Dialogue Social Science Review (DSSR)

www.thedssr.com

ISSN Online: 3007-3154
ISSN Print: 3007-3146
Vol. 3 No. 2 (February) (2025)

Library Automation: The Gateway to an AI-Driven Revolution

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Abstract

Background: In this digital era, every discipline of life has adopted new trends related to technology and the mood of work. In this scenario, libraries adopted the latest technology to serve the public with fastest & accurate services. To serve this purpose, libraries started automation in the university libraries of Lahore, Pakistan.
Purpose: The main objective of this study to investigate & to know about the current status of automation in libraries and assess whether automation can increase the utilization of library resources and services in a developing country like Pakistan.
Research Design: Quantitative research based on survey method was used in this research. The study was conducted in the context of university libraries because automation process started in universities some thirty years ago. Accordingly, respondents were university library professionals who were involved in automation activities at any level.
Key Findings: The study found that even more than three decades have been passed, but the automation landscape of the university libraries is still not mature. Libraries are

Dialogue Social Science Review (DSSR)

www.thedssr.com

ISSN Online: 3007-3154
ISSN Print: 3007-3146
Vol. 3 No. 2 (February) (2025)

still struggling towards achieving the fully automated status to expand their services in its full potential. Professionals skills level on automated systems is also at infancy stage.

Implications:

The findings of the study portray a clear canvas for the stakeholders to devise policies for improving the infrastructure of the educational institutions to compete with the challenging situations. Also, for the academicians to formulate such curriculum which enhance the skills of professionals in the age of artificial intelligence.

Keywords: Library Automation, Professional Skills, Automation Status

Introduction

In a fast-paced world of technologies, artificial intelligence is ready to capture the information landscape by stealing the limelight. AI has already dethroned various information activities like manual cataloging, traditional indexing, data retrieval processes, and personalized recommendations by introducing automated, more efficient, and innovative algorithms that reduce human effort and error while improving accuracy and speed. AI is a highly efficient system that adds a layer of intelligence to the data for decision-making. However, in a data-deprived environment, its working may collapse. Thus, automation is the solution for AI to survive.

Library automation is a critical catalyst in developing and sustaining educational and institutional knowledge. In a world driven by artificial intelligence, public, academic, national, and special libraries are not just information providers but dynamic knowledge ecosystems powered by AI technologies. As society transitions into the age of information technology, the demand for fast, precise, and personalized information continues to surge. This is where AI-driven library automation becomes indispensable, transforming how libraries manage and deliver services and resources. In a country like Pakistan, which is facing a harsh economic crisis, the gap between “haves and have not” is widening day by day. AI-driven services seem like a far-fetched dream that can only be fulfilled by completely automating library systems. Although, automation in the country is not new concept. It is being done from decades, but the true essence has not achieved yet.

In an era of artificial intelligence, library services can widely be integrated to achieve its full potential. However, in countries where digital divide is quite explicit, libraries can come to resolve the issue by automating resources and services to reach digitally deprive population. With the advent of automation, human mediation reduced to a great expanse. Consequently, it enables libraries to perform efficiently and errorless remote services. Library automation started in Pakistan in 1990s in academic sector. But the aim to fully transform libraries is still not accomplished. In order to move forward for artificial intelligence-based services, current situation should be assessed first. The study will help in clearing the current picture with empirical data and also will highlight important issues to be catered before moving forward.

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Objective of the Study

The objective of this study was to investigate the automation status of libraries along with skill level of professionals and challenges coming across in the adoption of automation technologies to its full potential.

