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Trends and Practices of Seeking Online Information Sources: The Case of Science Faculties of a Developing Country

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Abstract

Purpose – This study reports the trends and practices of seeking online information sources of Science faculties of a university of developing country. The focus was to explore their trends and practices of accessing and using online sources in both modes, i.e. Open Access (OA) and Subscribed Access (SA) to meet their academic and research information.

Design/methodology/approach – Quantitative design of research, based on a self-completion structured questionnaire survey was used. Surveyed population consisted of whole full time S&T teachers working in the 25 institutions/colleges/departments of all four S&T faculties viz. Sciences, Life Science, Engineering & Technology and Pharmacy of the University of the Punjab. Total response rate was 71% (156 out of 220 existed members). Frequency measure, descriptive statistics (mean (μ) and further, Analysis of Variance (ANOVA) were used to analyze, to interpret the data and to draw conclusions.
Findings – The survey results report valuable information regarding the digital access culture of this community. Though these are not considered extremely important and nor, are fully exploiting. Yet both modes are playing important and complementing role in meeting the e-scholarly needs of this community. It also discloses that there is no significant difference exists regarding the importance, use of both modes and adequacy level of subscribed sources among faculties.

Originality/value- Comparative analyses show no significant difference between the importance and use of these both modes in meeting the e-information. This study is the first account of the utilization of online modes by Science faculties of university.

Key words: Electronic scholarly communication; Open Access; Pakistan; Scientists; Subscribed Sources.

Paper type- Research paper

Introduction

Scholarly communication is the essence of all scientific work (Gravey, 1979). With the emergence of digital information resources and internet, the modes of accessing, searching, retrieving and consuming scholarly information have been rapidly changed. This scenario is "effectively transforming science into e-science" (Robert, 2009). The major developments in scientists' world are: globalization, exponential growth of S&T literature, increasing tendency of team research (multidisciplinary & interdisciplinary), collaboration at local, national and international level, and rapid disseminations of research results through sophisticated technologies. The direct access to scholarly communication made their practices more productive and collaborative. This scenario has brought certain challenges along with promising opportunities (Tahira, 2008).

The literature reports that science academicians of higher education are heavy users of e-scholarly communication besides traditional sources (Tenopir, 2002; 2003; Smith, 2003; Hiller and Self, 2002; Tenopir and King, 2004; 2001; Jamali, 2008). All over the world library subscription, online subscribed and unsubscribed sources are playing an important role in meeting their scholarly needs at local, national and international level. Life scientists were found the biggest users and OA repositories featured strongly in the ranked lists of life sciences (Nicholas et al. 2009). "The scientists have high expectation for being able to access all the information they need in the online format" (Jamali**,** 2008). While studying the differences in information seeking behaviour of scientists from different subfields of physics and astronomy, he raises question for this community that "What is not available online is not worth reading". Surridge rightly advocates the importance of web 2.0 as an important mode to meet the scientists' needs. He viewed the transition to Web 2.0 is perfectly natural. Scientists of the past or present are habitual of "crowd sourcing" of knowledge through open debate and Web 2.0 fits perfectly with the science works (as cited in Waldrop, 2008, May). The significant increase in the use of electronic modes and systems has a positive influence on the ease of communication without affecting the inherent structure of the process and faculty members and academic officers at some prestigious institutions are saying "no" to the big deal (Smith, 2007).

The awareness and adoption of e-journals is increasing rapidly while convenience of use has remained the most important concern for users. However, "the capacity to absorb scientific and technical knowledge is often weak in developing countries, leading to low levels of scientific output and further under-development" (Chan, Kirsop, Costa and Arunachalam, 2005, p.3). ProQuest advisory board meeting viewed that permanent access is a big deal, and raised the question to "thoughts on institutional

repositories, open access, ILS, and anything else that comes to mind" (Arbor, 2007, May, 7-8). The concept of OA has introduced by Harnad (1999) in a proposal. He suggested to place scholarly pre-prints along with post-prints of peer-reviewed published articles in open archives, and made available for free of cost. "OA is now threatening to overturn the $6 billion scholarly publishing industry and is forcing even the largest publishers against the ropes" (Poyender, 2004, p.5).

