Open-Source and Proprietary Library Automation Software: A Comparative Academic Librarian's Perspective

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Abstract

The purpose of this study was to get an understanding of how academic librarians perceive open-source and proprietary library software. The researchers used a survey research approach and a self-constructed questionnaire as data collection tool. The study targeted 103 library professionals working at HEC-recognized degree awarding institutions (DAIs) and universities in Lahore, both public and private sectors, yielding an 84% response rate. To meet study objectives, analysis of library professionals' perceptions regarding OSS and proprietary library automation software and the problems they face during implementation, descriptive and inferential statistics were applied. Comparative analysis revealed that open-source library software contains more modules and requires highly skilled employees. On the other hand, human resources with minor skills can use proprietary software. Factors that prevent adopting OSS for academic libraries include a lack of technical support, skilled and motivated library professionals, inadequate cooperation between supervisors and subordinates, and insufficient training opportunities. Study findings explored that library software should have the facility of advanced searching, library standards, and a user-friendly interface. Experienced library

professionals should guide and offer full cooperation in the selection and implementation of software. Library schools and associations should play a decisive role through school curriculum and professional development programs in preparing graduates and practitioners for embracing modern technologies. Open-source software developers should also organize training programs for software users to work independently in libraries.

Keywords: Automation software, library automation, information management system, open-source software, proprietary software

Introduction

Information is being produced at a very high pace. Library automation is necessary to handle this explosion of information in libraries. Every aspect of life has been impacted by technology. Almost all organizations are using computers for smooth functions. A library automation software program automates book acquisition, cataloging, circulation, and locating reading materials (Nkhoma-Wamunza, 2003; Thompson & Pwadura, 2014). Automation helps libraries to organize, and disseminate knowledge efficiently (Nkhoma-Wamunza, 2003; Thompson & Pwadura, 2014). Suku and Pillai (2005) have cited several reasons for library automation. As a result of the explosion of information, users lack of skills to locate required literature, time consumption on daily library tasks, and the ability to share resources quickly and easily. Libraries have embraced the information management system with the technology revolution. Mahmood (1996) stated, “a computer without an information management system is like a library without books and librarians”. The integrated library system helps libraries to perform their various daily routine functions, technical process, record keeping, acquisition, cataloging, user management, circulation, statistical reporting, etc., efficiently and also eliminates delays (Bills, 2000; Congleton, 2002; Siddique & Mahmood, 2015; 2016). While browsing the relevant literature, found that researchers called various nomenclatures such as, Library Management Systems (LMS), Integrated Library Systems (ILS), Integrated Online Library Systems (IOLS), Integrated Library Management Systems (ILMS) (Pratheepan, 2011; Siddique & Mahmood, 2015). Librarians in Pakistan are using a variety of software to automate libraries but mostly Koha (Asim & Mairaj, 2019; Jahangir, Siddique, & Adil, 2021; Khan & Ayesha, 2022).

Statement of the Problem

Different types of library automation software are using around the world. Librarians' lack of technical skills hinders library software selection and implementation in Pakistan. Specifically, this study presents the opinions of librarians regarding the required features that library automation software must have. This study will briefly compare proprietary and open-source software that helps library professionals cope with problems facing while implementing suitable software for their libraries. Either proprietary or open-source is adequate and can meet the library automation needs. Different research studies are available on OSS and Proprietary based library software separately (Asim & Mairaj, 2019; Jahangir, Siddique, & Adil, 2021; Khan & Ayesha, 2022; Masrek, Khan, & Doan, 2022). While browsing relevant literature, there is no study in Pakistan to compare proprietary and open-source library software. So this study got importance to fill the literature gap and to provide a road map to resolve this problem. This study will work as a baseline for further research. The study results are also helpful in encouraging LIS professionals to use library automation software and overcome the problems they are facing.

Study Objectives

The present study's primary objective is to assess library professionals' perceptions about open source and property-based library automation software in academic libraries. Furthermore, objectives of the study are given below.

1. To assess the opinions of academic library professionals about the features of a standard library software
2. To assess the perceptions of library professionals regarding open-source and proprietary-based library software
3. To identify the challenges faced by library professionals while implementing open-source and proprietary library software

Research Questions

1. What are the opinions of library professionals about the features of standard library software?

2. What are the opinions of library professionals regarding open-source and proprietary library software?
3. Is there a significant difference in library professionals' opinions about the features of standard library software?
4. Is there a significant difference in the opinions of library professionals regarding open-source and proprietary-based library software?
5. What challenges do library professionals face while implementing open-source and proprietary library software?

Literature Review

Nowadays, library automation is playing a splendid role in performing the best functions of a library. Automation defined as the application of computers with various related technologies to perform essential functions automatically (Jan & Sheikh, 2011; Otunla, 2016). Library automation has eased all the traditional housekeeping tasks such as acquiring, cataloging, classifying material, circulating books, and keeping membership records (Tabusum, Saleem, & Batcha, 2013; Nayana, 2019). According to the research, in 1960, library automation was introduced in America and Europe and later in 1980 got attention in Pakistan, but attained strong attention in 1990 when considered a subject and started the discussion in seminars and conferences (Mahmood, 1996; Haider, 1998). The first-ever union catalog in Pakistan of scientific periodicals was developed by scientists at Pakistan's Scientific and Technological Information Center (PASTIC) in 1998 (Haider, 1998). Likewise, the Netherlands Library Development Project (NLDP) started in the 90s. An aspect of the project was to provide training to the librarians with hardware and software for library automation (Ramzan & Singh, 2009).