Significance of the Study

Automation encapsulates all library operations and forms an integrated library systems (ILS) which has the capability to reduce human effort through error free operations. In this way these systems enhance focus on library services and smooth workflow (Matthews, 2018). Automation enables 24/7 access to digital resources and can increase its efficiency in the times of emergency like faced during Covid. It was automation that enabled libraries to transit towards remote services seamlessly (IFLA, 2020). Automated systems will be helpful in data-driven decision making. The findings of this study would be helpful for policymakers who are involved in the bringing innovations in the field of library management. They will devise the policies to combat challenges associated with automation and will give a nationwide plan to enhance library services through automation to minimize the gap. On the other hand, the study will also enable academicians to bring about changes in the curriculum of library and information science to enhance the skills of library professionals. The study will enable librarians and university management on the accountability of funds given to the library and monitor how the library fund is spent over a year. Therefore, the available literature shows that there is no comprehensive study has been done except a review (Malik, 1996) so that this study also helps in filling the research gap. This study will help to clear the picture of automation status and devise ways to launch artificial intelligence-based systems.

Review of the Literature

A substantial amount of literature shows the development of library automation in various regions of the world. Since its inception, the topic has remained under consideration, starting from developing automation in India and exploring the various factors influencing the process (Yogendra Singh, 2003). Automation has impacted library services by improving services and facilitating users (Anas, Iqbal & Ahmad, 2014), providing user satisfaction and increasing reliance on library resources.

Nayana (2019) organized a survey to identify the status of library automation services in academic libraries of Bengaluru city of India, his study shows that there were multiple library automatic services which is offered by libraries to users and researchers like, online public access catalog (OPAC), serial services, circulation, and others. The results show that almost 50% libraries offered automated circulation services to the users, while 44.4% libraries provide OPAC services and 8.33% only serial services.

Chitra and Kumbar (2020) revealed that ICT and internet connectivity have impacted in the libraries setup slowly and continuously to handle different routine activities of libraries. The study concluded that library automation has potential to improve library facilities and services and library professionals are struggling to equip themselves with necessary skills & updated trends and technologies.

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ISSN Online: 3007-3154
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Library automation is a term used in place of machine based learning that replaced traditional library environment (Ajani & Buraimo, 2021) and provide more fastest service. Library automation is a process of self-lighting all in-house departmental units of library e.g. technical units, reader services, gift and exchanges. Moreover all routine activities performed electronically (Olakoge & Kolawole, 2021). Resultantly, library automation enables library operations to work more efficiently and effectively (Abbas, 2014).

Jahangir, Siddique and Adil (2021) describe that before the advent of library integrated systems, circulation was intended to computerize. Circulation was integrated with the catalog module and vendors were benefaction a circulation system with OPAC from late 1970s. Automation impacting on circulation since the advent of computer. A complete record from circulation files, file accuracy and up to date information of circulation activity like, overdue, charges, renewal, auto due notice of fines and others activity.

In Pakistan, different institutes nationally and internationally started databases management systems e.g. *dBase, FoxPro, INMAGIC, CDS/ISIS*, and *WINISIS* were discussed. This software was used for library housekeeping routines in Pakistan. These packages had modules like cataloging, circulation, acquisition, and serial management report. Circulation module also included and its services made it possible to perform activities like check in check out, reservation, borrower's record, and calculation of fines (Mahmood, 1996).

The importance of an adequate library software is inevitable for the smooth functioning of automated systems (Naveed, Siddique & Adil, 2021). In this way, library automation replaces all traditional work like cataloging, classification, OPAC, purchasing and serial management by integrated systems. Almost every library has a rich collection and these resources access provide to users through library automation like OPAC, and these tools improves and increase productivity and library services (Meghabghab, 1997).

Siddique and Mahmood (2015) describe that literature related to the status of library automation and software is insufficient in Pakistan. A few studies highlight library automation and software stats, but not comprehensively explored. High tech problems and poor hardware hinders the potential of institutions to shift their systems towards a fully automated system (Chetty, 2020). Information professional should request these facilities from their high authority that is a basic demand to initiate automation (Veeranjaneyulu, K., Kumar, A., & Rathinasabapathy, G 2017).

Noor (2022) stated that the current status of library automation in Pakistan the keystone is cost of library automation network, display and continuation cost. The implementation of automation software like KOHA in Pakistan the key problems founded the lack of budget. The configuration of network, irregular power supply and lack of awareness related operating system are developing the key barriers and problems intricate in implementation of automation software in Pakistani libraries.

