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Online Information Searching Techniques: An Investigation from Library Science Professionals

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Online Information Searching Techniques: An Investigation from Library Science Professionals

Abstract

The purpose of this study is to identify the effective information retrieval techniques used by the library and information science professionals/librarians to successfully retrieve the required information from various online information sources. This study also investigates the opinion of information professionals about various useful online information resources which are helpful during research work. It highlights various advance searching techniques used for retrieving precise results from various online information sources i.e. search engines, databases, repositories, digital libraries, online journals, and websites, etc. In this study, a quantitative research method has been used by adopting a survey research design. The population of the study was 370 information professionals working as a librarian in various public and private sector universities of Punjab. Data was successfully obtained from 278 respondents by using a questionnaire and analyzed through SPSS software. The respondents identified various sources of information that are useful to find scholarly information. These sources include e-journals, HEC databases, digital libraries, Google Scholar, digital archives, etc. They identified various useful techniques to effectively formulate a search query and apply advance searching techniques to retrieve the desired information. This study is highly useful for libraries to increase online information resources which are useful for research students and faculty. The results of this research are also useful for early-career librarians, faculty members, and researchers to understand online search techniques and successfully retrieve the required information for research and educational tasks.

Keywords – Human-computer interaction, Advance searching, Query formulation, Online information retrieval

Introduction/Background

The use of online information resources has changed the online searching behavior of users. These sources have made it easy for researchers to find the required information efficiently and effectively from online information resources. These online information resources include online public access catalogs (OPACs), online digital libraries, e-databases, e-journals, HEC digital library databases, online research repositories, search engines, and so on. These sources are consulted by various types of library users that include students, faculty members, research scholars, etc. There is a dire need for effective searching skills among these users to better utilize these resources and retrieve the desired piece of information for educational and research goals. Jan and Sheikh (2011) pointed out that technological developments have transformed the typical library into a computerized, virtual, electronic, and digital library. Krishnamurthy and Chan (2005) mentioned that a new form of information sources has been widely accepted among library users and immense consideration is being given to the information services provided by the web. Makori (2015) indicated that online information resources are essential in the fields of research and academic activities in any university library. Jansen and Pooch (2001) highlighted that information literacy and learning skills are essential for research students to retrieve online information available in any library.

The uprising in ICTs, especially the Internet, is putting special effects on information-based services in libraries (Sethi and Panda, 2011). The use of newly developed technologies in libraries has changed the ways of delivering library services to encourage library users. Online

information resources save the space issue in libraries and stop wastage of time (Kenchakkanavar, 2014). These library assets are beneficial for users to retrieve a huge amount of information in a short time. The accessibility of information in electronic form has created opportunities for universal access to information, enlarged the figure of users obliged, increased the quantity of information delivered, and offered new selections for research students to discover information related to their research areas (Varghese, 2008). More students in the online environment can retrieve the required resources for their research (Wolsiki, 2015). Universities are spending massive expenses for the richness of their digital collection (Kim, 2011). Although the Internet has entered all fields of academics in universities, yet they're still not adequate access to online information resources (Okon, 2010). Most university libraries have not introduced their practical policy of providing accurate Internet access to their postgraduate students. Sharma (2009) highlighted that rapid progress in the field of information and communication technology has made library operations very easy to use online information. Electronic publishing is increasing rapidly so libraries are arranging online information resources for users. Technological developments have conveyed the fundamental modifications in the working of present establishments, and the libraries as well. It has affected the typical library functions such as collecting, storing, organizing, retrieving and circulating information (Sharma, 2009).

Research Problem:

It is fact that online sources of information are widely used by students, research scholars, and faculty members to find recent and updated scholarly literature related to their research work and educational assignments. The use of ICT in the field of information has changed the traditional ways of presenting information sources. Now the interface and behavior of information sources that are used to find and retrieve the information is completely changed.

Online information users need to understand the use of various ICT based online sources and retrieve the relevant and accurate information without any problem. To meet this objective, this study has been designed to learn the online searching experiences of information professionals who deal with information management through modern technology. It aims to find out various online sources of information for research, query formulation process to effectively execute online search and various searching techniques used by information professionals to retrieve precise and exact piece of information from various online sources.

Research Questions:

1. What are the useful online sources of information for researchers?
2. What are the query formulation methods to find relevant results from online sources?
3. What are the skills for effective online information retrieval?
4. What are the advance searching techniques used by information professionals to find precise and accurate information from online sources?
5. Is there any significant difference in the respondents' opinion about effective query formulation process and advance searching skills based on their qualification and professional experience?