Open-source software is typically freely available to users with certain restrictions on adding, changing, modifying, and distributing, this type of software generally performs all housekeeping (Rafiq & Ameen, 2009; Pratheepan, 2011). Researchers Ukachi, Nwachukwu, and Onuoha (2014) pointed out that library software comes from two distinct sources: proprietary and open-source software. Müller (2011) noted, with the advent of the internet, WWW, and open-source technologies, inventors, sponsors, and OSS developers have increasingly turned to free and OSS library solutions. Since the appearance of these technologies, developers have

steadily amplified the contributions of fast, free software. Based on an analysis of university libraries, Ogbenege and Adetimirin (2013) found that due to the limitations of proprietary software, librarians chose open-source software since it's free, flexible, and easy to use, works with Windows, and has a relatively large user community. The owner of proprietary software, usually the individual who developed it, owns and controls the software. Proprietary software always maintains the confidentiality of its source code. Mahmood (1996) stated that "a lot of commercial library software have been established and are running successfully all over the world and many software directories and other helpful tools accessible that support librarians to select appropriate software for their libraries. According to Zhou and Choudhary, (2022) the presence of open-source software may influence the price and quality of the proprietary software provider relative to the monopolist when the cost of improving software quality is modest. Based on Malwad's (1995) study, commercial software often offers solutions to some specific application problems. Their development requires a great deal of skill and effort. Because they have been developed commercially a variety of customers have been able to use them. These features make them simple to use, well documented, and consistent.

Jabeen et al. (2018) examined library professionals' opinions on introducing OSS in libraries using a mixed-methods approach. The study found that most libraries used commercial software and some used locally designed software. In their research, Shafique and Mahmood (2007) interviewed librarians about their thoughts on library software in Lahore, 84 libraries were surveyed. Their study reported that company's software was more user-friendly and training was readily available. The movement of open source software in Pakistan was analysed by the researchers Rehman, Mahmood, and Bhatti (2012), study originated that libraries in Pakistan are adopting open source software such as Koha, Greenstone, DSpace, and Zebra Indexing Server. Jabeen, et al. (2018) also endorsed that OSS adoption is rising sharply in developing countries that are showing great interest in implementing OSS comparatively developed countries.

Siddique and Mahmood (2014) found that Pakistani libraries do not have library software that meets the standards of advanced countries. Furthermore researchers disclosed that lack of training facility, limited financial support, computer illiteracy in librarians and unobtainable support of local vendors are the major issues in implementing library software. Mahmood (1996) enlisted recommendations for selecting library software. He noted that while software could be

established in foreign countries using directories and tools, but the situation in Pakistan is quite different. There is no standard tool that exists in Pakistan for library software selection. Mostly libraries select software without consulting with experts or senior professionals. The researcher pointed there is a lack of adequate preparation of graduates by library schools to address these challenges. Shafique and Mahmood (2007) concluded their study that library staff rarely discuss or share the problems or benefits of the chosen software, mostly opinions of library members does not contemplate while selecting library software. Results showed that, as compared to locally developed software, respondents were more satisfied with software from developed countries. Due to budget concerns, Helling (2010) reported that the Bloomfield Eastern Greene County Public Library (BEGCP) also moved to open-source software. According to Jabeen et al. (2018), lack of knowledge or technical expertise and the risk factor involved in the use of open-source software, are the reasons behind the lack of interest in adopting OSS. Dalling and Rafferty (2013) also came with the same results, the solid reasons for not accepting OSS are lack of interest, professional skills and financial limits. Shafi-Ullah and Qutab (2012) attained the outcomes from their study as mostly libraries use open-source software to automate their functions mainly due to their affordability and economic cost. Researchers highlighted hurdles to adopting open source software for automation, lack of funds, the expertise of staff, attention from professional associations, and the hesitant behavior of librarians toward using modern technologies. Asim and Mairaj (2019) also indicated that the university librarians in Punjab encountered problems in adopting library software for automation, such as insufficient technical skills in the staff, lack of knowledge of the Linux operating system, slow internet, and administration approval.

Research Method

Johnson and Onwuegbuzie (2004) argued that research questions must be followed to attain the best solution to a research problem. To achieve this study's goals, quantitative research approach was used. A key element of the research process is selecting the most suitable approach to achieve the research objectives. Among social science research strategies, survey research is the most effective. While browsing relevant literature, various previous studies (Kumar & Jasimudeen, 2012; Hudron Kari & Baro, 2014; Nayana, 2019; Ajani, & Buraimo, 2022) used survey research method. So survey method was adopted to carry out this study.

Population and Sampling

Generally, population is considered as a collective group or set of individuals who are being investigated. Leading researchers defined a population as a group of individuals or items who share common characteristics (Kothari, 2004; Powell, 2004). The study focused on library professionals working in Higher Education Commission (HEC) recognised public and private sector universities and degree-awarding institutes (DAIs) in Lahore. The sample refers to the subset of the population that is being investigated during a research study. Hence, the sample will reflect the entire population, as Goode and Hatt (1952) described. The convenience sampling technique was used to collect data from the targeted respondents. For this study, researchers gathered contact information of library professionals from institute websites, contacted colleagues and consulted a professional directory organised by Sada-E-Librarian. The complete list complied of 122 library professionals working in 36 universities and Degree Awarding Institutions (DAIs), 21 in private sectors, and 15 in public

