Information Search and Retrieval in Digital Environment: A Case Study of Marine Sciences Students of Goa University

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INTRODUCTION

Users today are so influenced by the online and digital media of information that they want to take advantage of these automated systems for retrieving information for various purposes. In developing countries-especially in India, people are lacking the knowledge to use the right combinations of steps to carry out the information retrieval search process. Therefore, there is an urgent need to make the users literate in searching and retrieving the information in a digital environment.

OBJECTIVES

Following are the objectives set for the study

- To find out the knowledge possessed by the users about search techniques used in digital environment.
- To find out if the users have knowledge about search engines.
- To find out if the users have sufficient knowledge about the usage of online public access catalogue (OPAC).
- To identify the digital literacy of the users.

SCOPE

Goa University was established in the year 1985 with 13 teaching departments and 17 affiliated colleges. Over the past years, the university has steadily expanded its dimensions, both in the number of colleges affiliated as well as the diversity of the courses it offers. Goa University is the only institute in Goa offering master degree in marine field which include marine microbiology, marine science and marine biotechnology for a period of 2 years.

The scope is restricted to the students undertaking post graduate degree in these departments.

LITERATURE REVIEW

For the sake of convenience and to understand the topic in a broader way, the review has been conducted on the following aspects:

It is a common thing to see not only the students, but people around the world utilise the web as their primary information search vehicle, Browne, Pitts & Wetherbe (2007). According to Hilliger & Roberts (2001) the World Wide Web offers great potential in supporting learning by transforming the access to resources, especially remote access to full text journals and databases. Due to the complexity and rapid technological changes in digital environment the users are not able to make their information choice, Mishra & Mishra (2010). Therefore the ability to search and retrieve useful information effectively has become an important part in academic life of the students, Frier (2001). Fourie (2007) states that there is continuous increase in searching the internet by a wider population. A survey carried out by Peciuliauskiene, Barkauskaite & Borodiniene (2010) revealed that 92.8% of the respondents information for study on the internet. It was found that internet is used as the source of information for study, by three times bigger percentage of the respondents' population. A number of studies have been undertaken in relation to the search skills in digital environment. Gordon & Pathak (1999) conducted a study on search engines and compared the measures of recall and precision with that of 8 search engines. Hargittai (2002) studied at the different patterns in people's information...
retrieval behaviour online. Haw, et.al., (2006) has examined the importance of intranet search engines with reference to the D’Galaxy intranet search engine. Moraveji, Morris & Morris (2010) have discussed how researchers can improve the manner in which students learn to search the Internet. Kumar & Vohra (2011) have studied the usage of OPAC in information retrieval through various search capabilities. Shariff et.al. (2011) conducted a search to evaluate how nephrologists use online information sources for patient care. Lau & Goh (2006) analysed the transaction log of University OPAC to identify query and search failure patterns. Dinet, Favart & Passerault (2004) examined the use of Boolean operators and evaluated the impact of information search expertise in OPAC.

With the advent of web, a new category of searching now presents itself, Jansen & Pooch (2001). Even though speed, directness and ease of use were found to be the advantages of Internet, Martzoukou (2008), a huge amount of information is also generated. Therefore, the users have to face the information overload as a result of which possessing the necessary skills and knowing the various techniques to retrieve the information has become the ultimate need in this digital era. To overcome this problem, the users should possess the necessary skills to retrieve the information. As Hess (1999) suggests, "Merely browsing sites haphazardly is not recommended. Information skills training may be a major step in the refinement process.*

INFORMATION SEARCH IN DIGITAL ENVIRONMENT

An information search begins with a user’s problem. The gap between the users’ knowledge about the problem or the users’ information needs to solve a problem is the information need. The users’ state is dynamic, not static and may change during the search process, Hess (1999).

With the change in technology, information users have shifted from print media to the digital media to use a variety of information resources like online databases, CD-ROM databases, OPACs, internet, digital libraries etc. Spink, et.al (1998) states that as the users learn or progress in their work, or as they clarify a problem, or as their situation changes, the users come back to the retrieval systems to conduct more searches and this process of repeated successive searching of digital environments over time to solve an information problem is called a successive search phenomenon.

According to Sridhar (2007), ICT has enabled access to enormous information instantaneously irrespective of time and place. But this "access to excess" results in serious consequences. This is because in traditional libraries, the professional librarians were first selecting the material and then allowing the users to access them, whereas now, the users have to access and retrieve a large amount of information material and then start selecting the required information from millions of hits. The information should be filtered before using.