Research Hypothesis:

1. There is a significant difference in the opinion of respondents about the effective query formulation process based on the respondent's qualification and professional experience.
2. There is a significant difference in the opinion of respondents about the effective query formulation process based on the respondent's qualification and professional experience.

Review of Related Literature

Use of Online Information Sources

The use of online information sources has been increased by library users and libraries have selected different online information resources to facilitate their users and provide the appropriate, reliable, and current information for their academic and research needs. Normally, research scholars interact with online information resources in libraries in two ways; browsing and searching. The simplicity of browsing depends on the comprehensive scheme of a particular system. In the current information environment in libraries, research students are expected to know how to search for online information resources to retrieve the required information (Hwang, 2008). There are many types of online information resources that make researchers' information searching process easy and effective. These online information resources include an online digital library, library OPACs, search engines, HEC digital library databases, online repositories, library web portal, library websites, different types of e-resources, e-journals, e-books, e-reports, e-conference proceedings, CDs/DVDs, e-maps, e-pictures, e-manuscripts, e-theses, databases, e-newspaper, website, listservs, newsgroups, subject directories and so on. Research students mostly depend upon information resources available in their institutional libraries. Academic librarians should manage high-quality online information resources to connect the researchers with information (Miller & Salkind, 2002).

Query Formulation to Successfully Interact with Online Sources

The query is defined as any question to be asked or asking about some unknown information. A query is asking some questions communicated in a formal approach. While a database query either a selected query or an action query. A selective query is a data retrieval query, while an action query performs more operations on the data, such as updating, insertion, or deletion (Rouse, 2005). Query formulation is the name of making a proper question. Query formulation is an important process of retrieving relevant information from online information resources. There are different methods of formulating a search query. Writing a complete topic, keywords, and phrases, breaking search into parts, using unique terms or concepts, and applying specific terms are some examples of formulating an effective query. Query formulation is an important factor in effective information retrieval. The challenges in conveying effective inquiries are stressed in web information search because the web is used by different people having different levels of expertise (Aula, 2003).

Advance Searching Skills for Effective Online Information Retrieval

The purpose of the information retrieval system is to retrieve the required documents. The basic aim of an information retrieval system is collecting and organizing information in a particular subject area (Manning, 2010). Many searching techniques are used to effectively retrieve the required information from various online retrieval systems.

Chowdhury (2010) discussed several searching techniques that are useful for the effective retrieval of information from online information systems. These techniques are discussed as under:

The basic search technique has two main categories that include the known item and an unknown item search. In a known item search, the user knows something about the item being searched for. This may be any key, such as author, title, publisher, ISBN, etc. In an un-known item search, users are not aware of the existence of any document that may solve their problems.

Keyword and Phrase searching is treated as entering a single term or a phrase having more than one term. The keyword search is the simplest method of searching. In keyword searching, the system retrieves the inverted file (the index) for each keyword/term establishing the search result. In a phrase search, the system searches/retrieves for the entire phrase. The phrase searches can be conducted only in those fields that are phrase indexed.

Boolean search technique combines search terms according to Boolean logic. Three types of Boolean searches are possible. AND search, OR search and NOT search. These are used to narrow or broaden the search scope.

Truncation is a facility that enables a search to be conducted for all the different forms of a word having the same common root. As an example, the truncated word REAS* will retrieve items like REASON, REASONING, REASONABLE, etc.

Proximity search allows the user to identify: Whether two search terms should occur adjacent to each other: Whether one or more words occur in between the search terms: Whether the search term should occur in the same paragraph irrespective of the intervening words, and so on. The operators used for proximity searching and their meanings differ from one search system to another. The various types of proximity search facilities and the corresponding operators are available in various online databases.

Field-specific search can be made on all the fields in a database or it may be limited to one or more chosen fields to get more precise results. Specific fields and codes vary according to the search systems and database.

Limited search is used to apply some limitations such as any particular language, year of publication, type of information source, and so on, these are named as limiting searches. Types of restrictions can be imposed by the database concerned to limit a search.

Studies Conducted to Investigate the Online Searching Skills

Numbers of studies have been conducted at the national & international to investigate the online searching behavior of students. The given section discusses some of the recent studies on the topic.