Research Instrument

Based on the study's objectives, a structured questionnaire was developed after reviewing the relevant literature (Malwad, 1995; Rafiq & Ameen, 2009; 2010; Müller, 2011; Pratheepan, 2011; Hudron Kari & Baro, 2014; Jabeen et al., 2018; Asim & Mairaj, 2019; Chukwueke, 2022). To ensure the questionnaire was valid, an expert review was taken. To get the experts' valuable feedback on the questionnaire a draft was sent out. The experts were chosen based on their professional reputation, relevant experience, and involvement in projects related to automation in university libraries. Recommendations received from the experts were incorporated accordingly. To check the reliability of the research instrument, 20 responses were collected to conduct a pilot study and to make a valid data collection tool. The Cronbach Alpha test was applied to check the questionnaire's reliability as described in Table 1. The alpha value for features of library automation software (22 statements) was 0.851, value for perceptions of library professionals about open source and proprietary library software (20 statements) was 0.746, and alpha value for problems faced while using open source and proprietary library software (15 statements) was 0.949.

Table-1 Cronbach alpha value scale reliability analysis

Questions	Reliability Coefficient	Constructs in Each Question
library automation software	.851	22
perceptions of library professionals about open-source and proprietary library software	.746	20
problems faced while using open-source and proprietary library software	.949	15

Data Collection

Google Doc was used to organize the questionnaire after final editing. Questionnaire was dispersed to the respondents by email, different WhatsApp and Facebook groups. However, 103 responses were received after continuous follow-up, yielding 84% response rate. After completing the data collection phase, the Statistical Package for the Social Sciences (SPSS) was used to analyze the data. To analyze perceptions and opinion differences between public and private sector library professionals, descriptive statistics and inferential statistics such as percentage, mean, standard deviation, and t-test.

Data Analysis and Interpretation

Demographic Information of the Respondents

The outcomes in Table 2 indicated that a greater part of the respondents, 66 (64.1%), were male and 37 (35.9%) were female, respondents 60 (58.3%) were from private while 43 (41.7%) belonged to public universities. 68 (66.0%) respondents were qualified MLIS/MLS, 33 (32.0%), hold the degree of MPhil and only 2 (1.9%) respondents have scored PhD degree in library science. The more significant part of the respondents, 55 (53.4%), were from the age group of 26-30 years, 18 (17.5%) belonged to age group of 36-40 years, 16 (15.5%) respondents

fell in the age group 20-25 years. Mostly respondents have experienced between 1-5 years (43.7%), 29 (28.2%) and 25 (24.3%), belonged to the professional experiences 6-10 and 11-15 years respectively and just 4 (3.9%) respondents have experienced between 16-20 years. Mostly respondents, 53 (51.5%) had designation of librarians, 21 (20.4%) and 15 (14.6%) were assistant librarians and senior librarians, respectively, 7 respondents had the designation of deputy chief librarians, and 5 (4.9%) were chief librarians.

Table-2 Demographic information of the respondents

Variables	Frequency	Percentage
Gender		
Male	66	64.10
Female	37	35.90
Professional qualification		
BS/MLIS	68	66
MPhil	33	32
PhD	2	1.9
Age		
20-25	16	15.5
26-30	55	53.4
31-35	13	12.6
36-40	18	17.5
Over 40	1	1
Professional work experience		
1-5 Years	45	43.7
6-10 Years	29	28.2
11-15 Years	25	24.3
16-20	4	3.9
Over 20	0	0
Designation		

Chief librarian	5	4.9
Deputy chief librarian	2	1.9
Deputy librarian	7	6.8
Senior librarian	15	14.6
Librarian	53	51.5
Assistant librarian	21	20.4
Type of university/institution		
Public	43	41.7
Private	60	58.30

Perceptions about the Features of Standard Library Software

To get the perceptions of public and university library professionals about the features of a standard library automation software, they were asked to rate their opinions on a five-point Likert-type scale across 22 statements. The results demonstrated that a significant number of respondents 61 (59.2%) strongly agreed that the popularity and authority of software developing company was an essential feature of library software. A high number of respondents 38 (36.9%) were agreed with the statement, respondents 53 (51.5%) were agreed, and 46 (44.7%) strongly agreed that library software should have user-friendly interface/OPAC, 62 (60.2%) were agreed, and 35 (34.0%) strongly agreed with that library software should be customizable according to library needs. The majority of respondents 60 (58.3%) were, agreed, and 23 (22.3%) strongly agreed that library software should reliable and secure, 55 (53.4%) and 44 (42.7%) were strongly agreed and agreed that software manual should be available, the respondents 73 (70.9%) were agreed that a library software should have full features support and 22 (21.4%) respondents were strongly agreed. Library professionals, 47 (45.5%) and 44 (42.7%) were strongly agreed or agreed that software should have multilingual support, respondents 52 (50.5%) strongly agreed, and 47 (45.6%) were agreed that library software should have cataloging standards like MARC21, and RDA etc. 44 (42.7%) and 41 (39.8%) were strongly agreed and agreed respectively with the statement that software should be web-based. The outcomes revealed that respondents 43 (41.7%) and 38 (36.9%) were strongly agreed and agreed, respectively, with the statement that software should be free and open-source, the significant number of respondents,