In todays' challenging environment, where artificial intelligence-based operations are growing exponentially. The integration of AI into library services like chatbots and ask a librarian services can improve user engagement through prompt response (Sukovic, 2022). Automation enables machine learning algorithms, data analytics and data driven

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www.thedssr.com

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ISSN Print: 3007-3146
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decision making (Chen et al., 2023). Also, AI based cataloguing practices reduces the metadata entry errors, thus increasing the discovery of resources (Deng & Liu, 2023).
Hence, the literature exhibits considerable evidence exhibiting importance of automation and its role in transformation of library operations, procedures and services. Although, it lack a comprehensive local literature which provide a complete picture of the automation landscape of Pakistani libraries. The present study strives to address this gap and help to understand the situation by focusing on the status, challenges and skill level of professionals.

Research Design

The study used quantitative design to approach all university libraries of the Lahore region and conducted a survey comprising of various question focusing on the scope of study. The questionnaires were distributed personally and through e-mail among the university librarians. A survey-based questionnaire was used to reach out to the target population as it is scattered in different university libraries of Lahore. The list of universities in Lahore is available on the website of HEC (Higher Education Commission, 2024) Pakistan, and the contact numbers & email of library professionals are available on the directory of PAKLAG, the HEC digital library page.
The study's target population was information professionals or library professionals of Lahore working in public and private universities. The target population is comprised on both public and private university library professionals. The total number of universities is 37, and the excepted target professionals are almost 145 librarians, as per website information.
An online questionnaire was developed using Google Docs to collect data from respondents. The researcher used a five-point Likert scale ranging from Extremely Poor to Excellent and a nominal scale comprising “Yes & No” responses. The questionnaire was adapted from previous literature. The status of library automation was measured through a questionnaire adapted from Naveed, Siddique, and Adil (2021) and challenges faced by the information professionals during the implementation of the automation project through Otunla (2016).
The questionnaire contained two parts; one was related for the chief / HOD librarian. The question of the study identifies the status of library automation. The second part was related to library professionals, which measures the different aspects of professionals, like awareness about library automation software, skills to operate this software, and challenges for professionals. SPSS (statistical package for social science) software used for data analysis.

Data Analysis and Interpretation

Data were collected from the 37 HEC-recognized universities in Lahore, both in the public and private sectors. The first part, showing demographics, provides an overall picture of the status of university library professionals.

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First Section

As explained earlier, the first part contained data from only head/ chief librarians. The overall distribution of the population in this section is as follows:

The data shows a total number of chief librarians working in 37 universities in Lahore. According to data, there were 45 total professionals working as chief librarians, of which 27 were reportedly male, and 18 labeled themselves as females. As per educational level statistics, 11 had PHDs, 19 had MPhil and 15 had only Master's degree. Mostly members such as almost 47% reported to have an experience of 11-20 years, and 36% had an experience of 1-10 years.

Table 1: Distribution of Participated Universities Chief/ In Charge Librarian (N=45)

Variables	Levels	Frequency	Percentage
Gender	Male	27	60%
	Female	18	40%
	Total	45	100%
Education	MLIS	15	33.3%
	M.Phil.	19	12.2%
	PhD	11	24.4%
Work experience	1-10 years	16	35.6%
	11-20 years	21	46.7%
	21-30 years	06	13.3%
	Above 30 years	02	04.4%

Automation status

In a quest to find out the status of library automation, respondents were asked to provide feedback based on the current situation. Table two revealed that 91% of libraries in Lahore are automated, but the extent of automation varies, and only 9% are operating manually. It means that the automation process, which started some thirty years ago, brought a visible change in the working of libraries. This transition towards automated library systems is at different stages, which is further investigated through another research question.

