ASSESSING THE IMPACT OF OPEN ACCESS DIGITAL REPOSITORIES (OADR) ON INFORMATION SEEKING PRACTICES OF INDIAN SCIENTISTS

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Abstract

The present study assesses the impact of Open Access Digital Repositories (OADR) on information seeking practices of scientists and research scholars of eight research intensive science laboratories of India. The study examines users awareness and preferences regarding OADR, benefits and drawbacks of seeking information through OADR and suggest changes to facilitate better information seeking in future through OADR. Data for the study was collected through questionnaire from scientists and research scholars of eight science laboratories of India. The results of the study indicate that the majority of the scientists are aware about the presence of OADR and they also prefer to seek information through them. The main purpose of using OADR is 'to update knowledge' ;'access to otherwise unpublished material' is the highest rated benefit of using OADR whereas 'lack of peer reviewed materials' is the major drawback of using OADR for information seeking. Users want 'more access to research materials' in future. They also rate 'increase in permanence and all time availability of research materials' as the biggest impact of OADR on their information seeking practices. The study will provide insight to the OADR managers and administrators to develop policies for enhancing the utilization and better information seeking through OADR in future.

KEYWORDS: Open access digital repositories, Information seeking practices, Scientists, Research Scholars, Science laboratories, Survey, CSIR, India

INTRODUCTION:

Recent developments in information processing, storage and communication technologies have revolutionized the scholarly communication system all over the world. The vast expansion of research data is now easily accessible via internet. Users especially scientists and research scholars are visibly more efficient in accessing current information and searching for alternative resources of electronic information. Electronic information has become an integrated element to provide support to their research, guidance and learning activities. As the research literature is the most potent research tool available **(Prosser, 2004)**, scientists and research scholars want access to all scholarly research materials without

any access barriers. One of the major barriers for scientists and research scholars is the lack of access to current literature in their subject, much of which may be published in journals that have high annual subscription rates and so are far too expensive for many libraries **(Krishnamurthy, 2008)**. The open access digital repositories, to some extent, challenge these barriers by facilitating the access to research literature on public internet, granting permission to read, download, copy, distribute, print, search or use them for any other lawful purpose, without financial, legal or technical barriers other than those inseparable from gaining access to the internet itself(www.soros.org/open access). Open access digital repositories therefore, can be defined as "an online database on the internet which makes the full text of items (or complete files). It contains freely and immediately available without any access restrictions **(Pinfield, 2005).**With the advent of open access digital repositories on scholarly communication scenario has remarkably changed the information seeking practices of scientists and has increased their information requirements. Due to ever increasing and complex information needs of scientists and research scholars open access digital repositories prove to be an excellent resource of electronic information. This necessitates the evaluation of information seeking practices of users in context with OADR.

The present study is conducted at eight Council of Scientific and Industrial Research (CSIR) laboratories of India. CSIR is the premier industrial Research and development organization in India constituted in 1942. It is an autonomous body and India's largest research and development (R&D) organisation, with 37 laboratories and 39 field stations or extension centres spread across the nation, with a collective staff of over 17,000.

LITERATURE REVIEW:

The information seeking practices/behaviour of the users has been the topic of much debate in recent years. The studies consulted for literature review are mainly based on the findings of survey and interviews on students/academicians information seeking practices/ behaviour in the electronic and digital environment. Such studies conducted at international and national level are reviewed here under:

Nicholas (2009) in his research paper reported the actual information seeking behaviour of students in digital scholarly environment. The study by using log and transaction analysis concluded a distinctive form of information seeking behaviour associated with students. Many studies like **Dalgleish and Hall (2000), Thelwall (2001) and Bceker (2003)** have all explored the role of popular search engines in defining the information seeking behaviour of students. These studies report that Google is the first preference for information seeking on internet among students. **Omidian and Sufi maleki(2013)** have surmised in their paper the graduate students information seeking behaviour on internet. They have compared the arts and science student's behaviour of seeking information from internet and found that science students have more proficiency in using internet services than arts students.

Kadli and kumbar(2011) and Ahmed and Vinayamoorthy(2014) both have conducted studies to explore the Information seeking behaviour of faculty and students respectively in digital environment. They have reported that the majority of the users are extensively

searching and using electronic information available on the internet .They have also concluded that changing ICT environment has affected the information seeking behaviour of users. **Babariya, Patel and Gohel(2014)** in their study concluded that internet and electronic resources are the most vital source of the academic information.