64 (62.1%), strongly agreed, and 36 (35.0%) were agreed that advance search facility should be available in the software, greater part of the respondents 50 (48.5%) agreed that software has license while 29 (28.2%) respondents chosen the option of neutral. The findings disclosed that a significant number of respondents, 52 (50.5%) were, agreed and 30 (29.1%) were strongly agreed that software should support the maximum operating system, respondents 76 (73.8%) were agreed that software should have the ability to integrate with other software and 20 (19.4%) respondents were strongly agreed with this statement, librarians 58 (56.3%) were agreed, and 42 (40.0%) were strongly agreed that consultancy and technical software support should be available easily, respondents 53 (51.5%) and 42 (40.8%) were strongly agreed and agreed respectively that software should have the ability of up-gradation with a new version, 56 (54.4%) and 39 (54.4%) were agreed and strongly agreed respectively that copy cataloging facility should be available in the library software. Mostly 45 respondents (43.7%) were agreed that software should have the ability of easy configuration 28 (27.2%) respondents were remained neutral and 21 (20.4%) were strongly agreed with the statement. Respondents 48 (46.6%) and 34 (33.0%) were agreed and strongly agreed respectively that software should have the ability to access without installation on the client-server, 53 (51.5%) were agreed, and 20 (19.4%) strongly agreed with statement that no need of client-server installation if operated through another location, respondents 45 (43.7%) agreed and 31 (30.1%) strongly agreed that software should have the ability to self-check-in and checkout while 23 (22.3%) respondents were remained neutral, the respondents 43 (41.7%) and 35 (34.0%) agreed and strongly agreed correspondingly that software should have the ability of live updating and has no need to synchronize for updates with other modules like cataloging and circulation.

Difference between the Perceptions about Features of Standard Library Software According to the Types of Universities

T-test was applied to examine the differences in opinions of the respondents about features of standard library software according to the types of universities. Table 3 revealed that three statements got significant difference such as manual should be available with library software *(p=0.02)*, multilingual support should be available *(p=0.00)*, and availability of library standard *(p=0.02)*.

Table-3 Difference between the perceptions about features of standard library software according to the types of universities

Sr.#	Statements	Public (n=43)		Private (n= 60)		t- (n=103)	t-test Sig (2tailed)
		Mean	SD	Mean	SD		
1	Popularity and authority of software developing company	4.55	0.547	4.55	0.594	0.071	0.94
2	User friendly interface/OPAC	4.30	0.557	4.48	0.567	-1.608	0.11
3	Libraries can customize software according to their needs	4.25	0.538	4.30	0.590	-0.388	0.69
4	Security and reliability of software	3.90	0.609	4.05	0.832	-0.957	0.34
5	Availability of software manual	4.32	0.644	4.60	0.558	-2.306	0.02
6	Features: full functional support for membership, circulation, cataloguing, acquisition, serial management, reporting, administration and tool modules.	4.00	0.654	4.18	0.567	-1.516	0.13
7	Multilingual support	4.04	0.924	4.46	0.657	-2.66	0.00
8	Standards such as MARC 21, Uni MARC, and RDA (Resource Description Access) are used in libraries.	4.30	0.599	4.56	0.592	-2.222	0.02
9	Web based	4.30	0.741	4.15	0.898	0.911	0.36
10	Free and open-source	4.30	0.831	3.98	1.016	1.691	0.09

11	Advance Searching	4.51	0.592	4.65	0.515	-1.262	0.21
12	Licensing	3.53	0.826	3.76	0.908	-1.325	0.18
13	Operating System Support (Window)	4.06	0.798	4.05	0.746	0.129	0.89
14	Integration with other software	4.06	0.506	4.15	0.546	-0.757	0.45
15	Technical support and consultation	4.23	0.570	4.45	0.622	-1.810	0.07
16	Up-gradation with new version	4.23	0.868	4.50	0.701	-1.727	0.08
17	The capability of copy cataloging (Z39.50)	4.16	0.432	4.36	0.801	-1.661	0.10
18	Easy Configurations	3.83	0.843	3.66	0.985	0.919	0.36
19	No need of client server installation if operated through another location	3.97	1.101	4.11	0.761	-0.801	0.42
20	Suggested by another library or professional	3.65	0.948	3.83	0.941	-0.965	0.33
21	Self-check in and check out	3.97	0.672	4.01	0.929	-0.253	0.80
22	Live updating and has no need to synchronize for updates with other modular like cataloguing and circulation	3.95	0.785	4.10	0.951	-0.828	0.41

Perceptions about Open-Source and Proprietary Library Software

To assess academic librarians' views about proprietary and open-source library automation software, they were asked to respond 20 statements on a Likert scale. The results revealed that most of the respondents, 62 (60.2%) were agreed that open-source library software has a lower cost of ownership than proprietary library software, and 22 (21.4%) were remained neutral against the statement, respondents 54 (52.4%) were agreed that there is no need of any vendor for implementation of an OSS 21 (20.4%) respondents were remained neutral against this