Makondo, Kanyengo, and Kakana (2018) studied the online behavior of the students at the University of Zambia (UNZA) while searching the required information through the web. The research revealed that the basic aim of utilizing the WWW by the respondents at the UNZA was to achieve educational objectives. It was observed that some elements such as experience about Internet and subject knowledge influenced search performance. It was found that the use of Google was at a great level among users than any database or other means. Ankrah and Atuase (2018) concluded that electronic information resources in educational libraries have raised the level of education, knowledge, and research activities in institutions. The study found that

institutional libraries should ensure the availability and usage of e-resources. Results showed that the usage of e-resources was not up to the mark due to lack of awareness, insufficient training, limitations of access, lower Internet speed, insufficient PCs, electricity issues, and lack of searching skills. Ugwu and Orsu (2017) studied the utilization of online possessions by research scholars. Results indicated the challenges that researchers are facing in the University of Nigeria while interacting with online information. Results showed that the usage of subscribed databases was very rare by students. This less usage rate was due to the problems that students faced during the usage of online resources. Otulugbu (2017) conducted a study at the University of Ibadan, Nigeria about the awareness of university students related to various online resources. Findings revealed that respondents know online information sources. However, very minimum numbers were conscious of the specific online resources that were made accessible in the campuses' libraries. Due to this, the usage of online resources was low. Hence, a very low level of satisfaction was observed among users with online resources.

In Pakistan, several investigators have studied the use of online information resources among students. Tariq, Mahmoud, Rehman, and Mustafa (2018) conducted a study to investigate the level of Online Information Searching (OIS) skills of the students of business studies. Results showed a satisfactory level of students' searching skills. Respondents rated themselves as satisfied with their searching skills. Some respondents rated their skills at a good or expert level. It showed that there was no statistically significant difference in students' skill levels based on their gender and type of institution. In his study, Tariq (2016) discussed that the use of online information resources is increasing among research students. Online information resources especially electronic books, e-journals, and databases are very useful for research students. Researchers prefer electronic books and journals and other available resources to print resources. Google was the most used online source by researchers to search for online information. Google scholar was another favorite search engine where researchers search to get articles. Bhatti, Akram, and Khan (2016) conducted a study on the use of e-information resources between research scholars of BZU, Multan. It was found to arrange training sessions for research scholars for the proper utilization of e-resources. Tariq and Mahmood (2015) investigated the use and scope of online information resources by postgraduate students of public and private sector universities of Lahore, Pakistan. It was found that the basic purpose of using these resources by university scholars was to complete their research work. Findings of the study revealed that social networking sites, journals, and magazines, electronic books, HEC databases, library catalogs were the most used resources by the researchers.

Keeping in view the importance of online searching skills for research scholars, students, and faculty members, it is highly desirable to investigate the information professional's perspective regarding various online searching techniques and methods to ensure relevant and precise retrieval.

Research methodology

The quantitative research method has been used by using a survey research strategy. The population of the study was information professionals known as a librarian and working in university libraries in Punjab Province. A peer-reviewed questionnaire (Annexure A) was used as a research instrument to collect data from the respondents. Adequate literature available on the topic was reviewed to formulate a draft questionnaire which was sent to the related experts having adequate professional experience and interaction with online information sources. Their comments were incorporated in the questionnaire to remove the ambiguities in the terminologies

and structure of the questions. The Cronbach alpha test was applied to check the reliability of the questionnaire. The tested value of Cronbach alpha was 0.089. The questionnaire was also pilot-tested on a small population of 30 respondents to get their feedback and know their understanding of the questions raised in the questionnaire for data collection. Before data collection, the population frame (Annexure B) was developed. According to this list, a total of 370 librarians were working in public and private sector university libraries and degree awarding institutions of Punjab Province. Questionnaires were shared among all the respondents. However, 278 valid responses were received with a response rate of 75%. The collected data were analyzed through SPSS software.