Providing speedy and reliable e-access to consumers is a fundamental prerequisite for promoting digital culture in a country. This study has been made at a time when the Government of Pakistan initiated significant, concrete efforts by establishing ICT infrastructure in universities and providing e-sources to university libraries in order to meet the changing needs of academicians, especially in the field of Science and Technology (S&T). The Government, through Higher Education Commission (HEC), is spending huge amount of budget for the subscription of online sources and promotion of national digital library programme. This is a unique example of country level subscription of e-sources in the third world (Said, 2006). Right now, HEC is spending huge amount of money in subscribing more than thirty e-databases and 45000 e-books. And it is also providing lending services from different e-repositories (Punjab University Library, n.d.) Library and information services available to the Community of PU are:

1. A central library
2. Institutional/departmental library units
3. HEC National Digital Library on Campus Access (subscribed as well as open access digital sources i.e., e-journals, e-books, links to e-repositories etc.)

These e-databases are searchable at PU campus with one window interface through ELIN **(E**lectronic **L**ibrary **I**nformation **N**avigator)**.** ELIN integrates data from several publishers, databases and e-print open archives (Punjab University Library, n.d.).

The networked academic environment demands that S&T teachers and researchers of Pakistan make effective use of the available resources for competitive teaching and research. They suppose to be able to use effectively the "knowledge @ your [their] fingertips" (Pakistan, HEC, n.d.). At the same time, for LIS professionals it is vital to probe into the pattern and practices of this community regarding seeking and using the digital resources at their disposal.

For the purpose of this study, OA and SA are defined as:

Open Access: An e-mode to access the information that is digitized, free of charge, copyright and licensing restrictions and available through general online-resources (e.g. Google, Yahoo, Scirus etc., e-links and informal e-communication).

Subscribed Access: HEC, IP based free on campus access to its affiliated institution(s).

Objectives

The objectives of this study are to investigate information seeking and usage patterns of Science faculties of PU with special focus on 'OA' and 'SA' modes to meet their e- information needs.
The key foci are intended to answer the following research questions:

1. What is science faculty's preferred e-mode for obtaining journals articles?
2. Is there any significant difference due to the importance assigned to SA and OA in search of relevant information and science faculties?
3. Is there any significant difference due to the importance assigned to SA and OA in search of relevant information and respondents' designation?
4. Is there any significant difference in the use of SA and OA and science faculties?
5. Is there any significant difference in the use of SA and OA and respondents designation?
6. Is there any significant difference to assign level of adequacy level of SA and science faculties?
7. Is there any significant difference to assign adequacy level of SA and respondents designation?

Research Method

Quantitative design of research, based on a self-completion structured questionnaire survey was used (Appendix A). Surveyed population consisted of whole full time S&T academics working in the 25 institutions/colleges/departments (Appendix B) of all Science faculties viz. Sciences, Life Science, Engineering & Technology and Pharmacy. Total response rate was 71% (156 out of 220 existed members). Frequency measure, descriptive statistics (mean [μ]) and further, Analysis of Variance (ANOVA) were used to analyze, interpret and draw conclusions. Likert type categorical scale and multiple choices are used to measure the respondents' attributes.

The analysis and interpretations of data are described below.

Data Analysis and Interpretations

Population Profile

Surveyed population is consisted of all full time S&T teachers of Science Faculties working in the 25 departments/colleges/institutions of PU.

The analysis of faculty wise percentage response in ranking order is presented in Table1. The total academic staff of four faculties was 267. At the time of data collection, 220 faculty members were present. Percentage response of Engineering and Technology faculty is 83 % (25/30), Science 77% (89/116), Pharmacy 67% (10/15) Life Science 54% (32/59). Total response rate is 71% (156/220).

Table1. ***Response Rate of S& T Faculties of PU***

Rank	Faculty	Total Faculty Members	Present	Respondents	Percentage Response
1	Engineering & Technology	36	30	25	83
2	Science	138	116	89	77
3	Pharmacy	22	15	10	67
4	Life Science	71	59	32	54
	Total	267	220	156	71

The data (Table 2) show percentage response received according to respondent's designation. Majority of respondents are Lecturer 60% (93) followed by Assistant Professor 19% (30), Associate Professor 12% (19) and Professor 9% (14).