There are many internet-enabled services available today but the primary use of the internet is for information retrieval. A search engine is a program designed to find information on the Web. Gordon & Pathak (1999) states that "Internet-based information retrieval would collapse if search engines were not available; without search engines searchers would be about as successful negotiating the internet as someone trying to look up a phone number in an unsorted phone book." They work by storing information of large number of web pages which they retrieve. The contents of each page are analysed and indexed. When a user comes to a particular search engine to conduct a search, the search engine matches the search keywords with its own index and provides a list of best matching web pages. An information seeker should have the knowledge to refine the search on all major search engines; to search for exact typed phrase, all the words in the phrase, any words in the phrase etc by using the required words or symbols, Jena (2007).

OPAC is a term used for computerised catalogue which acts as an information retrieval system for the user. It provides access to bibliographical information through search capabilities like keyword search, Boolean search, truncation, proximity search etc. Today many libraries are providing OPAC services to its users to locate the documents. However, Kumar & Vohra (2011), Mi & Weng (2008), Villen-Rueda, et.al (2007) and many other researchers who have carried a study on the use of OPAC have found that the users are finding difficulty in using the OPAC. The users do not have the basic skills to apply effective strategies. The main reason behind this is that the users use the OPAC similar to that of search engines. This concept is agreed by Willson & Given (2010) who states that even though search engines and OPACs have certain similarities, the system complexity of OPAC is far greater than that of search engines. It requires a certain level of expertise to use OPACs. Borgman (1996) has also highlighted that information retrieval in OPAC requires conceptual knowledge of the information retrieval process, semantic knowledge of how to effectively execute a query, and technical skills to implement the query.

Barry (1997) stresses the one specific change is the intensification of in the need for information skills in this complex information world. Therefore formulation of information need must be more precise in this electronic world in order to construct explicit search language, and be more focused in light of increasing information.

It is therefore necessary that the information users be made literate in carrying out search satisfactorily so as to enable them to use the right online sources, in the best possible way taking into consideration the authenticity and reliability of information. The solution to this problem is to provide digital literacy to the users, so as to provide the necessary skills to search and retrieve the desired information and enable them to use the resources effectively and efficiently.

INFORMATION SEARCH SKILLS

According to Spink & Saracevic (1993) the search for information is a highly complex process involving numerous factors and variables as well as decisions and interweaving of the sub-processes interrelated with the search. One of the keys to one of the sub-processes is the selection of terms for the search strategy which in turn is influenced by other factors, particularly those related to the results.

Typing in a few words into the system will not always return the desired result, but we should deal with the complex issues of linguistic diversity and its implications for retrieval. The user should know how to combine relevant keywords in order to find
Information. The user’s ability to construct an information search strategy in a second language, and fully grasp the meaning is also relevant. We need to consider the recall and precision when retrieving the results. There is an inverse relationship between recall and precision. The information seeker should possess skills which will retrieve precise information when the search is conducted in an online environment, Frier (2001). Nachmias & Gilad (2001) also state that the information user should have knowledge of internet notations, knowledge to determine the effectiveness of locating specific information, knowledge concerning the field into which information is directed, and language capabilities, in addition to skills like the ability to use Boolean logic, understanding the organisation of information and critical thinking abilities to select the information effectively. Barry (1997) highlights the following ‘information skills’ which are required to identify and locate information in an information age:

- Ability to identify and appraise internet based resources
- Information management
- Retrieval, storing and filtering information
- Ability to communicate and synthesise information using the internet.

According to Carroll (1999), finding information on the internet requires different skills like the ability to use internet tools like the search engine, knowledge of search techniques, and the cognitive capacity to organise the search for information into productive plans and the ability to execute the plans.

Therefore, to acquire the different skills to retrieve information from digital resources, it is necessary that the information seekers are digitally literate. As said by Chu & Law (2007), “Some people, including librarians, may equate being computer literate with being information literate. They may think that those who are good with computers do not need training in effective search techniques. This study demonstrated that even computer experts need to become information literate in order to uncover important sources in their research.”

DIGITAL LITERACY

Information literacy is a broader concept than skill-based literacies, and when information literacy was generally included as an ability to deal with electronic sources, the concept of ‘digital literacy’ came in vogue in the 1990s, Bawden (2001).