The lack of studies directly related to the current study has resulted in the review of literature covering related aspects. One such study conducted by **Yiotis (2005)** explained the crisis in scholarly communication and how open access can reform the present system**. Bjork, Bo-Christer (2004)** discussed in his paper the major barriers hindering a rapid proliferation of open access. **Prosser (2004)** suggested in his study to construct a system of scholarly communication that better serves authors and readers. This in turn will enhance research and education worldwide and bring great benefits to society. **Krishnamoorthy (2008)** described in detail the open access, open source movement in the digital library world. The paper explains the barriers and incentives of open access movements. **Mittal, Rekha and Mahesh G. (2008)** identified and evaluated the digital libraries and repositories in India. The paper provides a comprehensive listing of digital repositories in India available in public domain.

Most of the earlier studies have mainly focused and covered the various perspectives of information seeking behaviour of users but none have examined the Open access digital repositories in context with information seeking practices of users. This study fills that gap.

RESEARCH DESIGN:

This research paper conveys the results of the data collected from scientists and research scholars of eight research centric science laboratories of India. The sample laboratories are listed here under:

1. Central Drug Research Institute, India
2. Central Institute of Medicinal and Aromatic Plants, India
3. National Botanical Research Institute, India
4. Indian Institute of Toxicological Research, India
5. Center for Biochemical Technology, India
6. Institute of Microbial Technology, India
7. Institute of genomics and integrative biology, India
8. National Physical Laboratories, India

The research study covers a total of 400 (175 scientists and 225 research scholars) respondents out of 560 total users surveyed from these eight special science laboratories. Thus, the response rate of users is 71.43%. A structured questionnaire, prepared according to the objectives of the study, was used as an instrument for survey and mailed to respondents through email. Questionnaires were also administered personally to the scientists and research scholars wherever possible.

OBJECTIVES OF THE STUDY:

1. To access the level of awareness and preference for OADR among scientist and research scholars.
2. To ascertain the purpose of information seeking through OADR.
3. To understand preference of content in OADR.
4. To identify benefits and drawbacks of seeking information through OADR.
5. To measure the impact of OADR on information seeking practices.

RESULTS ANALYSIS AND DISCUSSION:

In this study the results have been shown in percentages and presented in the form of tables. The chi square test of significance has been used to verify the validity of results. The analysis of the result and discussions has been given in the following sections:

Table-1 Awareness of open access Digital Repositories

Awareness of open access Digital Repositories					
Users	**Yes**	**%**	**No**	**%**	**Total (%)**
Scientists	119	68.00%	56	32.00%	175(100%)
Research Scholars	196	87.12%	29	12.88%	225(100%)
Total	**315**	**78.75%**	**85**	**21.25%**	**400(100%)**

The concept of open access digital repository is quite recent development in the field of scholarly communication. In spite of that, most of the users are aware about its presence in the information scenario.

Table 1 depicts the scientists and research scholars' awareness about open access digital repositories present at international and national level. Most of the scientists (68%) and research scholars (87.12%) are well aware about the presence of OADR (open access digital repositories) as compare to only 21.25% users who lack such awareness. In comparison research scholars are more aware about the presence of OADR than scientists.

Table-2 Preference for Open Access Digital Repositories

Preference for Open Access Digital Repositories							
Users	**Preferred**	**%**	**Neutral**	**%**	**Not Preferred**	**%**	**Total**
Scientists	89	50.85%	32	8.28%	54	30.85%	175(100%)
Research Scholars	132	75.43%	48	27.43%	45	25.71%	225(100%)
Total	**221**	**55.25%**	**80**	**20.00%**	**99**	**24.75%**	**400(100%)**

Traditional sources of information are always preferred by users for information seeking as compare to electronic information resources. Traditional sources here mainly refers to Journals, Books , official Reports and Conference and seminar proceedings etc. But due to electronic information proliferation users are frequently seeking information through electronic sources as well. Internet is the biggest source of information present in the electronic form. Open access digital repositories are also making their presence felt in the area of electronic information resources. Users are not only aware about the presence of OADR but also prefer to seek information through them. Table 2 here presents the level of preference for open access digital repositories among scientists and research scholars. 55.25% scientists and research scholars prefer to seek information via OADR whereas 24.75 do not prefer and 20% users are reported neural in their response.