Analysis of Data

Gender of the Respondents

The result regarding the gender of the respondents showed that out of 278 respondents, males respondents were 138(49.6%) while female were 140(50.4%). The result indicated that in this study the percentage of the male and female respondents was almost the same. See Figure 1

Genders of the Respondents

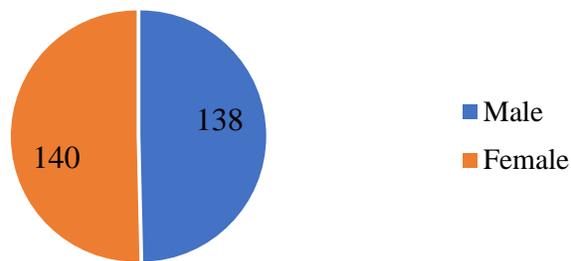


Figure 1

Educational Level of the Respondents

Figure 2 presented that majority of the respondents had a Master's degree in Library & Information Science. The second majority of the respondents had M. Phil degree and some of the respondents had a PhD degree. This result shows the low trend of higher qualification among LIS practitioners.

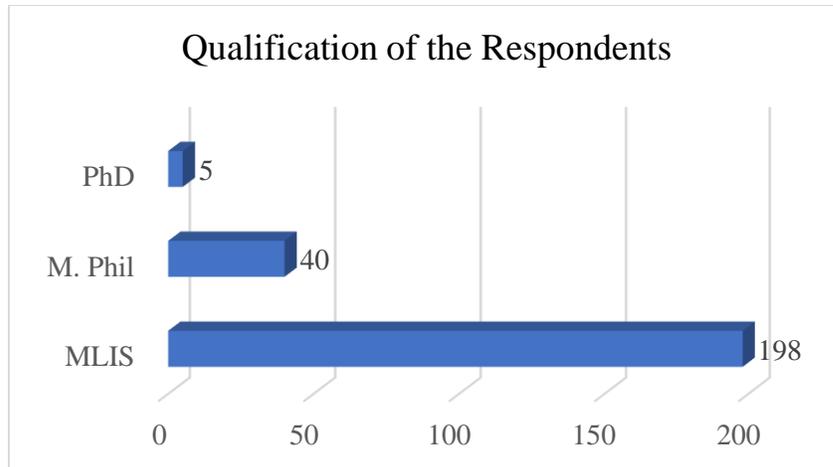


Figure 2

4. Professional Work Experience

The result regarding the professional work experience of the participants indicated that a very high number of respondents had 6 to 10 years of professional experience. The second majority of the respondents had 1-5 years of professional experience. A very few respondents mentioned that they have 16-20 years and more than 20 years of practical experience of work in a library setting. For further detail please see the given figure 3.



Figure 3

Online Sources of Information Which are Useful to Retrieve Scholarly Information

In the given table I, information about useful online sources of information was obtained from the library professionals. Most of the respondents mentioned that Google Scholar, E-journals, HEC databases, Digital libraries, Search engines, and Online archives are useful sources to find scholarly literature for research. The results also presented that e-theses, e-research reports, HEC repositories, and online reference databases are useful for research purposes. The research scholars and faculty members can get benefit from these resources in their research activities.

Table I
Frequency Distribution of the Respondent's' Opinion about Useful Online Information Sources for Scholarly Literature

Types of scholarly information sources	Frequency	Percentage
E-journals	150	54.0
HEC databases	149	53.6
Indexing and abstracting databases	22	7.9
Online reference databases (Scholarpedia, reference.com etc.)	33	11.9
E-thesis and dissertations	40	14.4
E-magazines	43	15.5
E-research reports	36	12.9
HEC research repository	44	15.8
Repository of other universities	41	14.7
Digital libraries	92	33.1

Search engines (Google, Yahoo, Bing, ask.com etc.)	79	28.4
Google Scholar	193	69.4
Online Archives	98	35.3
Online search directories	83	29.9

Respondent's Opinion about Required Skills and Knowledge to Effectively Interact with Online Information Resources

An attempt was made to know the opinion of the respondents about the required skills and knowledge to effectively interact with online information resources. Based on the searching experiences of the LIS professionals, they agreed that the skills mentioned in the given Table II are essential for researchers to successfully interact with online information sources.

Table II
Mean Distribution of Respondents Opinion about Required Skills to Successfully Interact with Online Information Sources

Skills to Successfully Interact with Online Information Sources	Mean	Std. Deviation
Skills to understand and communicate with online information systems	4.32	.748
Conceptual skills to understand the search results and apply different search strategies	3.99	.856
Analytical skills to evaluate the search results and refine the search query	3.88	.913
Understanding the vocabulary control methods used by various online information systems	3.67	.975
Skills to refining and narrow the search terms	3.58	1.034

(Strongly agree=5, Agree=4, Neutral=3, Disagree=2, Strongly Disagree=1)

Useful Query Formulation Techniques to Find Relevant Results

The respondents of the study were inquired about their opinion regarding query formulation procedure to successfully find the relevant results. As per results given in Table III, the respondents of the study were agreed that using different keywords and unique terms, creating concepts regarding search statements, refining and narrowing the search terms, use of synonyms and specific terms, and continuous modification of the search query until the required results are obtained are the useful methods to formulate a strong search query and find the most relevant results while searching online sources of information. See the Table III.