Gilster (1997) states that digital literacy is "the ability to understand and use information in a multiple formats from a wide range of sources when it is presented via computers". Mishra & Mishra (2010) definition of digital literacy goes from the ability to access and use to evaluate the use of digital resources and services in an effective way. Digital literacy is the need of any information seeker to suffice in this digital era. Having these abilities will help the user to know where to find, and provide them the necessary skills to use different search techniques to find the information. If the information users are made digitally literate, then they will have the thorough knowledge to use the right steps to carry out the search in any information retrieval system to retrieve the desired information.

RESEARCH METHODOLOGY

As stated in the scope, students studying for the post graduation in department of Marine Microbiology, Marine Science and Marine Biotechnology were selected. In all 74 students were admitted for the said courses. To make a survey of the above stated sample a questionnaire was designed supported by an interview. The questionnaire was distributed to the students and after a week it was collected. Care was taken to hold interviews of the students who have kept some of the questions unanswered.

DATA ANALYSIS

In all 74 questionnaires were distributed among the students and all the students responded, which became the sample for analysis. The following analysis is based on the responses provided by these students only.

Knowledge about OPAC

Most of the libraries today are automated, and Goa University Library is no exception. This University is automated using New Gen Lib software, wherein the facility of OPAC is provided to the users. However, the traditional form of card catalogue is also retained. The respondents were asked whether their Library had OPAC. The main purpose in asking this question was to determine if the respondents were aware about this service as only if the user is having knowledge about it, they will use it and the responses given are shown in figure no. 1.

![Fig. 1: Knowledge about OPAC](image)

The above figure 1 depicts that when the respondents were asked if their library had an OPAC, it was found that 51 (68.92%) respondents knew about it, 8 (10.81%) respondents stated that there was no OPAC and 15 (20.27%) respondents stated that they didn’t know about it. This means that 23 (31.08%) respondents are still not aware that their Library is providing OPAC to its users. The most probable reason for this is that the respondents failed to attend the library orientation programme, which is organised at the beginning of the year to make them aware about the various services offered by the library. Hence, it should be seen that all the students compulsorily made to attend the library orientation programme, wherein they can make the best use of the library.

Using OPAC

The online catalogue has advantages of time saving and multiple searches over the traditional card catalogue. An information literate person should be able to locate the information by himself by making the use of various tools. OPAC is one such tool which helps the users to locate the information in the library. The respondents were asked how they searched the information in the library, whether by using card catalogue, through OPAC or with the help of library staff. This question helps in finding how far the users make use of the automated systems to search and retrieve information and the responses are shown in figure 2.
Figure 2 clearly depicts, that even though the library has an OPAC, only 19 (25.68%) respondents use it to locate the books and other information in the library. Whereas 21 (28.38%) respondents still use the card catalogue, whereas majority of the users i.e. 34 (45.94%) of them take the help of the library staff to locate information. The main reason behind this could be the users may not have sufficient knowledge in conducting the search on an OPAC. This also reveals the helping attitude of the library staff, but rather than receiving assistance from others it is better that the users become digitally literate to conduct the search all by themselves, irrespective of time and place.

**Use of OPAC**

An OPAC is nothing but an automated form of library catalogue. Hence the main objective of the OPAC is to reveal to the user the books and other documents possessed by the library. Like the traditional catalogue, the OPAC is also considered to be the mirror of the library. The users should know what is the purpose of the OPAC and what can be found using the OPAC. This question aims to find if the users know what information can be found using the OPAC. The feedback received is as shown in table 1.

### Table 1: Use of OPAC

<table>
<thead>
<tr>
<th>Use of OPAC for</th>
<th>No. of Respondents</th>
<th>%age</th>
</tr>
</thead>
<tbody>
<tr>
<td>Books for sale</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Books and other documents owned by the library</td>
<td>25</td>
<td>33.78%</td>
</tr>
<tr>
<td>Articles published by the library</td>
<td>2</td>
<td>2.70%</td>
</tr>
<tr>
<td>Find newspaper articles</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Don’t know</td>
<td>47</td>
<td>63.51%</td>
</tr>
</tbody>
</table>

The above table 1 reveals the users’ literacy about the usage of OPAC. It shows that only 25 (33.79%) respondents know that OPAC is used to find books and other documents owned by a library, whereas 49 (66.21%) respondents have no knowledge regarding the use of OPAC. The users need to be made literate about the OPAC, as they fail to realise the basic purpose of the OPAC.