Table 3: Type of Open access digital repository preferred

Type of Open access digital repository preferred					
Types	**Scientists**	**%**	**Research Scholars**	**%**	**Total (%)**
Subject specific repositories	86	49.14%	108	48.00%	194(48.50%)
Content specific repositories	28	16.00%	21	9.33%	49(12.25%)
Regional/national Repositories	16	9.14%	17	7.55%	33(08.25%)
Cross Institutional Repositories	14	8.00%	22	9.78%	36(9.00%)
Institutional Repositories	31	17.71%	57	25.33%	88(22.00%)
Total	**175**	**100**	**225**	**100**	**400**
χ^2=6.842 **Level of Significance=0.50** **Degree of Freedom=4**					

There are several types of Open Access Digital Repositories available on the global platform since last decade covering various aspects of scholarly information. Table 3 explores the opinion of users regarding the type of repository they prefer to seek information. Most of the scientists and research scholars (48.50%) prefer Subject specific repositories for information seeking followed by preference for institutional repositories (22.00%) and content specific repositories (12.25%)

The statistical analysis of chi-square($\chi^{2)}$ suggests that subject specific repository as type of repository preferred for information seeking is closely associated with category of users. The significance level is kept at 0.50 and degree of freedom is 4.

Table 4: Purpose of using Open access digital Repositories

Purpose of using Open access digital Repositories					
Purpose	**Scientists**	**%**	**Research Scholars**	**%**	**Total (%)**
To complete Research Projects/ Assignments	11	6.28%	36	16.00%	47(11.75%)
To support Research Guidance	27	15.43%	7	3.11%	34(08.50%)
To write research papers/books	17	9.71%	13	5.77%	30(7.50%)
To update knowledge	58	33.14%	94	41.77%	152(38.00%)
To prepare presentations/reports	13	7.43%	11	4.88%	24(06.00%)
To access grey /unpublished works	49	28.50%	64	28.44%	113(28.25%
Total	**175**	**100**	**225**	**100**	**400**
χ^2 =30.62 **Level of Significance=0.50** **Degree of Freedom=5**					

The data analysis in table 4 reveals the purpose of seeking information through OADR. The highest percentage by users is given to the option 'to update knowledge' (38.00%) followed by 'to access Grey/ unpublished works'(28.50%) and 'to complete research projects and assignments (11.75%).The preferences are almost similar in both group of users.

The chi square(χ^2) analysis establishes a strong relationship between the variables purpose of using OADR and category of users. To update knowledge as purpose and users are statistically associated. The level of significance is 0.50 and degree of freedom is 5.

Table 5: Preference for content in Open access digital Repositories

Preference for content in Open access digital Repositories					
Content	**Scientists**	**%**	**Research Scholars**	**%**	**Total (%)**
Theses/Dissertations	21	12.00%	37	16.44%	58(14.50%)
Research Articles	49	28.00%	63	28.00%	112(28.00%)
Conference/seminars proceedings	31	17.71%	32	14.22%	63(15.75%)
PPT Presentations	5	2.85%	8	3.55%	13(03.25%)
Raw research data	36	20.57%	31	13.78%	67(16.75%)
Book chapters	6	3.43%	11	4.89%	17(04.25%)
Grey/unpublished literature	27	15.43%	43	19.11%	70(17.50%)
Total	**175**	**100%**	**225**	**100%**	**400(100%)**
χ^2 =6.219 **Level of Significance=0.50** **Degree of Freedom=6**					

Open access digital repositories are collection of various types of materials present in digital form. The data analysis of table 5 reports the opinion of users about the content they prefer in an OADR. Most of the scientists and research scholars (28%) prefer Research articles/papers

whereas 17.50% prefer grey and unpublished works, 16.75% prefer raw research data and 15.75% prefer conference and seminar proceedings.

The Chi square(χ^2) statistics between preference for content in an OADR and category of users is significantly associated. The difference in calculated and critical value of chi square confirms a strong relationship between variables. The level of significance is 0.50 and degree of freedom is 6.