Table III
Results of Descriptive Statistics about Opinion of the Respondents regarding Effective Query Formulation Procedure

Statements	Mean	Std. Deviation
Writing keywords from topic in search box and then press start button.	4.04	.900
Breaking down the search topic in parts and then start searching.	4.08	.826
Use of different keywords for searching.	4.12	.819
Use of unique terms of the subject for searching purpose.	3.95	.922
Creating concepts regarding search statement and then start searching.	3.85	.863
Refining and narrowing the searching terms.	3.80	.867
Use of synonyms and specific terms for searching.	3.77	.964
Continuous modification in search query according to search results until to find the required information	3.95	.920

(Strongly Agree=5, Agree=4, No opinion=3, Disagree=2, Strongly Disagree=1)

Respondents Opinion about the Advance Searching Techniques to Retrieve Relevant Results

Respondents were asked to provide their opinion about various advanced searching skills for effective information retrieval from various online sources. Analysis of the responses showed that as per the opinion of the respondents, use of phrase searching, Boolean operators, use of plus and minus sign, and using various file extensions at the end of a search term and use of truncation marks at the beginning, middle and end of the term are highly useful to find the precise and relevant results. To check the mean value, see the given Table.

Table IV
Descriptive Statistics about the Respondents' Opinion regarding Advance Searching Skills

Opinion about Advance Searching Techniques	Mean	Std. Deviation
Use of phrase searching	3.89	.878
Use of AND, OR, NOT (Boolean operators)	3.68	.950
Use of + or – sign	3.58	1.047
Use of NEAR operator	3.52	1.060
Use of file extension searching technique (.pptx, pdf, .docx, etc.)	3.82	1.020
Use of domain search (.edu, .com, .org etc.)	3.76	.981
Use of truncation marks * (left truncation, right truncation & middle truncation)	3.45	1.103
Use of proximity searching	3.32	1.062

Use of ~ (tilde sign)	3.26	1.126
Use of range searching (period, price etc.)	3.42	1.077

(Strongly Agree=5, Agree=4, No opinion=3, Disagree=2, Strongly Disagree=1)

Results Related to the Research Hypothesis:

1. There is a significant difference in the opinion of respondents about the effective query formulation process based on the respondent's qualification and professional experience.
2. There is a significant difference in the opinion of respondents about the effective query formulation process based on the respondent's qualification and professional experience.

The results related to the research hypotheses regarding the formulation of search query presented that there was no significant difference in the opinion of respondents based on their qualification and professional experience regarding query formulation techniques to develop a strong query and keywords and retrieve the most relevant results. It shows that all respondents were agreed with all the query formulation methods mentioned in Table V, VII is useful while interacting with online sources of information and retrieve relevant material to avoid receiving irrelevant results.

The hypothetical results related to the advance online searching techniques showed that no significant difference was found in the opinion of the respondents based on their professional qualification and experience about various online searching methods mentioned in Table VI. These results showed that all the participants of the study were agreed that the advance searching techniques provided in Table VI and VIII are important to obtain exact results against the search query.

Table V

Results of T-test regarding Significant Differences in the Opinion of Respondents about Query Formulation Process based on Respondents' Qualification (N=278)

Query Formulation Techniques	Mean		t-value	Sig.(2-tailed)
	MLIS Degree (198)	M.Phil Degree (40)		
Writing keywords from the topic in the search box and then press the start button.	4.12	3.95	1.666	0.258
Breaking down the search topic in parts and then start searching.	4.68	4.52	1.472	0.343
Use of different keywords for searching.	4.55	4.58	1.432	0.062
Use of unique terms of the subject for searching purposes.	4.84	4.65	1.399	0.176
Creating concepts regarding search statements and then start searching.	4.61	4.39	1.050	0.191

Refining and narrowing the searching terms.	4.75	4.68	0.345	0.220
Use of synonyms and specific terms for searching.	4.67	4.38	1.456	0.077
Continuous modification in search query according to search results until to find required information	4.65	4.49	1.303	0.177

