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A Study of IT Infrastructure in Pakistani University Libraries

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Abstract

This study has investigated the status of hardware, software, networking and IT support available in university libraries of Pakistan. Survey method of research was employed to collect the data through a questionnaire survey. Fifty two out of 82 chief librarians/head librarians of central libraries of the public and private universities responded. The study concluded that except few, a vast majority the university libraries have computers and other peripherals; use of 'free and open sources' software increase in the university libraries; only few university libraries implement standard integrated library software, while the use of in-house developed library software is common; most of university libraries use 'Internet Explorer' as their search engine; fixed line telephone facility is available in most of the university libraries, while 'fax' is available in some of the university libraries; a vast majority of the university libraries have local area network (LAN), whereas wireless network is available in some of the university libraries; a vast majority of the university libraries receive IT support from their university's IT Center/Computer Center, while some have their in-house support.

Keyword. **Information technology, Pakistani university libraries, library automation, IT infrastructure, ICT**

Introduction

Mankind has been handling information since thousands of years; early technologies that helped him in this regard included the abacus and printing. The last three decades or so have seen an amazingly rapid development of such technology, spearheaded by the computer; more recently, cheap microelectronics have permitted the diffusion of this technology into almost all aspects of daily life and an almost inextricable cross-fertilizing and intermingling of its various branches. The term information technology was coined, probably in the late 1970s, to refer to this nexus of modern technology, electronic based, for handling information. …Its applications are industrial, commercial, administrative, educational, medical, scientific, professional, and domestic (Illingworth, 1983).

UNESO has defined information technology as "scientific, technological and engineering disciplines and the management techniques used in information handling and processing: their application, computers and their interaction with men and machines and associated social, economic, and cultural matter". ALA Glossary of Library and Information Science (1983) defined information technology as "the application of computers and other technologies to the acquisition, organization, storage, retrieval, and dissemination of information".

Earl (1989) defines *IT infrastructure* as the technological foundation of computer, communications, data and basic systems. He views IT infrastructure as the technology framework that guides the organization in satisfying business and management needs. IT infrastructure is a foremost business resource and a prospective source to attain sustainable competitive advantage (Keen, 1991). The use of information technology in

academic libraries is very much needed to provide efficient and accurate services, to control the rapid growth of information, to facilitate cooperation, and to manage increased workload. IT has opened new avenues for the storage and retrieval of information and its use in academic libraries has been increasing gradually (Veeranjaneyulu, 2004).

Study Objective

The objective of this study is to investigate the status of hardware, software, networking and IT support available in university libraries of Pakistan.

Study Design

The Central Libraries of Pakistani Universities situated in four provinces and Federal Capital were included in the study. Among 91 universities, nine had presently no provision of Central Library. Therefore 82 out of 91 university libraries comprised the population for this study. A semi structured questionnaire both in printed and soft copies were sent to the chief librarians/head librarians. The valid response rate was 63.41% (52 out of 82). SPSS16 was used to analyse the data. The descriptive statistics including frequency distribution, percentage, mean, median, mode, minima, maxima, standard deviation etc. were employed to analyze the data. Figures were also included to express the data.

Literature Review

In this review, literature on three aspects (i.e. hardware, software, and networking) is included to understand the problem.

Hardware

Ortiz-Zapata & Quintana (1991) studied seventeen public and private academic libraries of Puerto Rica. The paper found that 76 percent libraries had one or more computers. In East Africa, all the government-owned university libraries had computers. Moi University Library had 51 (66.2%), Dar Es Salaam 16 (20.8%), Sokoine 8 (10.4%), Egerton and Mbarara one (1.3%) computer to provide services (Mulimila, 2000).

A comparative study of strategic management of IT applications in some selected university libraries of Ghana and United Kingdom found that the status of IT applications was very low in all the university libraries in Ghana with slightly varying degrees in individual institutions. In the United Kingdom, a very significant level of IT applications was found in the university libraries (Badu, 2004). In Zambia University Library, more than 50 percent IT equipment was out-of-order. Almost all the printers acquired since 1992 were not functioning (Makondo & Katuu, 2004). Davarpanah (2001) highlighted that about 93% university libraries in Iran had computer systems, whereas only seven percent had not yet introduced computers.