Table 2. ***Frequency Distribution of Respondent's' Designation* (*N=156)***

Rank	Faculty's designation	Frequency	Percent (%)
1	Lecturer	93	60
2	Assistant Professor	30	19
3	Associate Professor	19	12
4	Professor	14	9

Preference for E-Scholarly Communication

Table 3 demonstrates variation in positive and negative responses about the respondents' preferences for e-scholarly communication.

Table 3. ***Preferred E-modes for obtaining Journals Articles***

Faculty	Preferred e-modes	n	Yes	No
Science	Library online subscription	84	42	42
	Other online sources	84	50	34
Life Science	Library online subscription	32	21	11

	Other online sources	32	21	11
Engineering & Technology	Library online subscription	24	16	8
	Other online sources	24	19	5
Pharmacy	Library online subscription	10	10	0
	Other online sources	10	7	3

Frequency measures show that there is much positive response for the preference of 'other online sources' in case of Science and Engineering & Technology faculties. However, in case of Life Science, there is equal response for the preferences of both modes of e-sources. On the other hand, all the Pharmacy respondents prefer to consult 'library online subscription' to meet their e- scholarly communication.

Importance of E-modes in Search of Relevant Information

Quality and quantity of information sources have been mounted due to modern ICTs developments and networking environment. Ease of access, least effort in terms of time, money and energy are found important factors in searching, using and quality of information. Due to changing and emerging information needs, respondents' views are analyzed about the importance of both types of available e-sources. Table 2 presents the data in this regard.

Data (Table 4) provide point of view of the respondents of all science faculties about the importance of the 'SA' sources' and 'OA' sources in search of relevant information. Mean values (μ) exhibit that science faculty members consider direct e-access (both modes) 'very important' in searching of relevant information.

Further (Table 4.1) affiliation of Analysis of Variance (ANOVA) indicates that there is no significant difference among 'science faculties' and the 'consider importance' of SA (F=.756, Sig=.520) and OA (F=1.122, Sig=.342).

Table 4. ***The Importance of Subscribed and Open Access Sources in Search of Relevant Information***

Faculty	Sources	n	Mean= μ	Std. Dev.
Science	HEC digital sources	87	2.9	0.963
	Other online sources	84	3.2	0.822
Life Science	HEC digital sources	32	3.1	1.008
	Other online sources	32	3.4	0.499
Engineering &	HEC digital sources	23	3.3	1.054
Technology	Other online sources	24	3.5	0.721
Pharmacy	HEC digital sources	10	3.2	1.033
	Other online sources	10	3.1	0.994

Extremely Important = 4; Very important = 3; Important = 2; Some what important= 1; Not important= 0

Table 4.1. ***ANOVA Table of Responses among Science Faculties***

Importance of Online sources	F	Sig.
HEC digital sources	0.756	0.520
Other online resources	1.122	0.342

The mean difference is significant at the .05 level

Table 5. ***Designation and Importance of Subscribed and Open Access Sources in Search of Relevant Information***

Faculty Designation	Importance of online sources	n	Mean= μ	Std. Dev.
Lecturer	HEC digital sources	91	3.0	1.024
	Other online sources	91	3.3	0.761
Asst. Prof	HEC digital sources	29	3.3	0.897
	Other online sources	27	3.2	0.943
Associate Prof	HEC digital sources	18	3.2	0.984
	Other online sources	18	3.5	0.618
Professor	HEC digital sources	14	3.1	0.949
	Other online sources	14	3.5	0.518

Extremely Important = 4; Very important = 3; Important = 2; Some what important= 1; Not important= 0

Table 5.1. ***ANOVA Table of Responses by Designation***

Importance of Online sources	F	Sig.
HEC digital sources	1.499	0.217
Other online resources	1.063	0.367

The mean difference is significant at the .05 level

Descriptive statistics mean values (μ) (Table 5) on the basis of designation imply that they consider both modes of e-access important.

However, affiliation of ANOVA (Table 5.1) responses among science faculties revealed no substantial evidence of significant difference among 'respondent's designations' and the 'consider importance' of both SA (F= 1.499, Sig=0.217) and OA (F= 1.063, Sig=0.367).

Frequent Use of E-Sources

Descriptive statistics about the frequent use of e-sources (Table 6.) divulges that all the science faculties' often use 'OA' to meet their academic and research information needs. 'SA' is often used (μ= 2.8; 2.6) by Pharmacy and Life Science faculties. Whereas, the respondents of Engineering & Technology and Science are occasionally (μ= 2.4; 2.4) used these databases.