statement, a significant number of respondents 59 (57.3%) were agreed that source code can be accessed, inspected, modified, and redistributed by anyone with academic knowledge. In comparison 21 (20.4%) respondents were chosen neutral option, 59 (57.3%) agreed that supports are not easily available from community or commercial for an OSS and 23 (22.3%) respondents remained neutral, 45 (43.7%) agreed and in comparison 27 (26.2%) neutral regarding the statement developers and programmers manage that project as part of an open-source community. The majority respondents 48 (46.6) were agreed, 20 (19.4%) strongly agreed, and also 20 (19.4%) selected the neutral option against the statement that an OSS provides better flexibility which means more freedom which encourages innovation than proprietary software, 56 (54.4%) were agreed that open software has no guarantee of quality or fitness, 18 (17.5%) respondents were strongly agreed, and 18 (17.5%) were remained neutral against this statement. The 74 (71.8%) librarians were agreed, and 15 (14.6%) remained neutral regarding OSS high skilled manpower is needed to operate, respondents 54 (52.4%) were agreed, and 35 (34.0%) strongly agreed that OSS has more module range than proprietary library software, 59 (57.3%) were agreed 22 (21.4%) neutral, 19 (18.4%) respondents were strongly agreed with the statement that OSS is license-free. Most of the library professionals responded 41 (39.8%) agreed, 29 (28.2%) neutral and 25 (24.3%) strongly agreed that proprietary library software are much more costly than open source library software, respondents 57 (55.3%) were agreed, and 19 (18.4%) were strongly agreed that in order to access the source code, you need to be the author or publisher who holds the property rights. In comparison, 26 (25.2%) respondents were chosen neutral. 59 (57.3%) agreed and 30 (29.1%) strongly agreed that supports are easily available from the owner of the software as compared to OSS, more significant part of the respondents 60 (58.3%) were agreed and 25 (24.3%) remained neutral that updates and bug fixes meet the needs and suggestions of users, primarily respondents 47 (45.6%) were agreed and 20 (19.4%) were strongly agreed that proprietary library software has more stable framework than OSS although (25.2%) respondents were chosen the option of neutral. The 62 (60.2%) respondents were agreed and 18 (17.5%) strongly agreed that manpower with minor skills can use proprietary library software, 60 (58.3%) librarians were agreed and 26 (25.2%) were strongly agreed that proprietary library software has more modules range than OSS, respondents 52 (50.5%) were agreed and 17 (16.5%) were strongly agreed that bibliographic data is more secure on proprietary

library software than open-source whereas a high number of respondents 25 (24.3%) were remained neutral, 45 (43.7%) agreed and 28 (27.2%) respondents were neutral regarding the statement that cost of maintenance of proprietary software was much higher than OSS, 44 (42.7%) were agreed and 25 (24.3%) were strongly agreed that proprietary library software is more user friendly than OSS.

Difference between the Perceptions about Open-Source and Proprietary Library Software based on Types of Universities

T-test was employed to know the differences in opinions of the respondents about open source and proprietary library software based on types of universities. The outcomes revealed in Table 4 that 3 statements out of twenty got significant value. First one is, open-source library software a lower total cost of ownership than proprietary library software *(p=0.05)*. Second, no need of any vendor for implementation *(p=0.02)* and third, supports are readily available from the software owner compared to open-source software *(p=0.05)*.

Table-4 Difference between the Perceptions about open-source and proprietary library software based on the types of universities

Sr.#	Statements	Public (n=43)		Private (n= 60)		t- (n=103)	t-test Sig (2tailed)
		Mean	SD	Mean	SD		
	Open-Source Software						
1	Open-source library software a lower total cost of ownership than proprietary library software.	3.95	0.688	3.66	0.795	1.907	0.05
2	No need for any vendor for implementation.	3.34	0.922	3.78	0.940	-2.330	0.02
3	Anyone with the academic knowledge can access, inspect, modify and redistribute the source code.	3.65	0.752	3.66	0.914	-0.091	0.92

4	Supports are not easily available from community or commercial.	3.90	0.569	3.93	0.778	-0.189	0.85
5	The project is managed by an open-source community of developers and programmers	3.46	0.908	3.53	0.982	-0.358	0.721
6	It provides better flexibility which means more freedom which encourages innovation than proprietary software	3.51	0.797	3.85	1.022	-1.810	0.07
7	No guarantee of quality or fitness	3.83	0.753	3.71	1.009	0.661	0.51
8	Need high skilled manpower to operate	3.93	0.632	3.81	0.676	0.863	0.39
9	Open-source software has more module range than proprietary library software.	4.13	0.804	4.21	0.666	-0.515	0.60
10	License free software	3.90	0.781	3.91	0.671	-0.067	0.94
Proprietary Library Software							
11	Proprietary library software is much more costly than open-source library software.	3.81	0.906	3.78	0.940	0.165	0.86
12	Only the owner or publisher who holds the legal property rights of the source code can access it.	3.88	0.730	3.93	0.660	-0.360	0.72
13	Supports are readily available from the software owner compared to open-source software.	4.27	0.701	4.00	0.736	1.934	0.05
14	Updates and bug fixes meet the needs and suggestions of users.	3.74	0.693	3.75	0.815	-0.038	0.97

15	Proprietary library software has a more stable framework than open-source software.	3.81	0.982	3.68	0.853	0.719	0.47
16	The workforce with minor skills can use.	3.93	0.736	3.83	0.826	0.613	0.54
17	Proprietary library software has more modules range than open-source software.	4.09	0.717	4.73	5.061	-0.822	0.41
18	The bibliographic data is more secure on proprietary library software than on open-source.	3.72	0.825	3.75	0.894	-0.168	0.86
19	The cost of maintenance is much higher.	3.55	1.053	3.46	0.891	0.476	0.63
20	Proprietary library software is more user-friendly than open-source software.	3.76	1.042	3.73	1.022	0.166	0.86