Ramana & Rao (2003) found that most of the Central University (CU) Libraries in India had the basic infrastructure to introduce and use IT. Eleven (79%) out of sixteen libraries were found using computers, two were in the process of procurement and one had not reported the numbers of computers available. The respondent libraries had a total of 169 purchased computers ranging from one to 53 with an average of 15 PCs per CU library. In Rajasthan State, about all the academic libraries had PENTIUM III system, whereas only two out of ten libraries had acquired PENTIUM IV systems. Rajasthan University Library had 25 systems and Banasthali Vidyapith had 10 systems in its library (Vyas, 2003). Cholin (2005) stated that many Indian university libraries have had

procured computer systems. The infrastructure created became obsolete in less than 5 years and libraries were in need of additional financial support. It was interesting to note that the universities, who had introduced IT in recent past, have sophisticated computer systems as compared to those universities who had implemented computerization earlier. Raza & Nath (2007) described that all the university libraries under the study had installed computers having floppy drives, CD-ROM drives, and network facilities. Punjab University Library, Chandigarh had the largest number of computer terminals i.e. 98, followed by Guru Nanak Dev University Library, Amritsar with 71, Punjabi University Library, Patiala with 58 and Himachal Pradesh University Library, Shimla with 25 computers. Kannappanavar & Vijayakumar (2001) (as cited in Nyamboga & Kemparaju, 2002) highlighted the use of hardware and software in the universities of Agricultural Science libraries in Karnataka.

There was no computer in 23 percent libraries (N=244), 28.3 percent had one, 24.6 percent had 2-4, 11.9 percent had 5-10, 7.8 percent had 11-20 and 4.1 percent had more than 20 computers in the libraries of Pakistan (Ramzan, 2002). Mah-Jabeen (2004) found that 29 percent libraries (N=77) in Pakistan were using only one computer to perform library operations, and majority of the libraries (68.9%) were using 2-5 computers. Shafi-Ullah & Roberts (2009) recently conducted a survey of 13 public sector universities and degree awarding institutes in Islamabd, Pakistan, to investigate the capability of their ICT infrastructure to accommodate standardized library management system. The findings indicated that all the respondents have some ICT facilities.

Software

Ekpenyong (1997) stated that The University of Ibadan Library was the first largest library to computerise its library operations and services in Nigeria. Mini CDS/ISIS was the first woftware statrted to use in 1992 for cataloguing of new books. In April 1993, Mini CDS/ISIS was replaced by IME's TINLIB software. This university library played a significant role in promoting IT in the university libraries of Nigeria. Younis (1999) reported that nine (52.9 percent) Jordanian university libraries were using CDS/ISIS, six (35.3 percent) were using MINISIS and two (11.8 percent) were using customized applications to automate their services. Ramana & Rao (2003) described that thirteen (93%) out of sixteen Central University Libraries were using different operating systems, word processors and application software. CDS/ISIS was the most widely used software. Vyas (2003) surveyed 10 academic libraries of Rajasthan State and found that all academic libraries had Window based operating system. UNIX and LINIX were also being used in two libraries. Forty percent libraries were using commercial library software LIBSYS, while the same percentage was using SOUL; developed by INFLIBNET.

Raza & Nath (2007) found that MS-DOS, Windows, Unix and Linux operating systems were being used in university libraries of Punjab, Chandigarh and Himachal Pradesh. CDS/ISIS was being used in all the university libraries. Punjabi University Library, Patiala and Punjab University Library, Chandigarh were also using LIBSYS and TechLibPlus software respectively. A survey of Technical Deemed University Libraries of North India reported that 80 percent libraries were using LibSys, while 20 percent

were using SOUL software packages for automation. No library was using in-house developed software (Vasishta, 2008).

Mahmood (1993) stated features of Micro CDS/ISIS Version 3.0. He described 30 reasons to use Micro CDS/ISIS software in the libraries of developing countries (Mahmood, 1997). A survey conducted by Mahmood (1998) revealed that 45 percent (N=49) academic libraries were using CDS/ISIS. In 1995, Mahmood stated that library automation was in its formative years in Pakistan and no seriuos effort was made in a proper manner to develop a library software. The study recommended to establish a National Center for Library Software Development in the country. Idrees conducetd a survey "The library automation in Lahore" in 1995. Mehmood (1996a) described the important features and six modules of Library Automation Management Program (LAMP). This software was developed by Neatherlands Library Development Project (NLDP) using advanced programming features of CSD/ISIS to fulfill the automation needs of Pakistani libraries. Farooq (1997) evaluated LAMP software and declaired it best for Pakistani libraries. Mustafa (2000), in his Masters' thesis "Comparative study of LAMP & INMAGIC software" recommended to use LAMP in Pakistani Labraries after necessary revisions and modifications. Shafique & Mahmood (2007) conducted a survey of automated libraries of Lahore, Pakistan to know the opinions of LIS professionals regarding library softwares. Thirty one softwares were being used in 83 automated libraries. Forty four percent libraries were using local softwares, i.e. LAMP, LIMS, KITABDAR, Library Managemt System, Education Palnner, Library Manager, and LIVE-2000. Thirty two percent were using foreign softwares, i.e. CDS/ISIS, WINISIS, INMAGIC, Book Organizer Deluxe, DB-Text, Library World 98, EOSI_GOPAC, and

Virtual SLE. Twenty three percent libraries were using in-house developed software to automate their operations and services.