Further, affiliation of ANOVA (Table 6.1) about the often use of both e-modes provides no evidence of significant difference among 'science faculties' and the 'use' of) SA (F=.392, Sig=.759 and OA (F=.182, Sig=.908).

Table 6. ***Often Use of E-Sources by Science Faculties***

Faculty	E-Sources	N	Mean= μ	Std. Dev.
Science	HEC subscribed sources	86	2.4	1.144
	Other web sources	77	3.0	1.083
Life Science	HEC subscribed sources	29	2.6	1.178
	Other web sources	29	2.9	1.060
Engineering & Technology	HEC subscribed sources	24	2.5	1.382
	Other web sources	19	3.0	1.062
Pharmacy	HEC subscribed sources	10	2.8	1.033
	Other web sources	9	2.8	0.972

Very often= 4; Often= 3; Occasionally = 2; Rarely =1; Never= 0

Table 6.1. ***ANOVA Table of Responses among Faculties***

Use of Online sources	F	Sig.
HEC subscribed sources	.392	.759
Other web sources	.182	.908

The mean difference is significant at the .05 level

Descriptive statistics mean values (Table 7) about the often use of online sources by designation indicate that 'OA' is often use by all of them. Whereas, 'Assistant Professor' (μ=2.2) and 'Associate Professor' (μ=2.2) occasionally use 'SA' to meet their academic and research information needs.

Affiliation of ANOVA (Table 7.1.) revealed that data provide no substantial evidence about the often use of both e-modes and there is no significant difference existed between 'faculty's designation' and the 'use' of SA (F=2.381, Sig=0.072) and OA (F=.621, Sig=0. .603).

Table 7. ***Frequent Use of E-Sources by Designation***

Designation	Use of online sources	N	Mean= μ	Std. Dev.
Lecturer	HEC subscribed sources	86	2.5	1.111
	Other web sources	77	3.0	1.017
Asst. Professor	HEC subscribed sources	29	2.2	1.343
	Other web sources	29	3.0	0.868
Associate	HEC subscribed sources	24	2.2	1.214
Professor	Other web sources	19	2.6	1.277
Professor	HEC subscribed sources	10	3.0	0.997
	Other web sources	9	2.8	1.371

Very often= 4; Often= 3; Occasionally = 2; Rarely =1; Never= 0

Table 7.1. ***ANOVA Table of Responses among Faculties***

Use of online sources	F	Sig.
HEC digital sources	2.381	0.072
Other online resources	0.621	0.603

The mean difference is significant at the .05 level

Adequacy level of HEC Subscribed Sources

When responses are examined about the adequacy level of HEC subscribed sources, the data (Table 8.) present that the respondents of three faculties 'Science', 'Life Science' and 'Pharmacy' are to moderate extent (μ= 1.8; 1.7; 1.6) satisfied from HEC subscribed sources. Mean values also depict slight variation among their responses. Whereas, the faculty members of Engineering and Technology are only 'to some extent' (μ=1.4) satisfied from these sources.

Table 8. ***Faculties and adequacy level of Subscribed Sources***

Faculty	N	Mean= μ	Std. Dev.
Science	83	1.8	0.797
Life Science	32	1.7	0.693
Engineering & Technology	22	1.4	0.670
Pharmacy	10	1.6	0.699

To great extent =3; To moderate extent = 2; To some extent = 1; Not at all= 0

Table 8.1. ***ANOVA Table of Responses among Science Faculties***

Adequacy level of subscribed sources	F	Sig.
HEC digital sources	1.182	0.319

The mean difference is significant at the .05 level

However, affiliation of ANOVA (Table 8) provides evidence that none of science faculties found 'SA' adequate enough to meet their information needs. Data (Table 8.1) indicate that no significant difference (F=1.182, Sig=0.319) exist between 'adequacy level of HEC digital sources' and 'science faculties'.

Descriptive statistics mean values (Table 9) indicate that faculty members by designations found 'SA' to moderate extent adequate enough to meet their e-information needs. Further, analysis by ANOVA (Table9.1) provide evidence that there is no significant difference existed between 'adequacy level of HEC digital sources' (F=.076, Sig=0.973) and 'faculty's designation'.