Table 2: Status of Library Automation (N=45)

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Vol. 3 No. 2 (February) (2025)

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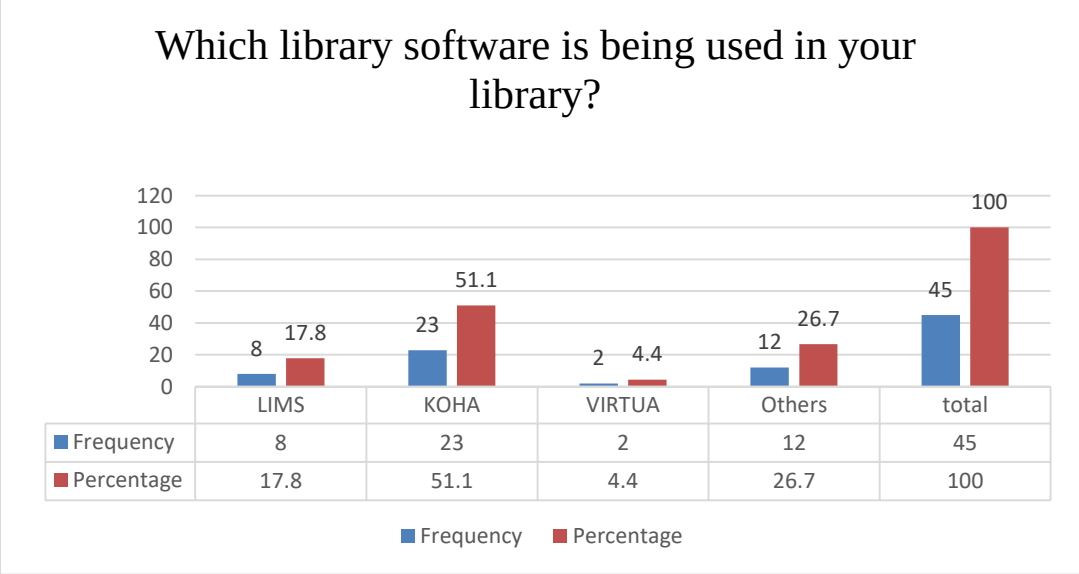
Is your library Automated	Frequency	Percentage
Yes	41	91.1%
No	04	8.9%
Total	45	100%

Type of Automation Software Being Used in Libraries

To further clarify the status, the researcher provided them with a list comprising of the software being used in Pakistani libraries. Hence, it is obvious from the figure that the most used library software is KOHA (51%), the second most used software is LIMS, used by 17.8% of libraries, and then comes VIRTUA, used in only two libraries.

Figure 1: Library Software Being Used in Library.



The next objective focused on checking the maintenance status of the software workforce hired in the libraries. It was found that 80% of the libraries need a proper IT department to maintain library software and resolve maintenance issues. Librarians are performing this duty. Only 13% of libraries have proper IT professionals to take care of the technology infrastructure, including software, and 6.7% are getting services from outside sources.

Table 3: Maintainers of Automation Projects N=45

	Frequency	Percentage
Library professional	36	80%
IT Professionals	06	13.3%
Others	03	06.7%
Total	45	100%

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To further explore the depth of software adoption, the researcher asked more focused questions about the usage of different modules. This section highlighted the extent of usage of each module. The data is presented in Table 4.

Table 4: Status of Library Automation in University Libraries of Lahore N=45

Variables	Yes	Percentage	No	Percentage
Cataloging Module				
I use Z39.50 protocol tool for copy catalog	39	86.7%	06	13.3%
I import record from individual university	37	82.2%	08	17.8%
Circulation Module				
I check-in & check-out books using circulation module.	38	84.4%	07	15.6%
Acquisition Module				
I use acquisition module for purchasing materials of library	22	48.9%	23	51.1%
Acquisition module to maintain budget of books	22	48.9%	23	51.1%
Serial Control				
I use serial module for subscriptions of peric	34	75.6%	11	24.4%
Serial control maintains the budget of perio	29	64.6%	16	35.4%
I manage frequency of periodicals	34	75.6%	11	24.4%
OPAC (online public access catalog)				
I use OPAC module to publish library's catalog.	41	91.1%	04	8.9%
I provide the bibliographic details of library materials using OPAC.	41	91.1%	04	8.9%
Reports module				
I generate various library statistical report	38	84.4%	07	15.6%