Rafiq & Amin (2008) in their recent publication on "issues and lessons learned in open source software adoption in Pakistani libraries" emphasised to adopt open sources software in the Pakistani libraries. The paper concluded that:

> The adoption of OSS is at an early stage in Pakistan. OSS offers many attractions to the country's libraries which lag behind in technology adoption. OSS offers economical alternatives to costly commercialized library management systems. The open source model also gives an opportunity to library staff to be actively involved in development projects, to enhance their skills and to employ a wide range of technological application for library functions. However, the adoption of OSS on a wide scale will largely depend on long-term commitments by the organisations. Libraries and library professionals need to empower themselves with needed technological skills, and address conceptual, social, financial, technical, human issues in a collaborative manner for greater efficiency and cost savings. Moreover, the Open Source Resource Center (OSRC) may play a vital role in pursuance of OSS adoption in Pakistani libraries on a wider scale. It is hoped that OSS adoption projects in Pakistani libraries will accomplish success by careful planning and by devising a mechanism to address the identified issues (p.608).

Shafique & Mahmood (2008) described the different features of four intergated library softwares (LIMS, WINISIS, LAMP and INMAGIC) being used in the libraries of Lahore, Pakistan. The study rated INMAGIC as the best integrated library software as

compared to other three types of software regarding its ease of use, documentation, online help, easy installation, error-freeness, speed, compatibility with hardware, overall suitability for their libraries, input facility, reports, web compatibility, availability of all desired software modules and searching facility. LIMS, a free of cost software was declared as second by the respondent libraries due to the availability of all the desired modules.

According to a survey of LIS professionals (N=370, from 48 countries) conducted to know their perceptions towards open source software (OSS) adoption in libraries, the respondents showed their positive inclination toward the adoption of OSS. The study concluded that the use of OSS was at the stage of infancy and there was a need for further enquiry on this area on a large scale (Rafiq, 2009).

Library automation dated back to 1950s and 1960s in US and Europe. In Pakistan, it was introduced in 1980s and a small number of libraries computerised their services in or after 1987. Most of the Pakistani libraries were using microcomputers and were working individually to automate their libraries without having benefits of others' experiences. Due to few articles on this area, library literature had not figured out the status of automation in the country (Malik, 1995; Mahmood, 1996b; Haider, 1998).

Haider (2003) stated that automation activities were started in the late 1960s and, since 1990, has been the main focus of LIS profession in Pakistan. Few private university libraries had implemented integrated library systems, whereas large public sector university libraries, college libraries, and public libraries were lacking automated systems. UNESCO's developed CDS/ISIS, INMAGIC and ORACLE were the major popular softwares being used in Pakistani libraries.

Networking

Literature about networking is gridded in Table 1.

Table 1

Summary Table of Literature on Networking

Citation	Sample	Environment	Method	Conclusion
Mulimila (2000)	8	Govt. Owned University Libraries of East Africa	Survey	Only one (20%) university library had established local area network.
Ramazan (2002)		Academic and research libraries of Pakistan	Survey	Sixty eight percent academic and research libraries in Pakistan had no network server, 29 percent had one and eight percent had 2-4 server machines.
Ramana & Rao (2003)	14	Central University Libraries, India	Survey	Eight (57%) respondent libraries, had computer network and five (36%) had CD network too.
Barnett-Ellis & Charnigo (2005)	53	Medium size academic libraries United States	Survey	Results showed that 85percent respondent (N=53) libraries offered wireless-network access, only four institutions have had wireless networks for more than three years. The majority (73 percent) has implemented wireless networks just within the last two years.
Salih (2006)	4	University libraries of Kerala State	Survey	All the university libraries of Kerala State, India, had a LAN within the library.

Results

Hardware

Personal computers. The study discloses (Table 2) that 20 (42.55%) respondent libraries had up-to 10 and 14 (29.79%) had between 11-50 personal computers in their use. Two (4.26%) libraries had got personal computers between 151-200, while one each library had 101-150 and more than 200 personal computers respectively. The descriptive statistics shows that the sum of personal computers in 47 respondent libraries was 1720, ranged between 1 and 216, whereas the mean value was 36.60.

