CHAPTER 7

Seeking Online Information Sources among Science Faculties of Developing Countries

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Abstract. *This study explores the trends and practices of accessing online information of four Science academics of higher education in a developing country. Scientist and technologist differ in their 'socioeconomic' background this may have a deep impact on the information needs and seeking behaviors. Literature review reveals that psychological perspective of S&T teachers belonging to various disciplines play different roles, have different needs and respond differently to the same information because of particular psychological attributes (Personality, age skills, style, experience, habits etc.). Activities of basic researcher applied researchers and technologists are not always neatly defined.*

Keywords: Online Information, Information Seeking Behavior, Science Information Sources

1. Introduction

Scholarly communication is the essence of all scientific work (Gravey, 1979). With the emergence of digital information resources and the internet, the modes of accessing, searching, retrieving and consuming scholarly information have been rapidly changing. This scenario is "*effectively transforming science into e-science*" (Robert, 2009). The major developments in the scientists' world are: globalization, exponential growth of S&T literature, increasing tendency of team research (multidisciplinary and 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, 2010).

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). The advent of scholarly communication and publishing behaviour in open access or subscribed journals has also transformed their behavior of searching and using digital access (Hemminger, Lu, Vaughan, Adam, 2007; Warlick, 2006; Brown, 2003). All over the world library subscription, online subscribed and unsubscribed sources are playing an important role in meeting their scholarly needs of local, national and international level. Significant changes have been observed during a census survey about current information seeking behavior at the University of North Carolina at Chapel Hill. Basic science and medical science academics were studied. Major changes were the increased reliance on web based resources and fewer visits to the library (Hemminger, Lu, Vaughan, Adam, 2007). Life scientists were found the biggest users and OA repositories featured strongly in the ranked list of life sciences (Nicholas, Clark,

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Rowlands, Jamali, 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 questions 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 says that in principal, this 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). 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 this initiative is positively debated by faculty members and academic officers at some prestigious institutions by the notion "*NO*" too big deal (Smith, 2007).

The awareness and adoption of e-journals are 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). Azubogu and Madu found ease of use, convenience, free access to the internet were the main reasons of using internet among Nigerian university teaching staff (2007).

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). A study focused on the impact of ICT on science faculties respondents' choice pattern for information needs of PU science faculties reflects that both libraries and e-resources are playing important role in meeting respondents' information needs; direct access to e-sources has slightly decreased the number of their visits to departmental and central libraries; faculty spend comparatively more time on searching web sources than print. General web resources, university libraries and HEC digital library are respectively considered very important resources in search of relevant information and they comparatively spend more time on searching web sources than print sources (Tahira and Ameen, 2010). Their information needs are associated more with the teaching activities followed by research activities. About 68 percent of science faculty wanted a formal training in the use of online databases (Tahira, 2010).

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 in 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 the budget for the subscription of online sources and promotion of the 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.). It provides the broadband facility (at 256Kbps, 512 Kbps and 1 Mbps) to expand the IT network in education structure. A recent initiative is an open access digital archiving project (journal articles, conference papers, PhD/MPhil theses and dissertations) from HE's' institutions of Pakistan.

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 (Electronic Library Information Navigator). ELIN integrates data from several publishers, databases and e-print open archives (Punjab University Library, n. d.).

The networked academic environment played a significant role in developing e-culture in public universities. It demands the effective use of these available resources from academics and researchers for competitive teaching and research. They supposed 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).

2. 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 meet their e- information needs.

The key foci are intended to answer the following research questions:

1. What is science faculty preferred e-mode for obtaining journal articles?
2. Is there any significant difference exist due to the importance assign to '*SA*' and '*OA*' in search of relevance information and '*science faculties*'?
3. Is there any significant difference exist due to the importance assign to '*SA*' and '*OA*' in search of relevant information and "*respondent's designation*"?
4. Is there any significant difference exist about the use of '*SA*' and 'OA and "*science faculties*"?
5. Is there any significant difference exist about the use of '*SA*' and 'OA and "*respondent's designation*"?
6. Is there any significant difference to assign level of adequacy of *SA*" and "*science faculties*"?
7. Is there any significant difference to "*assign level of adequacy of SA*" and "*respondents designation*"?
8. To explore the major weaknesses of the existing information system.