Note: Yes=1; No=2

Table 5: Status of Automation

Modules	No. of Libraries	Percentage
Cataloging	39	87%
Acquisition	22	49%
Circulation	41	91%
Serial Control	34	76%
OPAC	44	93%
Report	38	84%

N=45

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ISSN Print: 3007-3146
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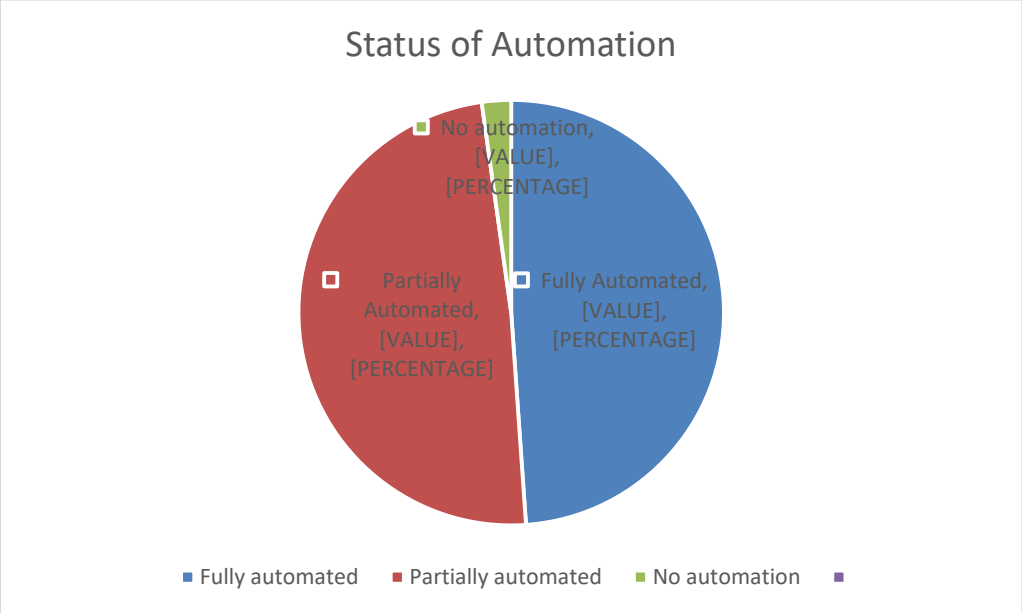
Status of Automation

The Table 5 clearly depicts the automation scenario in Pakistan. The automation process, which started some thirty years back, has yet to reach its maturity, and only half of the libraries seem to have achieved the target. The only module being widely used is OPAC in almost all libraries. The above table shows that modules related to services at the user end, such as OPAC and circulation services, are using automation software in the majority of the libraries. Also, other services that are more technical and require direct involvement of users are not there, like the acquisition module being the least used, serial control, report generation, and cataloging module being used partially in these libraries.

Based on above inferences, the automation scenario looks as follows:

Figure 2: Status of automation



Second Section

Demographics of Library Professionals

To discover the obstacles to achieving the automation target, the study asked library professionals a few questions to measure their awareness level and skills regarding software, metadata, and some technical skills, along with their perception of challenges and obstacles they felt hindered their progress.

A total of 131 library professionals participated in the study, out of which 76 (58%) were males and 55 (42%) were females. As far as their education level is concerned, it is clear from the data that 50% of professional librarians have MA degrees, 43.5% have MPHIL, and only almost 4% have a Ph.D., while 2% also have BLIS degrees. Experience with professional education also matters a lot and helps in the provision of better services. So, the present study also got insight into their experience, which shows that 60% of the

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ISSN Online: 3007-3154
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respondents had experience from 1-10 years, 35% with 11-20 years, 3.8% had experience of 21-30 years, and only one respondent had more than 30 years of experience.