Table 2

Frequency Distribution of Personal Computers(N=47)

Number of PCs	Frequency	Percent
Up-to 10	20	42.55
11-50	14	29.79
51-100	9	19.15
101-150	1	2.13
151-200	2	4.26
201+	1	2.13

Note. Percentages do not always equal 100 due to rounding.

IT equipments. Table 3 presents the cross tabulation of IT equipments and the available quantity in responded libraries. The analysis reveals that only 11 (21.15%) respondent libraries had a sum of 19 CD-ROM Servers. Twelve CD-ROM Towers were

available only in three libraries . Majority (29 out of 52, 55.77%) of the respondents had Database Server ranged between one and four with a sum of 40 Sixteen (30.77%) university libraries were using Hard Disk as a Back-up Device ranged between one and four.

Microfiche Reader, Microfilm Digitizer, Microfilm Printer was available only in one of the respondent library. Eight (15.38%) libraries had the provision of Microfilming Machines.

Regarding the availability of Hubs, 24 respondent libraries stated that they had installed Hubs to establish network ranged from one to 12. Network Server and Switches were being used by half of the university libraries under the study. Eleven (21.15%) libraries had mounted Routers in their network.

Dot Matrix Printer was available in 12 respondent libraries; nine had provision of Heavy Duty Network Printer; 14 were using Inkjet Printer; while majority (44 out of 52, 84.62%) university libraries had got Laser Printers facility.

Eight (15.38%) respondent libraries had the facility of Barcode Printer, while 22 (42.31%) libraries were using Barcode Reader in their circulation operations.

Regarding the scanners availability, 23 (44.23%) university libraries stated that they had Flat Belt Scanner, while eight (15.38%) had Over-head Scanners.

Digital Camera was available in 14 (26.92%), DVD/CD Player and Multimedia Projector in 17 (32.69%), Laptop in 13 (25.00%), Photocopying Machine in 30 (57.69%), Television in 19 (36.54%), UPS in 33 (63.46%) ranged from one to 35, VCR/VCP in 15 (28.85%) and Video Conferencing Device was available only in four respondent libraries.

Table 3

Cross Tabulation of IT Equipments and Their Quantity

		Number of Equipments														
Name of equipment	N	1	2	3	4	5	6	7	8	9	10	11	12	25	35	55
CD-ROM Server	11	8 (72.73%)	2 (18.18%)					1 (9.09%)								
CD-ROM Tower	3	2 (66.67%)									1 (33.33%)					
Database Server	29	20 (68.97%)	8 (27.59%)		1 (3.44%)											
Hard Disk as Backup Device	16	8 (50.00%)	4 (25.00%)	3 (18.75%)	1 (6.25%)											
Microfiche Reader	1	1 (100.00%)														
Microfilm Digitizer	1	1 (100.00%)														
Microfilm Printer	1	1 (100%)														
Microfilm Reader	2	2 (100.00%)														
Microfilming Machine	8	6 (75.00%)	1 (12.50%)		1 (12.50%)											
Hubs	24	10 (41.66%)	7 (29.16%)	1 (4.17%)	3 (12.50%)				1 (4.17%)		1 (4.17%)		1 (4.17%)			
Network Server	26	18 (69.23%)	7 (26.92%)	1 (3.85%)												
Routers	11	3 (27.27%)	3 (27.27%)				4 (36.37%)									1 (9.09%)
Switches	26	6 (23.08%)	7 (26.91%)	1 (3.85%)		2 (7.68%)	5 (19.23%)	1 (3.85%)		1 (3.85%)	1 (3.85%)		1 (3.85%)	1 (3.85%)		
Barcode Printer	8	7 (87.50%)			1 (12.50%)											
Dot Matrix Printer	12	7 (58.33%)	3 (25.00%)	2 (16.67%)												
Heavy Duty Network Printer	9	7 (77.78%)	2 (22.22%)													

Table 3 (continued)