**OPAC Search**

Usually, when we conduct a digital search, at times, it is found that the retrieval system shows ‘no results found’. At this point, the searcher may get depressed and quit the search process. But a person who is literate enough, will alter the search using other keywords/synonyms, to retrieve the information. Therefore, the users were asked that if they make a search in an online catalogue, and the system displays no documents found, then what would be their conclusions. The main purpose of this question is to find if the respondents have this knowledge and the responses are as revealed in table 2.

### Table 2: OPAC Search

<table>
<thead>
<tr>
<th>Conclusions Made</th>
<th>No. of Respondents</th>
<th>%age</th>
</tr>
</thead>
<tbody>
<tr>
<td>Library does not have any document on this topic</td>
<td>21</td>
<td>28.38%</td>
</tr>
<tr>
<td>You have not used the right words</td>
<td>30</td>
<td>40.54%</td>
</tr>
<tr>
<td>All documents on this topic are on loan</td>
<td>19</td>
<td>25.68%</td>
</tr>
<tr>
<td>System is down</td>
<td>4</td>
<td>5.40%</td>
</tr>
</tbody>
</table>
The above table 2 reveals that only 30 (40.54%) respondents will derive the right conclusions, wherein they have not used the right words, and they need to alter the search. Whereas the remaining, 44 (59.46%) respondents have no knowledge how to conduct a search. The users should be taught about the various search techniques to be used to carry out the search successfully.

**Boolean Operators**

The Boolean Operators are used to conduct search in any online systems using AND, OR or NOT operators, to broaden or narrow the search. Boolean operators are useful to conduct a search using a combination of two or more terms. Question was asked to the respondents that if they want to find information on a given topic like "Effects of oil spillage on marine life", how they would conduct the search, and the options provided and the responses given are shown in table 3.

**Table 3: Using Boolean Operators**

<table>
<thead>
<tr>
<th>Oil AND</th>
<th>Oil OR</th>
<th>Oil Spillage</th>
<th>Marine Science</th>
<th>All of the above</th>
<th>I don't know</th>
</tr>
</thead>
<tbody>
<tr>
<td>32</td>
<td>2</td>
<td>15</td>
<td>4</td>
<td>17</td>
<td>4</td>
</tr>
</tbody>
</table>

From the above table 3, it is seen that, only 32 (43.24%) respondents know that the search conducted using AND operator will display valid hits displaying information related to both ‘oil’ and ‘marine’. Whereas the remaining 42 (56.76%) respondents have opted for the OR operator - which will broaden the search, or have opted for the wrong terms, and as such reveal that they have no knowledge in using the Boolean operators for conducting the search.

**Truncation Search**

Truncation search is another search technique which broadens the search by allowing retrieving all variant endings or spellings of that word. This question aims to find out whether the respondents are literate in using the truncation search technique. Therefore, the respondents were asked which of the following combination of words would they use to conduct a search on ‘oil spillage’ and the responses given are in table 4.

**Table 4: Truncation Search**

<table>
<thead>
<tr>
<th>Oil Spil*</th>
<th>Oil</th>
<th>Oil Spills*</th>
<th>Oil Spoilage*</th>
<th>I Don't Know</th>
</tr>
</thead>
<tbody>
<tr>
<td>19</td>
<td>3</td>
<td>41</td>
<td>4</td>
<td>7</td>
</tr>
</tbody>
</table>

The above table 4 reveals that, only 19 (25.68%) respondents are aware about the truncation search whiles the remaining 55 (74.32%) of them have no knowledge to conduct the search using truncation as they have selected the truncated terms which will reveal invalid results as spills* and spoilage* are complete terms by themselves. Therefore it can be analysed that most of the respondents are not literate about truncation and need to be made literate.

**Search Engines**

Search engines are used to conduct a search on the internet, and when the user types a search term the search engine produces results after conducting a search in various websites. Before conducting the search, the users should know what information can be retrieved and what cannot be retrieved from the internet. Therefore the respondents were asked what information you would not find using a search engine and the responses given are tabulated in table 5.