Problems Facing while Implementation of Library Software

To get views of library professionals about the implementation of automation software, 15 question statements on a Likert scale were asked. The results revealed that significant number of respondents 41 (39.8%) and 27 (26.2%) agreed and strongly agreed that non-cooperation between professionals in library automation was the major problem in the implementation of software. Respondents 55 (53.4%) were agreed and 17 (16.5%) strongly agreed that lack of consultancy and technical service, most respondents 51 (49.5%) and 29 (28.2%) were agreed and strongly agreed with the statement, lack of competent and willing library staff. 49 (47.6%) respondents were agreed that availability of training facilities was insufficient 27 (26.2%) respondents were strongly agreed respectively with the statement, respondents 48 (46.6%) and 14 (13.6%) were agreed and strongly agreed that inadequate library budget was also problem in the adoption of new software 28 (27.2%) respondents were remained neutral and 11 (10.7%) were disagreed with statement. The outcomes revealed that significant number of respondents 41

(39.8%) and 39 (37.9%) were agreed and strongly agreed respectively that lack of customization was also major issue in the implementation of library software. Greater part of the respondents 54 (52.4%) and 26 (25.2%) were agreed and strongly agreed respectively with the question statement lack of up-gradation facility was the major problem. The respondents 49 (47.6%) were agreed and 26 (25.2%) were strongly agreed that lack of IT infrastructure was a problem, 50 (48.5%) and 20 (19.4%) were agreed and strongly agreed with statement lack of admin rights by IT department, significant number of respondents 41 (39.8%) were agreed that lack of admin right for software by software house was the major problem, 29 (28.2%) respondents were neutral and 17 (16.5%) were strongly agreed and 16 (15.5%) were disagreed with the statement. The outcomes disclosed that respondents 37 (35.9%) were agreed and 14 (13.6%) strongly agreed with the statement, lack of automation policy, while 32 (31.1%) respondents were neutral and 20 (19.4%) respondents were disagreed. The respondents 36 (35.0%) were agreed that transfer of staff was the problem in the implementation and use of library software, 30 (29.1%) respondents were neutral and 24 (23.3%) were strongly agreed with statement. Greater part of the respondents 49 (47.6%) and 26 (25.2%) were agreed and strongly agreed respectively that no cooperation of super ordinate with subordinate was major hurdle, 50 (48.5%) librarians were agreed that lack of fund was major problem in the adoption of library automation software, 20 (19.4%) respondents were strongly agreed. The findings revealed that significant number of respondents 41 (39.8%) were agreed and 17 (16.5%) were strongly agreed that compliance with internet was the major problem in the use of library automation software while 29 (28.2%) respondents were remained neutral and 16 (15.5%) were disagreed with statement.

Difference between the Perceptions regarding Problems Facing while Implementation of Library Software According to the Types of Universities

T-test was applied to ascertain whether there are significant differences between respondents' opinions regarding problems during the implementation of library software according to types of universities. Table 5 presents results that no statement got a significant difference between the opinions of respondents from public and private universities.

Table-5 Difference between the perceptions regarding problems while implementation of library software according to the types of universities

Sr.#	Statements	Public (n=43)		Private (n= 60)		t- (n=103)	t-test Sig (2tailed)
		Mean	SD	Mean	SD		
1	Non-cooperation in library automation by University/Institution	3.72	0.959	3.73	1.132	-0.058	0.95
2	Lack of consultancy and technical service	3.69	0.913	3.70	0.961	-0.012	0.99
3	Lack of competent and willing library staff	4.00	0.816	3.88	1.043	0.636	0.52
4	Availability of training facilities	3.86	0.989	3.86	0.947	-0.032	0.97
5	Inadequate library budget	3.53	0.934	3.63	0.919	0.809	0.59
6	Lack of customization facility	4.04	0.950	4.00	1.057	0.67	0.81
7	Lack of up gradation facility	3.79	0.940	4.01	0.873	0.085	0.21
8	Lack of IT infrastructure facilities (Hardware/Software)	3.72	0.854	4.01	0.947	-1.627	0.10
9	Lack of admin right by IT department	3.65	0.813	3.76	1.047	-0.604	0.54
10	Lack of admin right for software by software house/company	3.65	0.896	3.51	0.982	0.710	0.47
11	Lack of library automation policy	3.41	0.823	3.45	1.048	-0.163	0.87
12	Staff transfer	3.67	0.837	3.70	1.062	-0.131	0.89
13	No cooperation of super ordinate with subordinates	3.72	0.854	4.01	0.947	-1.627	0.10

14	Lack of fund/economic resources	3.65	0.813	3.76	1.047	-0.604	0.54
15	Compliance with internet	3.65	0.896	3.51	0.982	0.710	0.47

Findings and Discussion

The study has discovered that facility of advanced searching, popularity and authority of software development company, software manual library standards like MARC21, RDA, user-friendly interface, facility to up-gradation with new versions were the main features of standard library software opined by librarians that these featured should be embedded in the software. A T-test was applied to examine the differences in opinions of respondents about the features of standard library software examined according to the types of universities, significant differences were found in the statements, manual should be available with library software *(p=0.02)*, multilingual support should be available *(p=0.00)*, and availability of library standard *(p=0.02)*. The study has explored that open source library software has more modules than proprietary, supports for OSS are not easily available from community or commercial as compared to proprietary library software. Need highly skilled workforce to operate OSS, in contrast, workforce with minor skills can use proprietary software. In the study found that proprietary library software is much more expensive than open-source library software and the source code is only accessible to those with legal ownership rights. The T-test outcomes revealed that three statements out of twenty got significant values. Significant differences were found in the opinions of library professionals about open source and proprietary library software based on types of universities about the topic statement, open-source library software has lower cost of ownership than proprietary library software *(p=0.05)*, no need of any vendor for implementation *(p=0.02)* and supports are readily available from the software owner compared to open source software *(p=0.05)*. Study highlighted that a lack of customization, incompetent and unwilling library staff, insufficient upgrading, and lack of cooperation between supervisors and subordinates are the major problems in implementing and utilizing library automation software in university libraries of Lahore. Based on the results of t-test, there were no significant differences found between the opinions regarding facing problems while implementation of library software according to the Types of Universities