Table 6: Library Professionals or Informational Professionals (N=131)

Variables	Levels	Frequency	Percentage
Gender			
	Male	76	58%
	Female	55	42%
	Total	131	100%
Education			
	BLIS	03	2.3%
	M.A	66	50.4%
	M.Phil.	57	43.5%
	PhD.	05	3.8%
Work experience			
	1-10 years	79	60.3%
	11-20 years	46	35.1%
	21-30 years	05	3.8%
	Above 30 years	01	0.8%

Awareness of library professionals regarding library Software

To check the awareness of library professionals, they were given a list of library software to mark their level of awareness on a scale ranging from "Extremely Poor to Excellent".

Table 7: Software Awareness Level

Awareness level	KOHA		LIMS		MLIMS		VIRTUA		INSIGNIA		INHOUSE	
	f	%	f	%	f	%	f	%	f	%	f	%
Excellent	46	35	53	42	35	27	17	13	56	**43**	14	11
Above Average	57	**44**	60	46	64	49	58	44	59	**45**	66	**50**
Average	22	17	16	12	23	18	35	27	14	11	46	**35**
Below Average	03	02	02	02	03	02	16	12	02	02	03	02
Extremely Poor	03	**02**	02	02	05	**03**	05	**03**	02	02	02	02

Note: Extremely Poor=1; Below Average=2; Average=3; Above Average=4; Excellent=5

The data in the Table 7 intimated that professionals are in different capacities when it comes to awareness about software's related to automation. As seen in Table 7 that 43% of the professionals are aware of INSIGNIA, 42% are aware of LIMS, 35% are aware of

Dialogue Social Science Review (DSSR)

www.thedssr.com

ISSN Online: 3007-3154
ISSN Print: 3007-3146
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KOHA. VIRTUA turned out as least aware software among professionals, and only those professionals are aware of INHOUSE software's who are using these. Statistics showed that information professionals rate their awareness level as either excellent or above average. Some consider that their awareness level is average and still very few consider themselves below average or poor. So, this status shows almost less than 50% awareness among library professionals regarding any automation software.

Table 8: Library professional's awareness about cataloging & classification

Cataloging & Classification	Frequency	Percentage
Excellent	59	45%
Above average	57	43.5%
Average	13	9.9%
Below average	01	0.8%
Extremely poor	01	0.8%
Awareness about acquisition		
Acquisition	Frequency	Percentage
Excellent	34	26.2%
Above average	58	44.6%
Average	28	21.5
Below average	08	6.2%
Extremely poor	02	1.5%
Rate your level of Awareness on Circulation Modules		
Circulation	Frequency	Percentage
Excellent	59	45%
Above average	57	43.5%
Average	13	9.9%
Below average	01	0.8%
Extremely poor	01	0.8%
Awareness about serial control		
Serial control	Frequency	Percentage
Excellent	41	31.3%
Above average	50	38.2%
Average	23	17.6%
Below average	13	9.9%
Extremely poor	04	3.1%
Libraries professional's awareness about Reports		
Reports	Frequency	Percentage
Excellent	59	45%
Above average	62	47.3%
Average	08	6.1%
Below average	01	.8%
Extremely poor	01	.8%

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ISSN Print: 3007-3146
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OPAC

OPAC	Frequency	Percentage
Excellent	38	29%
Above average	72	55%
Average	16	12.2%
Below average	03	23.%
Extremely poor	02	1.5%

Note: Extremely Poor=1; Below Average=2; Average=3; Above Average=4; Excellent=5

The above statistics showed that professionals level of awareness varies on different automation modules. They are mostly aware of the cataloguing, classification module along with report generation module (45%). They also rated their awareness level more than 50% on OPACs. It means that professionals started automation to ease their technical working like classification, catalouging, report generation. These all activities require no user involvement. Although they are not aware of the automation modules relevant to direct user services OPAC, Circulation services. This might be due to the lower skill level of users on automated systems.