Cross Tabulation of IT Equipments and Their Quantity

		Number of Equipments														
Name of equipment	N	1	2	3	4	5	6	7	8	9	10	11	12	25	35	55
Inkjet Printer	14	14 (100.00%)														
Laser Printer	44	23 (52.27%)	4 (9.09%)	3 (6.82%)	1 (2.27%)	3 (6.82%)	5 (11.36%)		1 (2.27%)	2 (4.55%)	1 (2.27%)		1 (2.27%)			
Barcode Reader	22	13 (59.09%)	4 (18.18%)	2 (9.09%)		2 (9.09%)	1 (4.55%)									
Flat Belt Scanner	23	14 (60.87%)	3 (13.05%)	4 (17.39%)	2 (8.69%)											
Over-head Scanner	8	6 (75.00%)		1 (12.50%)	1 (12.50%)											
Digital Camera	14	11 (78.57%)		2 (14.29%)			1 (7.14%)									
DVD/CD Player	17	8 (47.06%)	2 (11.76%)	1 (5.88%)	2 (11.76%)	1 (5.88%)		1 (5.88%)			1 (5.88%)		1 (5.88%)			
Laptop	13	11 (84.62%)	1 (7.69%)	1 (7.69%)												
Multimedia Projector	17	12 (70.59%)	3 (17.65%)	2 (11.76%)												
Photocopying Machine	30	18 (60.00%)	7 (23.34%)	4 (13.33%)				1 (3.33%)								
Television	19	12 (63.16%)	5 (26.32%)	1 (5.26%)								1 (5.26%)				
UPS	33	13 (39.39%)	7 (21.22%)	1 (3.03%)	2 (6.06%)	4 (12.12%)	1 (3.03%)	1 (3.03%)					1 (3.03%)	2 (6.06%)	1 (3.03%)	
VCR/VCP	15	11 (73.33%)	2 (13.33%)	1 (6.67%)			1 (6.67%)									
Video Conferencing Device	4	4 (100.00%)														

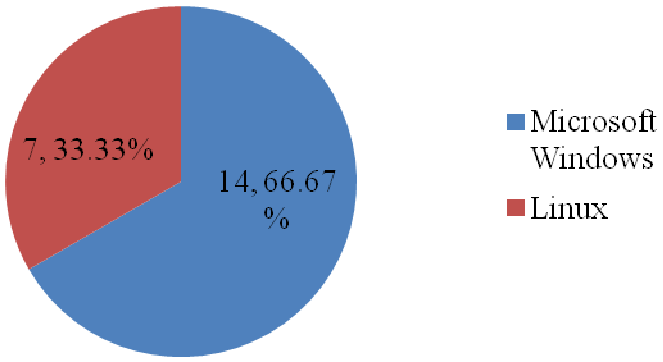
Software

Operating System for Network and Workstations. Pie Chart (Figure 1) indicates the response of 21 university libraries regarding their Network Operating System.

It was clarified that Microsoft Windows was the priority of 14 (66.67%) respondents, while 7 (33.33%) were using Linux as their Network Operating System.

Twenty two libraries submitted their response about the use of operating system for official and public workstations. Analysis shows that Microsoft Windows was the only Operating System, which was being used by the respondents.

Figure 1. Use of Network Operating System (N=21)



Use of library software. Survey results presented in Table 4 show that nine (20.93%) respondent libraries were using PakLag LIMS, freely available software, developed in Microsoft Access for small libraries; five (11.63%) had selected KOHA for their automation, it is an open source integrated library software; Vartua (an off-the-shelf integrated library system) was the choice of three (6.98%) respondents; two

Table 4

Frequency Distribution of Library Software (N=43)

Names of the Library Software	Frequency	Percent
PakLAG LIMS	9	20.93
KOHA	5	11.63
Vartua	3	6.98
LAMP	2	4.65
INMAGIC	2	4.65
WINISIS	1	2.33
KITABDAR	1	2.33
City University Library Software	1	2.33
EduPlanner	1	2.33
LIMS	1	2.33
LMS	2	4.65
MLIMS	1	2.33
Oracle log based	1	2.33
Ripha LIS LIMS	1	2.33
SLIS	1	2.33
Softsol	1	2.33
SSUET Library Information	1	2.33
UET-LIBAS	1	2.33
UOB-LMS	1	2.33
Name not mentioned	7	16.28

Note. Percentages do not always equal 100 due to rounding.

each libraries were using LAMP and INMAGIC (LAMP is a DOS based library software, while INMAGIC is a commercial integrated library package). WINISIS (freely available bibliographic database) and KITABDAR (an off-the-shelf library package) were deployed in one each respondent library. Twenty (46.51%) of the libraries responded that they had implemented in-house developed library software to automate their library operations and services. The following were the names of in-house developed library software; 'City University Library Software', EduPlanner', 'MLIMS', 'LIMS', 'Oracle Log Based', 'Ripha LIS LIMS', 'SLIS', 'Softsol', 'SSUET Library Information', UET-LIBAS', 'UOB-LMS' and 'Library Management System (LMS)'. LMS was commonly used name by two respondents for their library software, while seven libraries had not mentioned the name of their library software package. Analysis also reveals that majority (28, 53.85%) of the university libraries under the study had used integrated library software to automate their operations and services.