3. 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 teachers working in the 25 institutions/colleges/departments (Appendix B) of all four S&T faculties viz. Sciences, Life Science, Engineering& Technology and Pharmacy. The 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 analyse, interpret and draw conclusions. Likert type categorical scale and multiple choices are used to measure the respondents' attributes. One open ended question is designed to get opinion about major weakness of the present system.

The analysis and interpretations of data are described below.

4. Data Analysis and Interpretation

4.1 Population Profile

The population surveyed consists 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 academics of four faculties were 267. At the time of data collection, 220 faculty members were present. The percentage response of Engineering and Technology faculty is 83 % (25/30), Science 77% (89/116), Pharmacy 67% (10/15) and Life Science 54% (32/59). The total response rate is 71% (156/220).

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

Table 1. Response Rate of Science and Technologies Faculties of PU

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

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

Table 2. Frequency Distribution of Respondents Designation (N = 156)

4.2 Preference for E-Scholarly Communication

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

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 the case of Life Science, there is an equal response to 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.

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

Table 3. Preferred E-modes for obtaining Journals Articles

4.3 Importance of E-modes in Search for Relevant Information

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

Data (Table 4) present the opinion 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 for 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 the importance*' of SA (F =. 756, Sig =. 520) and OA (F = 1.122, Sig = .342).

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 & Technology	HEC digital sources	23	3.3	1.054
	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

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

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

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

Table 4.1. ANOVA Table of Responses among Science Faculties

The mean difference is significant at the .05 level

Faculty 's' 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

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

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

The mean difference is significant at the .05 levels

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 between '*respondent's designations*' and the '*consider importance*' of both SA (F = 1.499, Sig = 0.217) and OA (F = 1.063, Sig = 0.367).

4.4 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).

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

Table 5.1. ANOVA Table of Responses by Designation

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

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

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

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

Table 6.1. ANOVA Table of Responses among Faculties

The mean difference is significant at the .05 levels

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

Descriptive statistics mean values (Table 7) about the often use of online sources by designation indicate that "*OA*" is often used 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.

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 Professor	HEC subscribed sources	24	2.2	1.214
	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

Table 7. Often Use of E-Sources by Designation

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 = 0.621, Sig = 0.603).

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

Use of online sources	F	Sig.
HEC digital sources	2.381	0.072
Other online resources	0.621	0.0603

Table 7.1. ANOVA Table of Responses among Faculties

The mean difference is significant at the .05 levels

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 a 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.

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

Table 8. Faculties and adequacy level of Subscribed Sources

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

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

Table 8.1. ANOVA Table of Responses among Science Faculties

The mean difference is significant at the .05 levels

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 a 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*'.

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

Table 9. Designation and Adequacy level of Subscribed Sources

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

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

Table 9.1. *ANOVA Table of Responses by Designation*

The mean difference is significant at the .05 levels

4.5 Major Weaknesses of Information System

Lack of up-to-date training of library staff' (N = 18), no promotion of library activities/services (N = 50) and low level of staff motivation towards library services (N = 39) were second and the '*lack of user interaction with library staff*' (N = 23) were three major weaknesses pointed by respondents.

5. Findings

The focus of the study was to assess the trends and practices of Science faculties 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 analysed 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 these faculties towards the importance and use of e-modes. It discloses direct e-access '*very important' for searching the relevant information and 'often use*' to meet their e-information needs. Further, an 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 exists in terms of '*importance*' and '*use*' of these modes and the '*respondent's designations'*. The same fact is founded true regarding their perception of the adequacy level of "*SA*".