**Table 5: Search Engines**

<table>
<thead>
<tr>
<th>Search Engines Doesn’t find</th>
<th>No. of Students</th>
<th>%age</th>
</tr>
</thead>
<tbody>
<tr>
<td>Books available in the library</td>
<td>40</td>
<td>54.05%</td>
</tr>
<tr>
<td>Biographical information about famous people</td>
<td>2</td>
<td>2.70%</td>
</tr>
<tr>
<td>Merchandise catalogue</td>
<td>8</td>
<td>10.81%</td>
</tr>
<tr>
<td>I don’t know</td>
<td>24</td>
<td>32.43%</td>
</tr>
</tbody>
</table>

The above table 5 reveals that 40 (54.05%) respondents know that one can’t find the number of books available in the library using search engine, 2 (2.70%) respondents stated that biographical information about people cannot be found, one can’t find a merchandise catalogue using search engines stated 8 (10.81%) respondents, while, 24 (32.43%) of them admitted that...
they were not aware what information they could not find using search. If we analyse the responses, it is seen that only 40 (54.05%) respondents seem to be knowing that the number of books available in the library cannot be found using search engines, whereas 34 (45.94%) of them have no knowledge what can or what cannot be found using the search engines. The people especially the students are so fanatic about the internet that they turn towards the internet to find any information without considering the authenticity and reliability of the retrieved information. The users should therefore, be made literate also about the disadvantages of the internet.

**Metasearch Engines**

Apart from search engines, there are also metasearch engines which retrieve information after executing a search in many search engines simultaneously. Therefore metasearch engines give a wider scope to search and retrieve information as compared to a search engine which will retrieve information only from its own database. Hence, the respondents were asked if they were aware how the metasearch engines retrieved information, and then it was found that 72 (97.30%) respondents stated that they didn’t know about it, whereas 2 (2.70%) respondents stated that metasearch engines helped to search in foreign language websites. Therefore it can be concluded that, the respondents have no knowledge about searching information using metasearch engines. The users have no thorough knowledge to conduct search in digital environment.

**FINDINGS**

- Even though the Goa University Library has an OPAC, it is seen that all the students are not aware about it. Due to which the users are still using the traditional form of card catalogue, while many of them take assistance from the library staff to locate the information. This implies that the users are also not literate in using the OPAC all by themselves.
- Many users have no knowledge about the uses of OPAC and as such these users are not literate in finding the sources using the OPAC in their libraries.
- The users have no knowledge to conduct a search in an online catalogue and do not possess the skills to alter the search strategy if no documents are found on a given topic.
- 42 (56.76%) of the respondents are not aware how to conduct the search using Boolean operators.
- 55 (74.32%) respondents have no knowledge to use truncation techniques. Hence it can be concluded that the respondents are not aware about the various search techniques which can be used in digital environment.
- Many respondents are not aware what information can be searched and what cannot be searched using search engines on the internet.
- Similarly the respondents are not literate about the metasearch engines and how they are used to retrieve the information on the web.
- The respondents are not digitally literate as it is revealed that they do not possess the necessary skills to locate the information, neither do the users have sufficient knowledge about the tools used to conduct the searches in digital environment.

**SUGGESTIONS**

The users need to be made literate in using the basic tools like the OPAC in finding information sources. This can be done by imparting user education at the beginning of the year by the library. The users need to be taught how to use the OPAC, what searches can be made using OPAC, and how the OPAC is used to retrieve the information from the library. The users should compulsorily be made to attend the orientation courses, so that they don’t miss out the education program conducted by the library.

The users also need to be provided digital literacy wherein they are taught the various techniques like the Boolean search, truncation, advanced search etc. which can be used to conduct search in a digital environment. The library can organise a short term course in this regard. A digital literacy webpage may also be introduced on the library website, to help the users to educate themselves as and when the need arises. The users should be taught about various digital sources of information, how to use them and what information can be sought using these sources. This is the need of the hour as many students today are turning towards the internet to retrieve any information even in case of research work. The drawbacks of the internet need to be taught to the students, how to locate information of research value using the search engines and other metasearch engines, and the various techniques to use which will lead them to retrieve reliable and authentic information should be taught.

**CONCLUSION**

It is seen that the students are greatly influenced by the internet and as such use it to retrieve every information they need. However, various studies have proved that the users are not well versed to carry out the search effectively in a digital environment. The skills required by an individual to retrieve information also changes with the ever changing technology. The students of Goa University also face the similar barriers in handling the vast amount of information available online. There seems to be vast gap in the user education imparted by the library as the students are not even aware about the OPAC and how to use it to retrieve information.

Therefore providing digital literacy to the students is the ultimate solution to inculcate the necessary search skills among the students. This will help the user to know where to find, and provide them the necessary skills to use different search techniques to find the information. As technology changes, so also the role of a librarian varies. User education which is imparted to the new entrants should accommodate the search skills along with the critical skills rather than just providing traditional user orientation. Collaboration among the library staff with that of the faculty members is needed to conduct literacy programmes.

**REFERENCES**