Use of digitization software. Frequency distribution in Table 5 shows that only seven respondent libraries were using digitization software. Three (42.86%) libraries were using 'Greenstone', an open source digitization software; one of the respondent library had installed 'Booksnap', 'Arobatic', 'HP Director' and 'NU E-Library'.

Use of anti-virus software. Five out of 24 respondents had selected 'Symantec'; four were using 'Kaspersky' and 'McAfee' respectively, while three other had opted 'Nod' and 'Norton' to secure their systems from computer viruses. 'AVAST', 'AVG', 'Avira', 'Bit Defender' and 'Rising' anti-virus software were being used by one each respondent library. A graphic representation of the use of 'Anti-Virus Software' is given in Figure 2.

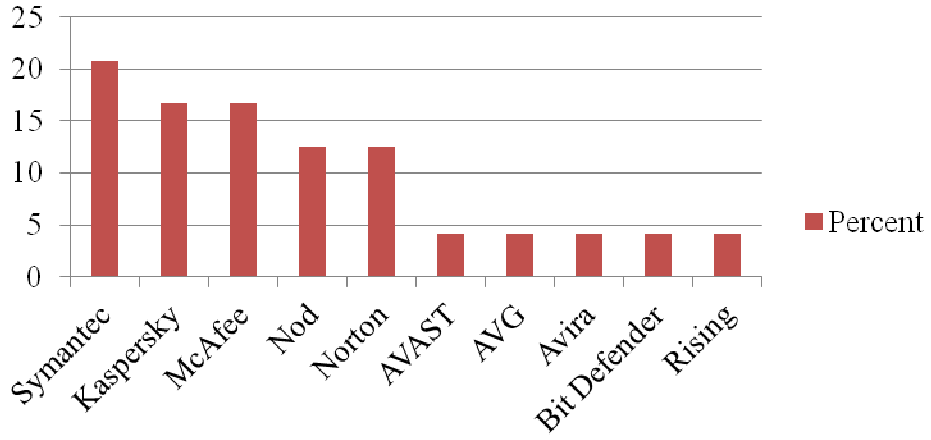
Table 5

Frequency Distribution of Digitization Software (N=7)

Names of the Digitization Software	Frequency	Percent
Greenstone	3	42.86
Booksnap	1	14.29
Arobatic	1	14.29
HP Director	1	14.29
NU E-Library	1	14.29

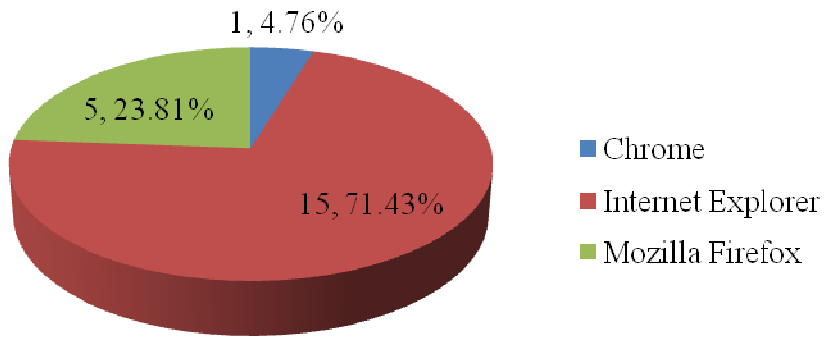
Note. Percentages do not always equal 100 due to rounding.

Figure 2. Use of Anti-Virus Software (N=24)



Use of web browser. Figure 3 depicts that majority of respondents (15 out of 21, 71.43%) selected 'Internet Explorer' as their web browser, while 'Mozilla Firefox' had installed in five out of 21 university libraries in Pakistan.

Figure 3. Use of Web Browser (N=21)



Use of office suit. Libraries were asked to mention the name of 'Office Suit' in their use. Only 18 respondents answered this question. Data analysis reveals that all the respondents were using 'Microsoft Office' as their 'Office Suit'.

Use of screen reader software. Only two libraries had reported that they were using 'JAWS' as the 'Screen Reader Software' to provide computing and Internet facility to their blind users.

Use of software: Off-the-shelf, free & open source, developed in-house or pirated. Table 6 indicates that seven each out of 21 respondents were using 'Off-the-Shelf', 'Free & Open Source' and 'Pirated' network operating system respectively.

Among 21 respondents, 14 (66.67) had installed 'Pirated' and seven (33.33%) had acquired 'Off-the-Shelf' operating system for their workstations.