Table 9. Designation and ***Adequacy level of Subscribed Sources***

Designation	N	Mean= μ	Std. Dev.
Lecturer	88	1.7	0.713
Asst. Professor	29	1.6	0.897
Associate Professor	17	1.8	0.831
Professor	13	1.7	0.630

To great extent =3; To moderate extent = 2; To some extent = 1; Not at all= 0

Table 9.1. ***ANOVA Table of Responses by Designation***

Adequacy level of subscribed sources	F	Sig.
HEC digital sources	.076	0.973

The mean difference is significant at the .05 level

Findings

The focus of the study was to assess the trends and practices of Science faculty's of university in seeking both e-modes (OA and SA) of online sources to meet their e-scholarly information needs. The following findings are made on the basis of analyzed data.

To meet their e-scholarly communication needs, Science and Engineering & Technology respondents prefer to consult OA slightly more than others. Whereas, respondents of Life Science give equal preferences for both modes and Pharmacy respondents showed their preferences for 'SA' in obtaining e-journals articles. The study also explores trends and practices of Science faculties towards the importance and use of e-modes. It discloses that Science faculties of PU consider direct e-access 'very important' for searching the relevant information and 'often use' to meet their e-information needs. Further, affiliation of ANOVA depicts that there is no substantial difference exists in terms of the 'importance' and 'use' of both e- modes and 'Faculties'. In the same vein, no significant difference exist in terms of 'importance' and 'use' of these modes and the 'respondent's designations'. The same fact is found true regarding their perception of the adequacy level of 'SA'.

Conclusion

This study explores the trends and practices of accessing online information of Science academics of higher education in developing countries. Faculties of sciences are seeking both e-modes to meet their e-information needs. Comparative analyses show no significant difference in the importance and use of

both modes of online sources. The study is limited to explore the some aspects of the online sources. It is seem imperative to explore the more subjective views of the participant in interpretive or critical ways.

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Appendix A.

QUESTIONNAIRE

Be sure that data supplied by you will be treated as confidential and will be used for research purpose only. Please feel free in supplying the information.

Faculty:_____

Q1. How important are the following sources while searching information on your relevant field?

Sr #	Resources	Extremely Important	Very Important	Important	Somewhat Important	Not Important
2.1	HEC digital library					
2.2	Other online web sources					

Q2. How do you obtain journal articles? (Please check all that apply)

3.1 Library's online subscription ☐

3.2 Other online web sources ☐

Q3. How often do you use the following sources of information?

Sr #	Sources	Very often	Often	Occasionally	Rarely	Never
4.1	HEC subscribed databases					
4.2	Other web sources					

Q4. When in need of information, are you most likely to…..? (Check one)

5.1 Search HEC subscribed sources ☐

5.2 Search other online sources ☐

Q 5. To what extent accessibility of HEC subscribed databases adequate enough to meet your information needs?

To great extent ☐ To moderate extent ☐ To some extent ☐ Not at all ☐ Never used ☐

Appendix B.

LIST OF S&T FACULTIES AND DEPARTMENTS/INSTITUIONS/COLLEGES of PU SURVEYED

1. Faculty of Life Sciences
2. Institute of Biochemistry & Biotechnology
3. Department of Botany
4. Department of Zoology
5. Department of Micro Biology & Molecular Genetics
6. Institute of Mycology & Plant Pathology
7. Department of Psychology & Applied Psychology
8. Centre for Clinical Psychology
9. Faculty of Sciences
10. Department of Physics
11. Institute of Chemistry
12. Institute of Geology
13. Centre for High Energy Physics

14. Centre for Geographic Information System (GIS)
15. Department of Space Science
16. Department of Geography
17. Centre for Clinical Psychology
18. Department of Mathematics
19. College of Statistical and Actuarial Sciences
20. Centre for Solid State Physics
21. College of Earth and Environmental Sciences
22. Punjab University College of Information technology
23. Faculty of Pharmacy
24. University College of Pharmacy
25. Faculty of Engineering & Technology
26. Institute of Chemical Engineering & Technology
27. Institute of Quality & Technology Management
28. College of Engineering and Emerging Technologies
29. Department of Metallurgy and Material Engineering