistication of the system.
6. It has also been seen that the users with better preparation, more knowledge of the information sought, and a greater familiarity with the OPAC will make their queries from the analytical search option in a greater proportion. This is the case of the Professors, with high utilization from their offices.
7. These results point to a characteristic use in the University of Granada of a strong preference for searching by title (49 percent), followed by searches by author (37 percent), and finally, by subject search (14 percent). Our findings come to support the results of previous authors, highlighting the

inherent difficulties and reduced interest surrounding searches by subject.

8. As for the subject searches, the Experimental Sciences and the Health Sciences are the two areas of knowledge that conduct more of these type of searches, with the lesser rate of said searches corresponding to Humanities, Law, and the Social Sciences. This can be attributed to the comparatively rapid evolution of scientific literature in the areas of the Science as opposed to the Humanities, and therefore, the needs for obtaining precise information are greater in the Sciences. Moreover, the users in these areas are more accustomed to the use of library catalogs and other databases for serving their investigative purposes.

We also come to the evident conclusion that the interface of the OPAC of the University of Granada was not optimal for serving user needs, with apparent limitations in its design, a lack of screens for assistance, a deficient system of searching by subject heading, and very limited search options. Precisely, studies like this one should serve as grounds for decisions to change the Integrated System of Library Management of the LUG, to offer another system contemplating all these possibilities in its query interface.

Yet as we already know, improvement of the interface cannot be the only line of effort in developing a system of library consultation. Aspects such as the technological factor, mechanisms for the better use of information stored in log files, or the heightened preparation and awareness of the user in regard to search techniques, are areas that deserve further attention. Comparative studies of the results published here with new data gathered from the updated catalog (featuring access to electronic journals) will be the basis for future work on our part.

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