A good number of respondent libraries (20 out of 43, 46.51%) had developed their own library software; 15 (34.88%) were using 'Free & Open Source Software' to automated their library, while only eight (18.60%) university libraries under the study had acquired 'Off-the-Shelf Software' to automate their operations and services.

Regarding 'Digitization Software', three out of seven libraries responded that they were using 'Free & Open Source Software', whereas two each had 'Off-the-Shelf' and 'in-House Developed' software respectively.

Table 6

Cross Tabulation of Types of Software and 'Off-the-Shelf, Free & Open Source, In-House Developed and Pirated Software'

Type of Software	N	Off-the-Shelf Software	Free & Open Source Software	Developed in-house Software	Pirated Software
Network Operating System	21	7 (33.33%)	7 (33.33%)		7 (33.33%)
Operating System for workstations	21	7 (33.33%)			14 (66.67%)
Library Management System	43	8 (18.60%)	15 (34.88%)	20 (46.51%)	
Digitization Software	7	2 (28.57%)	3 (42.86%)	2 (28.57%)	
Antivirus	24	9 (37.50%)	6 (25.00%)		9 (37.50%)
Web Browser	21		21 (100.00%)		
Office Software Suite	18	5 (27.78%)			13 (72.22%)
Screen Reader Software	2				2 (100.00%)

Note. Percentages do not always equal 100 due to rounding.

Six out of 24 respondents were using 'Free & Open Source' while nine each selected 'Off-the-Shelf' and 'Pirated' anti-virus software to save their systems and data.

All the 21 respondents inclined toward 'Free & Open Source' web browsers.

Majority (13 out of 18, 72.22%) respondents were using 'Pirated' office software suite, whereas only five (27.78%) had purchased licensed off-the-shelf office suite. Two libraries responded that they had installed 'Pirated' Screen Reader Software to facilitate their blind users in the use of electronic resources and services.

Telecommunication and Networking Facilities

Telecommunication facilities. Table 7 describes that vast majority (48, 92.31%) of the respondents had 'Fixed Line Telephone' facility. 'Fax' was available only in 16 (30.77%) libraries; nine (17.31%) respondent libraries reported that they had 'Wireless Telephone', while only six (11.54%) university libraries under the study had official 'Mobile Phone' facility.

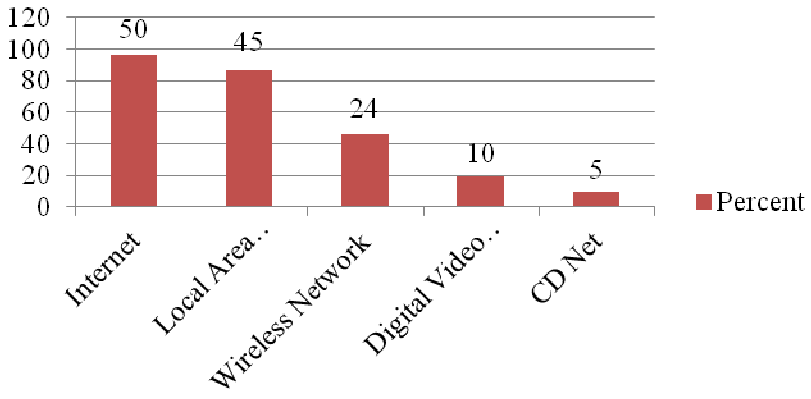
Table 7

Frequency Distribution of Telecommunication Facilities (N=52)

Rank	Telecom Facilities	Frequency	Percent
1	Fixed Line Telephone	48	92.31
2	Fax	16	30.77
3	Wireless Telephone	9	17.31
4	Mobile Phone	6	11.54

Provision of networks. Figure 4 shows that a vast majority (50, 96.15%) of respondents had the provision of 'Internet' connectivity and 'Local Area Network'; 24 (46.15%) libraries pointed towards the availability of 'Wireless Network'; 'Digital Video Conferencing' facility was being provided in 10 respondent libraries, while only five (9.62%) had the provision of 'CD Net'.

Figure 4. Provision of Networks



Findings

Hardware

The study discloses that 47 respondent libraries had a sum of 1720 personal computers ranged between 1 and 216 with a Mean value of 36.60 to provide computing facilities to their staff and patrons. Only 11 respondent libraries had CD-ROM Server. CD-ROM tower facility was available only in three libraries. Majority (29 out of 52, 55.77%) of the respondent university libraries had database server ranged between one and four with a sum of 40 and Mean value of 1.38. Sixteen university libraries were using hard disk as a back-up device ranged between one and four. Microfiche reader, microfilm digitizer, microfilm printer was available only in one of the respondent libraries. Eight libraries had the provision of microfilming machines. Twenty four respondent libraries had installed hubs to establish network ranged from one to 12. Network server and switches were being used by half of the respondent university libraries. Eleven libraries had mounted routers in their network. Dot matrix printer was available in 12 respondent libraries; nine had the provision of heavy duty network printer; 14 were using inkjet printer; while majority (44, 84.62%) university libraries had got laser printers' facility.