Table 6: Benefits of seeking information through open access digital Repositories

Benefits of seeking information through open access digital Repositories					
Benefits	**Scientists**	**%**	**Research Scholars**	**%**	**Total (%)**
Easy and free access	31	17.71%	37	16.44%	68(17.00%)
Permanence and all time availability	38	21.71%	51	22.66%	89(22.25%)
Single point access to all works produced by an institution	19	10.86%	26	11.56%	45(11.25%)
Access to otherwise unpublished materials	69	39.43%	93	41.33%	162(40.50%)
Multi User Access	14	8.00%	8	3.56%	22(05.50%)
Hyperlink access to additional Information	4	2.29%	10	4.44%	14(3.50%)
Total	**175**	**100.00%**	**225**	**100.00%**	**400**
χ^2 **=5.155** **Level of Significance=0.50** **Degree of Freedom=5**					

Open access digital repositories collect, preserve and disseminate scholarly output in open and free mode. Table 6 analyzes the opinions of users regarding the benefits of seeking information through OADR. The users' response weigh highly towards the option 'access to otherwise unpublished materials'(37.50%). The other options such as 'permanence and all time availability' (22.25%), 'easy and free access(14.50%) and single point access to all works'(11.25%) are also favoured by users as the benefits of OADR.

The chi square(χ^2) analysis establishes the significantly strong relationship between 'access to unpublished materials' as the benefit of seeking information through OADR and category of users. The level of significance is kept at 0.50 and degree of freedom is 5.

Table 7: Drawbacks of seeking information through open access digital Repositories

Drawbacks of seeking information through open access digital Repositories					
Drawbacks	**Scientists**	**%**	**Research Scholars**	**%**	**Total (%)**
Lack of Relevant materials	27	15.43%	23	10.22%	50(12.50%)
Lack of Original research works	11	6.28%	12	5.33%	23(5.75%)

Lack of Quality content	17	9.71%	27	12.00%	44(11.00%)
Lack of peer reviewed materials	73	41.71%	68	30.22%	141(35.25%)
Lack of knowledge about availability	36	20.57%	83	36.89%	119(29.75%)
Lack of instruction about how to use/search	11	6.28%	12	5.33%	23(5.75%
Total	**175**	**100%**	**225**	**99.99%**	**400 (100%)**
χ^2=15.408 **Level of Significance=0.50** **Degree of Freedom=5**					

Table 7 surmises the analysis of the opinion of users pertaining to the drawbacks of seeking information through OADR. The biggest drawback as responded by users is 'lack of peer-reviewed materials with 35.25% which is followed by 'lack of knowledge about availability (29.75%), 'lack of relevant materials (12.50%) and 'lack of quality content'(11%). The responses of both user groups have little variations while 41.71% scientists have chosen 'lack of peer-reviewed materials' as the major drawback , 36.89% Research scholars responded in favour of the option 'lack of knowledge about availability'.

The statistics of chi square(χ^2) suggests that category of users and 'lack of peer-reviewed materials' as the biggest drawback of OADR is significantly correlated. The huge difference between calculated (15.408) and critical value (4.351) of chi square reflect the strong relationship between variables. The level of significance is 0.50 and degree of freedom is 5.

Table-8: Future changes required for facilitating Information seeking through Open Access digital repositories

Future changes required for facilitating Information seeking through OADR					
Future Changes	**Scientists**	**%**	**Research Scholars**	**%**	**Total (%)**
Access to more research works	89	50.86%	72	32.00%	161(40.25%)
Only peer-reviewed works should be available	11	6.28%	39	17.33%	50(12.50%)
Quality of content should be checked	32	18.28%	25	11.10%	57(14.25%)
More search options should be provided	10	5.71%	21	9.33%	31(7.75%)
Hyperlink to additional information should be available	11	6.28%	14	6.22%	25(6.25%)
Feedback mechanism should be available	22	12.57%	54	24.00%	76(19.00%)
Total	**175**	**100%**	**225**	**100%**	**400**
χ^2 =26.126 **Level of Significance=0.50** **Degree of Freedom=5**					

The analysis of the present study depicts that users prefer to use OADR for information seeking but face many challenges while using it. This table examines the responses of users regarding the changes they suggest for facilitating better information seeking in future. Most

of the users including scientists and research scholars (40.25%) suggest that there should be 'access to more research works' and 'feedback mechanism should be available'(19%) in OADR. Other changes that suggest are 'quality of content should be checked'(14.25%) and 'only peer-reviewed works should be available'(12.50%).

The analysis of chi square(χ^2) statistics confirms a strong relationship between 'access to more research works' as the change required in OADR and category of users. The difference in calculated (26.126) and critical values (4.351) of chi square explains that users strongly suggest changes in OADR to facilitate better information seeking in future.