This study aimed to examine the perception of university librarians about OSS and proprietary-based library software, moreover investigated the features of standard library software. The integrated library system helps libraries to perform their various daily routine functions, technical process, record keeping, acquisition, cataloging, user management, circulation, statistical reporting, etc., efficiently and also eliminates delays (Bills, 2000; Congleton, 2002; Siddique & Mahmood, 2015; 2016). Many researchers researched the use of modern technologies to automate library functions (Hamad, Al-Fadel & Fakhouri, 2021; Ahmed & Sheikh, 2021). A plenty of literature strengthens the results of the present study open-source software is a top choice of library professionals to select for library automation (Rafiq & Ameen, 2009; 2010; Rehman, Mahmood & Bhatti, 2012; Siddique & Mahmood, 2015; Khan & Sheikh, 2022). The study found strong problems facing by library professionals while implementing library automation software as, non-cooperation, technical service, willingness to work of staff, availability of training facilities, and inadequate library budget. The results endorsed by various researchers (Mahmood, 1996; Helling, 2010; Jabeen et al., 2018; Otunla 2016; Asim & Mairaj, 2019; Rafiq & Ameen, 2009) through their studies in which they also highlighted the same challenges as lack of training facilities, unobtainable support of local vendors, budget concerns, software adoption without consulting with experts, inadequate technical competences in staff, lack of knowledge of the Linux operating system, and administration approval. Mahmood (1996) advised library schools should prepare LIS graduates to encounter such types of challenges.

Conclusion

Library software should have the facility of advanced searching, library standards like MARC21, RDA, and user-friendly interface. Software manuals should be provided by the developers to library professionals so that they can use them efficiently. Open-source library software has more module range than proprietary. Supports for open source software are not readily available from community or commercial as compared to proprietary library software. Need proficient workforce to operate open source software while with minor skills can use proprietary software. The cost of proprietary library software is much higher than open-source software, and only the owner or publisher who holds the legal property rights of the source code can access it. Implementation and use of library automation in university libraries of Lahore

were plagued by problems such as a lack of customization, insufficient and unwilling library staff, and inadequate cooperation between the library professionals.

Recommendations

The study recommended that libraries with insufficient budgets should adopt open-source software. Open-source software developers should organize training programs for software users to provide full command to work independently in libraries. Senior and expert library professionals should guide and offer full cooperation in selecting and implementing library automation software. Library schools may revise curriculum to prepare graduates to cope with obstacles to adopting modern technologies. LIS associations should raise awareness of OSS adoption through the organization of conferences, training sessions and other professional development programs.

Delimitations of the Study

Every research has some limitations, following are the delimitations that must be taken into account while applying the results of this research. Only degree-awarding institutes and universities accredited by the Higher Education Commission (HEC) in Lahore were part of the study. Data is collected only from libraries that have implemented or are implementing library automation software.

Topics for Future Research

- Studies may be carried out with other population, can extend to librarians of other cities of Pakistan.
- A study may be conducted to explore the librarian's first-hand experience in implementing various library software modules.
- Success stories of libraries in implementing library software in libraries should be explored.

References

Ahmed, S., & Sheikh, A. (2021). Information and communication technology skills among library and information science professionals: A predictor of enhanced library services. *Journal of Librarianship and Information Science*, *53*(3), 444-453.

Ajani, F. O., & Buraimo, O. (2022). Perceived impact of automation on university library services by library personnel in South West, Nigeria. *Information Development*, 38(2), 179-191.

Asim, M., & Mairaj, M. I. (2019). Librarians' perceptions about adoption and uses of the Koha integrated library software in Punjab, Pakistan. *The Electronic Library*, 4(37), 624-635.

Bills, L. (2000). Technical services and integrated library systems. *Library Hi Tech,* 18(2), 144-150.

Chukwueke, C. (2022). Utilization of open source software in university libraries in the south-south Nigeria. *Library Philosophy and Practice.*

Congleton, R. (2002). Re-evaluating technical services workflow for integrated library systems. *Library Collections, Acquisitions, and Technical Services*, 26(4), 337-341.

Dalling, J. & Rafferty, P. (2013). Open source, open minds? An investigation into attitudes towards open source library management systems in UK higher education libraries, *Program: electronic library and information systems*, 47(4), 399-423.

Goode, W.J., & Hatt, P.K. (1952). *Methods in social research.* New York: McGraw Hill.

Haider, S. J. (1998). Library automation in Pakistan. *The International Information & Library Review*, 30(1), 51-69.

Hamad, F., Al-Fadel, M., & Fakhouri, H. (2021). The effect of librarians' digital skills on technology acceptance in academic libraries in Jordan. *Journal of Librarianship and Information Science*, *53*(4), 589-600.

Helling, J. (2010), Cutting the proprietary cord: A case study of one library's decision to migrate to an open source ILS, *Library Review*, 59(9), 702-707.