6. Discussion and Conclusion

Faculties of sciences are seeking both e-modes to meet their information e-scholarly information needs. Though these

Rank	Major weaknesses	N	Science (N = 5)	Life Science (N = 23)	Engineering &Technology (N = 21)	Pharmacy (N = 6)	Frequency
1	Lack of up to date training of library staff	106	22	14	10	4	50
2	Improper marketing/promotion of library activities/services		19	8	9	3	39
3	Low level of staff motivation towards services		9	7	5	2	23
4	Lack of user interaction with library staff		11	5	3	1	20
5	Inadequate internet connectivity speed		4	5	2		11
6	Lack of awareness regarding existing information services		5	2	2	1	9
7	Lack of S&T subject back ground of library staff		3	2		2	7
8	Non user friendly system		2		1	2	5
9	Lack of standardization		2	1	2		5
10	No-resource sharing among libraries		1	1	2		4
11	Finance is major problem		2		1		3
12	Interrupted power supply					1	1

Table 10. *Frequency Distribution of Major Weaknesses of the present information Systems of PU* (*N*=156)

are not using up to the optimum level. Even though, subscribed sources by parent body are considered of high quality, but these pricey databases are also not fully exploiting. Comparative analyses show no significant difference in the importance and use of both modes of online sources. The discipline, experience, and purpose of use do matter a lot in seeking any kind of sources. Palmer (1991) clustered scientists IB (Information Behaviour) into five groups of seekers and non-seekers according to discipline and experience in the field. The way they involves/participate (take on) these activities may slightly vary according to discipline (Ellis, Cox & Hall, 1993). Scientists find e-resources faster, easier, quicker and convenient to use because of value added features. Familiarity (or lack of it) is a root cause of use and non-use of information sources. The variables that affect the selection and use of information sources mentioned by Pinelli (1991) are relevant, accessibility, ease of use, expense, familiarity and reliability. It is also found in different studies that usually convenience, availability of information and ease of access affect the quality of information sources (Hallmark, 2001, Fidal & Green, 2004). Tenopir (2002, 2003) noted that the use of electronic versions still varies from discipline to discipline and age. Lack of awareness was mentioned as one of the contributing factors for non-use of e-journals (Nelson, 2001, Tenner & Ye, 1999; Teskey & Urquhart, 2001). Hallmark (2001) found out that academics meteorologists used easiest method of locating relevant information instead of going for quality. Accessibility (in terms of saving time) (Taylor, 1991; Björk & Turk, 2000; Fidal & Green, 2004) and familiarity (Fidal & Green, 2004) to be the factor that most influences engineers' in selection of information. Case (2007) after reviewing different information seeking research survey related to engineers found "*the most compelling reason was relevancy followed by accessibility and technical quality or reliability*" (p.256). There have been surprising changes due to Information Communication Technology (ICT) from collection to connect. Furthermore, many factors contribute to the selection and use of different information sources. such as: cost, past success, accuracy, reliability, availability comprehensiveness, usefulness, currency, response time, accessibility, technical quality and the format (Shanmugan, 1999; Yang, 1998, as cited in Majeed &Tan, 2002)." The variables that affect the selection and use of information sources in e-publishing and communication modes would be a potential area to study in the future. Scientists '*invisible college*' and their collaborative activities would be another potential area need to be studied in digital scenario.

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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 c

3.2 Other online web sources c

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 c
5.2 Search other online sources c

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

To great extent c to moderate extent c to some extent c Not at all c Never used c

Q.6 In your view, what is/are the overall major weakness (es) of the present information services of the PU? Your valuable suggestions are more than welcome. (You may use extra sheet)

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Appendix B

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

1. Faculty of Life Sciences

1. Institute of Biochemistry & Biotechnology
2. Department of Botany
3. Department of Zoology
4. Department of Micro Biology & Molecular Genetics
5. Institute of Mycology & Plant Pathology
6. Department of Psychology & Applied Psychology
7. Centre for Clinical Psychology

2. Faculty of Sciences

1. Department of Physics
2. Institute of Chemistry
3. Institute of Geology
4. Centre for High Energy Physics
5. Centre for Geographic Information System (GIS)
6. Department of Space Science
7. Department of Geography
8. Centre for Clinical Psychology
9. Department of Mathematics
10. College of Statistical and Actuarial Sciences
11. Centre for Solid State Physics
12. College of Earth and Environmental Sciences
13. Punjab University College of Information technology

3. Faculty of Pharmacy

1. University College of Pharmacy

4. Faculty of Engineering & Technology

1. Institute of Chemical Engineering & Technology
2. Institute of Quality & Technology Management
3. College of Engineering and Emerging Technologies
4. Department of Metallurgy and Material Engineering