Table-9: Impact of Open access digital Repositories on Information Seeking practice

Impact of Open access digital Repositories on Information Seeking Practice					
Impact	**Scientists**	**%**	**Research Scholars**	**%**	**Total (%)**
Increase in relevant searching	39	22.28%	32	14.22%	71(17.75%)
Increase in accessibility and convenience	14	8.00%	13	5.77%	27(6.75%)
Increase in access to unpublished materials	49	28.00%	53	23.55%	102(25.50%)
Increase in permanence and all time availability of materials	53	30.28%	81	36.00%	134(33.50%)
Decrease in time used for searching	20	11.43%	46	20.44%	66(16.50%)
Total	**175**	**100%**	**225**	**100%**	**400**
χ^2=10.899 **Level of Significance=0.50** **Degree of Freedom=4**					

The inception of Open access digital repositories has benefited the scholarly communication on global level. The scholarly materials are now easily collected and disseminated through free and open medium via OADR. Table 9 explores the users opinions about possible impact of OADR on their information seeking practices.33.50% scientists and research scholars report 'increase in permanence and all time availability of materials' as the biggest impact of OADR which is closely followed by 'increase in access to unpublished materials' with 25.50% and 'Increase in relevant searching' with 17.75% responses.

The statistical analysis of chi square(χ^2) test shows difference between calculated and critical values which further establishes a strong and significant relationship between the category of users and 'increase in permanence and all time availability of materials' as the impact of OADR. The level of significance is kept at 0.50 and degree of freedom is 4.

MAJOR FINDINGS OF THE STUDY:

On the basis of the analysis of 400 responses of scientists and research scholars of CSIR laboratories regarding the impact of open access digital repositories on their information seeking practices, the major finding are listed here under:

1. Most of the scientists and research scholars (78.75%) are well aware about the presence of open access digital repositories on the information scenario.
2. Results of the study suggest that users are not only aware about OADR but 55.25% users also prefer to use them for information seeking purposes.
3. The study also find out that most of the scientists and research scholars (48.50%) prefer to use subject specific repositories and Institutional repositories(22%) as compare to other content specific and cross institutional repositories.
4. The main purpose of seeking information through OADR as reported by the study is 'To update knowledge'(38%). 28.44% Research scholars also prefer to use OADR to 'access grey/unpublished works'.
5. It is deducted from the study that scientists and research scholars prefer Research articles/ papers and raw research data as the content in open access digital repositories.
6. Access to unpublished or grey literature is being reported as the biggest benefit of information seeking through OADR by both group of users i.e. Scientists and research scholars.
7. The study attempts to find out the drawbacks of seeking information through OADR. Most of the users' opinionated that 'lack of peer reviewed materials' and 'lack of knowledge about availability' are the major drawbacks of OADR.
8. Users prefer to seek information through OADR but suggest some changes so that the experience of information seeking can be made more meaningful.40.25% users want 'access to more research works' and 19% users want 'availability of feedback mechanism' in OADR as changes to be made in future.
9. The main purpose of the study is to measure the impact of OADR on users' information seeking practices. The study deduces that 'increase in permanence and all time availability of materials' is the most noticeable impact of OADR on users.

CONCLUSION AND RECOMMENDATIONS:

The study was taken up to assess the possible impact of open access digital repositories on information seeking practices of the users of eight research intensive CSIR laboratories of India. The results of the study conclude that scientists and research scholars are well aware about OADR and prefer to seek information through them. Research papers and articles are the most preferred content in an OADR. According to users access to otherwise unpublished materials is the major benefit and lack of peer reviewed materials is the major drawback of seeking information through OADR. To update knowledge is the main purpose of using OADR. In future scientists want access to more research works. Increase in permanence and all time availability of research materials is the biggest impact of OADR on scientists and research scholars information seeking practices.

Based on the results of the study following recommendations have been made:

1. Awareness of OADR is relatively less among scientists as compared to research scholars and Research scholars also prefer OADR more for information seeking than the scientists. This trend demands adoption of promotion policy for OADR on the level of libraries and OADR developers.

2. Libraries should conduct training programmes to make scientists and research scholars aware about the availability of OADR in their respective subject fields.

3. More and more subject specific repositories should be developed to facilitate scholarly communication among peers globally.

4. More emphasis should be given on the collection of Open Access Digital Repositories. Content should be according to the preference of the Users. More and more research centered and only peer-reviewed materials should be disseminated through OADR.

5. Feedback mechanism should be adopted by OADR developers to facilitate communication with users which will eventually help in minimizing the drawbacks of OADR.

6. OADR developers should provide some incentives to the users for encouraging more participation in contribution as well as in usage.

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