Table 9: Software skills

Software skills	Excellent		Above average		Average		Below average		Extremely poor	
	f	%	f	%	f	%	f	%	f	%
Computer literate	36	23.1	74	57.4	16	1.3	03	1.9	02	1.3
Basic system software knowledge	56	35.9	60	38.5	12	7.7	02	1.3	01	0.6
Office automation knowledge.	38	29%	71	54.2	17	13	03	2.3	02	1.3
OPAC / Web OPAC	38	29%	71	54.2	17	13	03	2.3	02	1.3
Knowledge about library software Installation, use and troubleshot	38	29%	71	54.2	17	13	03	2.3	02	1.3
Database searching	38	29	71	54.2	17	13	03	2.3	02	1.5
Library website Development	38	29	71	54.2	17	13	03	2.3	02	1.5
Knowledge about Information searching and retrieval	38	29	71	54.2	17	13	03	2.3	02	1.5
Database searching	38	29	71	54.2	17	13	03	2.3	02	1.5
Library website Development	38	29	71	54.2	17	13	03	2.3	02	1.5
Knowledge about Information searching and retrieval	38	29	71	54.2	17	13	03	2.3	02	1.5

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Note: Extremely Poor=1; Below Average=2; Average=3; Above Average=4; Excellent=5
In order to measure the skills, professionals were asked to rate their skills regarding database searching, library website development, and knowledge about information searching and retrieval. Data revealed that more than half of the information professionals consider their knowledge of the above-mentioned skills is at "above average" (54%). Accordingly, 29% consider themselves to have "excellent" knowledge of library-related skills. Although few of them are at average level (13%) and still 2% consider themselves having below average.

Table 10: Technical skills

Technical skills	Excellent		Above average		Average		Below average		Extremely Poor	
	f	%	f	%	f	%	f	%	f	%
Website designing	35	26.7	69	52.7	20	15.3	04	3.1	3	2.3
Word processing	36	27.5	69	52.7	20	15.3	04	3.1	2	1.5
Digitization technology	39	29.8	68	51.9	18	13.7	04	2.3	2	1.5

Note: Extremely Poor=1; Below Average=2; Average=3; Above Average=4; Excellent=5

As for as technical skills are concerned professionals considered themselves that they have adequate knowledge of website development (53%), word processing (53%) and digitization technology database language and application (53%). However, mastery in these skills is yet to achieve as only 28% considered themselves having excellent skills. But this is quite encouraging that very few of the professionals are at below average (3%) or extremely poor category (2%).

Table 11: Metadata skills

Metadata skills	Excellent		Above average		Average		Below average		Extremely poor	
	f	%	f	%	f	%	f	%	f	%
MARC/AACR2 / RDA	35	26.7	63	48.1	25	19.1	05	3.8	03	2.3
Dublin core	34	26	65	49.6	20	15.3	07	5.3	05	3.8
XML (extensible markup language)	33	25.2	65	49.6	21	16	08	6.1	04	3.1

Note: Extremely Poor=1; Below Average=2; Average=3; Above Average=4; Excellent=5

The data Table 11 revealed the competency levels of 35 (26.7%) library professionals about metadata skills "MARC/ AACR2 and RDA" have excellent awareness. The majority of librarians, 63 (48.1%), have above-average, and 24 (19.1%) have average

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competency in metadata skills. Only five librarians (3.8%) have below-average knowledge, and three librarians (2.3%) have inferior knowledge.

Dublin core (metadata about data) is a data entry standard, that is used to preserve the digital content in the digital library. The findings of this standard show that 34 librarians (26%) have excellent competency. The majority of librarians, 65 (49.6%), have above average, and 20 (15.3%) have average knowledge. Only seven (5.3%) librarians have below average and five have extremely poor.

Third statements of metadata skills find out the results that 33 library professionals (25.2%) have excellent competency related to XML (extensible markup language**)**. Majority of librarians 65 (49.6) have above average and 21 (16%) have average knowledge. Only 8 (6.1%) librarians have below average and 4 (3.1%) have extremely poor awareness.