*Note: Alpha level for Significant Difference (p= 0.05)**

Table VI

The output of Independent Sample T-test to Identify the Mean Differences in Respondents' Opinion about Advance Searching Techniques based on their Qualification

Statements	Mean		T-value (with equal variances)	Sig.(2-tailed)
	MLIS Degree (198)	M. Phil Degree (40)		
Use of phrase searching	3.94	3.75	1.524	.129
Use of AND, OR, NOT (Boolean operators)	3.69	3.69	.020	.984
Use of + or – sign	3.59	3.61	-.152	.875
Use of NEAR operator	3.46	3.72	-1.689	.069
Use of file extension search technique (pptx, pdf, docx, etc.)	3.85	3.73	.825	.410
Use of domain search (.edu, .com, .org etc.)	3.74	3.84	-.735	.452
Use of truncation marks * (left truncation, right truncation, & middle truncation)	3.41	3.59	-1.178	.240
Use of proximity searching	3.31	3.41	-.663	.508
User of –(tiled sign)	3.22	3.39	-1.087	.278
Use of range search (period, price)	3.34	3.66	-2.089	.020*

Note: Significance alpha level (.05)

Table VII

Significance Difference in the Opinion of Respondents about Query Formulation Process based on their Professional Experience (N=278)

Query Formulation Techniques	Experience Category	Mean Value	T-value	Sig.2 tailed
	6-10 yrs.	4.55		
	11-15 yrs.	4.87		
	16-20 yrs.	4.86		
	Over 20	4.55		
Breaking down the search topic in parts and then start searching.	1-5 yrs.	4.75	1.265	.165
	6-10 yrs.	4.53		
	11-15 yrs.	4.72		

Use of different keywords for searching.	16-20 yrs.	4.91	1.333	.132
	Over 20	4.53		
	1-5 yrs.	4.57		
	6-10 yrs.	4.29		
	11-15 yrs.	4.38		
Use of unique terms of the subject for searching purposes.	16-20 yrs.	4.68	1.453	.174
	Over 20	4.59		
	1-5 yrs.	4.75		
	6-10 yrs.	4.55		
	11-15 yrs.	4.74		
Creating concepts regarding search statements and then start searching.	16-20 yrs.	4.86	1.735	.126
	Over 20 yrs	4.44		
	1-5 yrs.	4.49		
	6-10 yrs.	4.55		
	11-15 yrs.	4.56		
Refining and narrowing the searching terms.	16-20 yrs.	4.68	1.865	.165
	Over 20	4.09		
	1-5 yrs.	4.69		
	6-10 yrs.	4.46		
	11-15 yrs.	4.55		
Use of synonyms and specific terms for searching.	16-20 yrs.	4.66	1.342	.162
	Over 20	4.03		
	1-5 yrs.	4.64		
	6-10 yrs.	4.38		
	11-15 yrs.	4.88		
Continuous modification in search query according to search results until to find the required information	16-20 yrs.	4.95	1.573	.089
	Over 20	4.26		
	1-5 yrs.	4.53		
	6-10 yrs.	4.42		
	11-15 yrs.	4.64		
	16-20 yrs.	4.39		
	Over 20	3.75		

*Note: Alpha level for Significant Difference (p= 0.05)**

Table VIII

Significance Difference in the Opinion of Respondents about Query Formulation Process based on their Professional Experience (N=278)

Advance Searching Techniques	Experience Category	Mean Value	T-value	Sig.2 tailed
Use of phrase searching	1-5 yrs.	4.88	1.913	.823
	6-10 yrs.	4.55		
	11-15 yrs.	4.87		
	16-20 yrs.	4.86		
	Over 20	4.55		
Use of AND, OR, NOT (Boolean operators)	1-5 yrs.	4.75	1.265	.165
	6-10 yrs.	4.53		
	11-15 yrs.	4.72		
	16-20 yrs.	4.91		