Hudron Kari, K., & Emmanuel Baro, E. (2014). The use of library software in Nigerian University Libraries and challenges. *Library Hi Tech News*, 31(3), 15-20.

Jabeen, M., Qinjian, Y., Jabeen, M., & Yihan, Z. (2018). Library professional's opinion about open source software adoption: Status, problems and measures used in libraries of Beijing, China. *Global Knowledge, Memory and Communication*, *67*(3), 180-192.

Jahangir, M., Siddique, N., & Adil, H. M. (2021). Status of automated circulation services in University Libraries of Lahore: a survey. *Library Philosophy and Practice*.

Jan S.U & Sheikh R.A. (2011). Automation of university libraries: A comparative analysis of Islamabad and Khyber PukhtoonKhwa, *Pakistan. Library Philosophy and Practice*.

Johnson, R. B., & Onwuegbuzie, A.J. (2004). Mixed methods research: A research paradigm whose time has come. *Educational researcher*, 33(7), 14-26.

Khan, M. K., & Sheikh, A. (2022). Open source software adoption for development of institutional repositories in university libraries of Islamabad. *Information Discovery and Delivery*, (ahead-of-print).

Khan, S. A., & Ayesha, G. (2022). Key features of information management systems (IMSs) for automation in university libraries: a view point of information professionals in Pakistan. *Library Hi Tech*, 40(6), 1606-1626.

Kothari, C. R. (2004). *Research methodology: Methods and techniques*. New Age International.

Kumar, V., & Jasimudeen, S. (2012). Adoption and user perceptions of Koha library management system in India. *Annals of library and information studies*, 59(4), 223-230.

Mahmood Malik, K. (1996). The status of library automation in Pakistan. *Library Review*, 45(6), 36-42.

Malwad, N. M. (1995). Selection criteria for library automation software. *DESIDOC Journal of Library & Information Technology*, 15(2).

Masrek, M. N., Khan, A., & Doan, T. C. (2022). Quality attributes and performance satisfaction of open source library system: A survey amongst librarians in Pakistan. *Malaysian Journal of Library & Information Science*, *27*(2), 19-36.

Müller, T. (2011). How to choose a free and open source integrated library system. *OCLC Systems & Services: International digital library perspectives*, *27*(1), 57-78.

Nayana, J. (2019). A study on library automation status among the aided college libraries in Bengaluru. *Library Philosophy and Practice*.

Nkhoma-Wamunza, A. G. (2003). Library automation: The role and significance of library automation plans. *Huria: journal of the Open University of Tanzania*, 5(1), 120-133.

Ogbenege, J., & Adetimirin, A. (2013). Selection and use of KOHA software in two private Nigerian universities. *Library Hi Tech News*, *30*(6), 12-16.

Otunla A.O. (2016). Current status of automation in academic libraries in Osun State, Nigeria. *Journal of Applied Information Science and Technology*, 9(2), 29-40.

Powell, R.R., (2004). *Basic research methods for librarians* (4th ed.): Westport.

Pratheepan, T. (2011). Integrated library management systems (ILMS)-open source and commercial software: an assessment of the merits and demerits, *In Conference Proceedings of the University Librarians Association of Sri Lanka*, available at: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2215414

Rafiq, M., & Ameen, K. (2009). Issues and lessons learned in open source software Adoption in Pakistani libraries. *The Electronic Library*, 27(4), 601-610.

Rafiq, M., & Ameen, K. (2010). Adoption of open source software in Pakistani libraries: A survey. *Information Age*, *4*(3), 35-38.

Ramzan, M., & Singh, D. (2009). Status of information technology applications in Pakistani libraries. *The Electronic Library*, 27(4), 573-587.

Rehman, A., Mahmood, K., & Bhatti, R. (2012). Free and open source software movement in LIS profession in Pakistan. *Library Philosophy and Practice*.

Shafique, F., & Mahmood, K. (2007). Librarians' opinions about library software: a survey of libraries in Lahore. *The Electronic Library*, 25(6), 766-777.

Shafi-Ullah, F., & Qutab, S. (2012). From LAMP to Koha: case study of the Pakistan legislative assembly libraries. *Program*, *46*(1), 43-55.

Siddique, N., & Mahmood, K. (2014). Library software in Pakistan: A review of literature. *Library review*, 63(3), 224-240.

Siddique, N., & Mahmood, K. (2015). Status of library software in higher education institutions of Pakistan. *International Information & Library Review*, 47(3-4), 59-65.

Siddique, N., & Mahmood, K. (2016). Combating problems related to library software in higher education institutions of Pakistan: An analysis of focus groups. *Malaysian Journal of Library & Information Science*, 21(1), 35-51.

Suku, J., & Pillai, M. G. (2005). Automation of university libraries in Kerala status, problems and prospects. *The Journal of academic librarianship*, 31(2), 151-159.

Tabusum, S. T., Saleem, A., & Batcha, M. S. (2013). Impact of library automation in the development era. *Journal of humanities and social science*,17(5).

Thompson, E. S., & Pwadura, J. (2014). Library automation at the University for Development Studies: Challenges and prospects. *New Review of Academic Librarianship*, 20(1), 66-77.

Ukachi, N. B., Nwachukwu, V. N., & Onuoha, U. D. (2014). Library automation and use of open source software to maximize library effectiveness. In *Information and Knowledge Management*, *3*(4), 74-82.

Zhou, Z. Z., & Choudhary, V. (2022). Impact of competition from open source software on proprietary software. *Production and Operations Management*, 31(2), 731-742.