Eight respondent libraries were using barcode printer, while 22 (42.31%) libraries had installed barcode reader in their circulation operations. Twenty three university libraries had Flat Belt Scanner, while eight had Over-head scanners for scanning and digitization purpose. Digital camera is available in 14, DVD/CD player and multimedia projector in 17, laptop in 13, Photocopying Machine in 30, television in 19, UPS in 33 ranged from one to 35, VCR/VCP in 15 (28.85%) and video conferencing device was available only in four respondent university libraries.

Software

Fourteen respondent libraries were using Microsoft Windows while 7 were using Linux as their network operating system. Microsoft Windows is the only operating system, which was being used by all the respondent university libraries. Nine respondent libraries were using PakLag LIMS; five (11.63%) had selected KOHA for their automation; Vartua was the choice of three (6.98%) respondents; two each libraries were using LAMP and INMAGIC. WINISIS and KITABDAR were deployed in one each respondent library. Twenty of the libraries had implemented in-house developed library software to automate their library operations and services. Only seven respondent libraries were using digitization software. Different 10 anti-virus software were being used by 24 respondent libraries. Majority of respondents (15 out of 21, 71.43%) had selected 'Internet Explorer' as their web browser, while 'Mozilla Firefox' had installed only in five university libraries of Pakistan. Data analysis reveals that all the respondents (18, 100%) were using 'Microsoft Office' as their 'Office Suit'. Only two libraries had reported that they were using 'JAWS' as the 'Screen Reader Software' to provide computing and Internet facility to their blind users.

Analysis indicates that seven each out of 21 respondents were using 'Off-the-Shelf', 'Free and Open Source' and 'Pirated' network operating system respectively. Among 21 respondent libraries, 14 (66.67) had installed 'Pirated' and seven (33.33%) had acquired 'Off-the-Shelf' operating system for their workstations. A good number of respondent libraries (20 out of 43, 46.51%) had developed their own library software; 15 (34.88%) were using 'Free and Open Source Software' to automated their library, while only eight (18.60%) university libraries under the study had acquired 'Off-the-Shelf Software' to automate their operations and services. Regarding 'Digitization Software', three out of seven libraries were using 'Free and Open Source Software', whereas two each had 'Off-the-Shelf' and 'in-House Developed' software respectively. Six out of 24 respondents were using 'Free and Open Source' while nine each had selected 'Off-the-Shelf' and 'Pirated' anti-virus software to save their systems and data. All the 21 respondents were inclined toward 'Free and Open Source' web browsers. Majority (13 out of 18, 72.22%) of the respondents were using 'Pirated' office software suite, whereas only five (27.78%) had purchased licensed off-the-shelf office suite. Two libraries responded that they had installed 'Pirated' screen reader software to facilitate their blind users in the use of electronic resources and services.

Telecommunication and Networking Facilities

Analysis describes that vast majority (48, 92.31%) of the respondents had 'Fixed Line Telephone' facility. 'Fax' was available only in 16 libraries; nine respondent libraries reported that they had 'Wireless Telephone', while only six university libraries under the study had official 'Mobile Phone' facility. A vast majority (50, 96.15%) of the respondents had the provision of 'Internet' connectivity and 'Local Area Network'; 24 (46.15%) libraries had the

availability of 'Wireless Network'; 'Digital Video Conferencing' facility was being provided in 10 respondent libraries; while only five had the provision of 'CD Net'.

IT Support

Out of 52, 44 (84.62%) respondent libraries were receiving IT support from their 'University's IT/Computer Center'; 22 (42.31%) had the provision of in-house support, while only two (3.85%) had out-sourced their IT support.

Conclusions

- Except few, a vast majority the university libraries have computers and other peripherals.
- Use of 'Free and Open Sources' software increase in the university libraries.
- Only few university libraries implement standard integrated library software, while the use of in-house developed library software is common.
- Most of university libraries use 'Internet Explorer' as their search engine.
- Fixed line telephone facility is available in most of the university libraries, while 'Fax' is available in some of the university libraries.
- A vast majority of the university libraries have Local Area Network (LAN), whereas Wireless Network is available in some of the university libraries.
- A vast majority of the university libraries receive IT support from their university's IT Center/Computer Center, while some have their in-house support.

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