	Over 20	4.53		
Use of + or – sign	1-5 yrs.	4.57	1.333	.132
	6-10 yrs.	4.29		
	11-15 yrs.	4.38		
	16-20 yrs.	4.68		
	Over 20	4.59		
Use of NEAR operator	1-5 yrs.	4.75	1.453	.174
	6-10 yrs.	4.55		
	11-15 yrs.	4.74		
	16-20 yrs.	4.86		
	Over 20 yrs	4.44		
Use of file extension search technique (pptx, pdf, docx, etc.)	1-5 yrs.	4.49	1.735	.126
	6-10 yrs.	4.55		
	11-15 yrs.	4.56		
	16-20 yrs.	4.68		
	Over 20	4.09		
Use of domain search (.edu, .com, .org etc.)	1-5 yrs.	4.69	1.865	.165
	6-10 yrs.	4.46		
	11-15 yrs.	4.55		
	16-20 yrs.	4.66		
	Over 20	4.03		
Use of truncation marks * (left truncation, right truncation, & middle truncation)	1-5 yrs.	4.64	1.342	.162
	6-10 yrs.	4.38		
	11-15 yrs.	4.88		
	16-20 yrs.	4.95		
	Over 20	4.26		
Use of proximity searching	1-5 yrs.	4.53	1.573	.089
	6-10 yrs.	4.42		
	11-15 yrs.	4.64		
	16-20 yrs.	4.39		
	Over 20	3.75		
User of –(tiled sign)	1-5 yrs.	4.53	1.573	.089
	6-10 yrs.	4.42		
	11-15 yrs.	4.64		
	16-20 yrs.	4.39		
	Over 20	3.75		
Use of range search (period, price)	3.34	3.66	-2.089	.020*

*Note: Alpha level for Significant Difference (p= 0.05)**

Discussions on Results:

The results of the study presented that the respondents of the study who provided their opinion about various online searching techniques to retrieve relevant and precise results from online sources of information had a professional degree in Library & Information Science. Based on their professional knowledge and experience of work in dealing with online sources of information they shared their practical knowledge and skills regarding how to retrieve relevant information. As the majority had a professional experience of 6-10 years.

The respondents identified various types of online sources which are useful to download research papers, thesis, e-magazine, digital books, etc. The Google Scholar, HEC databases, e-journals, digital libraries, online repositories were the most rated sources of information to download research-related documents.

To have a successful interaction with online sources, it is required to develop skills to understand the nature of online information systems. The knowledge of various features of the information system is helpful to hit the right bit of information out of the information flood. Equally, it is also important to use different searching strategies while interacting with the digital information system. The skills are very helpful to analyze and evaluate the search results and modify the search query to retrieve the exact information. Similarly, various online information systems use different types of vocabulary control methods while developing the index of various documents. These methods include natural language indexing and artificial language indexing. If our search query is developed as per the chosen vocabulary control language by the system, the searcher can retrieve relevant results.

The process of query formulation plays a vital role in retrieving relevant documents. The respondents were agreed to write develop keywords out of your research topic by breaking down the search topic into different parts always helps in finding healthy results. Likewise, the use of unique terms of the subject related to your search topic increases the chances of effective retrieval. It is also important to create relevant concepts regarding your topics and search them into the search bar in finding relevant results. The respondents mentioned that if the search term is continuously modified and refined the chances of retrieving the required information are increased.

The respondents of the study provided their opinion about the use of various advance searching techniques while interacting with online information systems is highly important. They pointed out that various online systems offer phrase searching options that are very important to find the exact phrase in retrieved documents. The use of AND, OR, NOT within the searching terms expands the scope of retrieved results. However, the use of the NOT operator within the searching terms exclude the desired term that is written after the NOT operator. Similarly, the NEAR operator is used to find relevant results. The respondents pointed out that the use of various file extensions such as .pptx, .pdf, .docx is useful to retrieve the required results in desired file format. The use of domain search is highly useful to hit the targeted website of any institution or organization.

The results related to the research hypothesis showed that there was no significant difference in the qualification and experience of the respondents and their opinion about various query formulation techniques mentioned the Tables V and VII. So, the techniques are very useful to formulate a strong search query. Similarly, there was no significant difference was found in the opinion of the respondents based on their professional qualification and experience about various online searching methods mentioned in Table VI. So, it can be said that the advance searching techniques identified by the respondents are important to acquire relevant results.

Conclusion

To effectively retrieve relevant results from online sources of information such as search engines, databases, online repositories, and digital libraries, it is highly important to acquire information about that system to successfully interact with. The knowledge of the system's specification, its features, the query formulation process, and advance searching techniques plays an important role in the success and failure of search results.

Practical Implications

The results of this research are important for all types of information seekers who interact with various online information sources available on the Internet. Research students, faculty members, and new information professionals can get benefits from this research to learn online information retrieval skills and successfully retrieve the needed information from various online information channels.

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