Table 12: Challenges regarding implementing library automation software

Statement	Yes	Percentage	No	Percentage
Insufficient fund to start automated system	106	80.9%	25	19.1%
Staff training deficiency	101	77.1%	30	22.9%
Poor attitude of library staff to learn new things.	106	80.9%	25	19.1%
Lack of professional staff	105	80.2%	26	19.8%
Poor internet facilities	106	80.9%	25	19.1%
Difficult to search the document on OPAC / lack of searching skills	105	80.2%	26	19.8%
Lack of technical support from a ver community	102	77.9%	29	22.1%
Lack of software knowledge about installatio	102	77.9%	29	22.1%
Lack of library automate services orientation	101	77.1%	30	22.9
Non availability of skilled staff	105	80.2%	26	19.8%
Lack of infrastructure and technical skills	105	80.2%	26	19.8%
Non availability of Documentation	100	76.3	31	23.7%

The most important and prime concern of the information professionals was about insufficient funds to start automation projects, poor attitude of library staff and poor internet facility (81%). Lack of funding for library projects is the main hindrance and the other two arise because of this. Staff motivates to learn and implement new things when organizations support them through incentives and facilitation. Lack of funds results in poor infrastructure and low staff motivation.

The scarcity of professional staff and the non-availability of skilled staff, along with inadequate infrastructure and technical skills (80%), hinder the process of automation. As previously discussed, mostly automated systems in libraries are maintained by library professionals due to the non-availability of IT professionals. So, the scarcity of skilled staff leads to mishandling of the automated systems, which in turn creates chaos in the organization. This is a hindrance towards achieving full automation status for libraries.

Dialogue Social Science Review (DSSR)

www.thedssr.com

ISSN Online: 3007-3154
ISSN Print: 3007-3146
Vol. 3 No. 2 (February) (2025)

Apart from that, there is also a need for more technical support from the vendor community (78%). Library professionals lack sufficient knowledge regarding software installation (78%), which resulted in the closure of these projects. Staff needs to be trained to resolve issues (77%), library automation orientation service (77%) is not available, and the non-availability of the documentation process to carry on these projects resulted in the failure of automation projects.

Conclusion, Recommendations

The study depicted a clear picture regarding the status of automation in Pakistan. Most of the projects are still in their infancy stage. According to the data, half of the libraries have yet to achieve the status of complete automation, and the other half are still struggling to achieve it. Now, libraries are facing continuous challenges to combat their deficiencies and provide reputed services to users, which is impossible in the wake of the current scenario. In such circumstances, providing artificial intelligence-based services is a far-fetched dream. Policymakers should invest and provide the infrastructure and skilled manpower to cope with the challenging needs of the information world. Professionals should divest their efforts in learning and implementing innovative technologies to lessen the distance between haves and have not. This will open up new avenues for the public through libraries. Otherwise, other sectors with more vigilant and skilled manpower may capture the information market and dethrone libraries from their centuries-old position.

Recommendations and Future Suggestions

In the light of above-mentioned findings, the following recommendations are made:

- Institutions must allocate the budget for automation projects on regular basis.
- There should be training for library staff on a regular basis to make them compatible with the changing environment.
- Library schools across the country need to embed IT-based courses in the curriculum to reduce automation costs and increase library professionals' efficiency.
- Proper documentation should be done to ensure the long-term sustainability of the automation projects.
- To avoid budgeting limitations, libraries should strive for open-source software and build in-house software to implement the project.

There are following recommendations for future research on this topic:

- An exploratory study may be designed to explore the in-depth implementation of automation projects.
- Other type of libraries may be included to check the status.
- The study should be conducted in other big cities or provinces.
- This study will serve the purpose of providing the baseline data for future studies.

Explanatory studies can also be planned to check the effect of various factors on automation status.

Dialogue Social Science Review (DSSR)

www.thedssr.com

ISSN Online: 3007-3154
ISSN Print: 3007-3146
Vol. 3 No. 2 (February) (2025)

DIALOGUE SOCIAL SCIENCE REVIEW

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