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LIBRARIANS' PREPAREDNESS IN EMERGING TECHNOLOGIES TO OFFER LIBRARY SERVICES

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Abstract
Purpose- *This study aimed to examine the preparedness of librarians to use emerging technologies (Augmented/virtual reality, cloud computing, semantic web/linked data, Bibliographic Framework, current awareness services, Really Simple Syndication feed, Big Data, Radio Frequency Identification, and WeChat) to offer library services (user, technical, instructional, and management services).*
Design/methodology/approach- *A survey method of research was applied to conduct the research. A quantitative and structured questionnaire was used to collect data. The population of the study consists of library professionals of Lahore, Islamabad, and Rawalpindi (Pakistan). Convenience sampling was applied and 218 library professionals of public and private universities were taken as sample. The data was analyzed by using SPSS.*
Findings- *Results show that most of the respondents are highly prepared to use emerging technologies to offer library services. There is no significant difference exists between various university librarians in terms of preparedness regarding emerging technologies in offering user services, technical services, technical services, and management services. Conversely, all the above emerging technologies were not used in their libraries to offer library services.*
Originality/value- *This paper tries to highlight the preparedness of university librarians to use emerging technologies to offer library services.*

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Keywords- *AR, VR, cloud computing, BIBFRAME, CAS, RSS feed, Big data, and RFID*

1 Introduction

In the present era, information and communication technologies have a significant impact on libraries. According to the fifth law of Ranganathan (1931) library is a growing organism. It grows and updates day by day therefore libraries are also known as digital libraries, virtual libraries, hybrid libraries, library 2.0 etc. Libraries update their services keeping in view their user needs. For instance, as document delivery information has replaced interlibrary loan services as well as the manual catalog has been replaced by OPAC, and online reference services web 2.0 has replaced the libraries reference desk (Mittal, 2017).

Yang and Li (2016) described that emerging technologies refers to any new technology that can help/support user services, instruction, library management, and technical services. User services explains the idea of cloud computing through multiple devices such as dropbox, Google drive is used in circulation sections (RFID) and augmented & virtual reality is used in libraries to provide services. To identify, user needs and provide services, libraries shifted from 1.0 to 2.0 (social networking sites, wikis, social tagging, instant messaging, social bookmarking) and eventually to 3.0 (semantic web, cloud computing, barcode, and QR quick response). Instruction services are provided by libraries through the reference department using "ASK a librarian services", CAS, and RSS feed. Technical services include semantic web and linked data (BIBFRAME, RDF, OWAL, and SKOS). However, libraries provide management services through big data, cloud computing, and mobile-based services. In the libraries, the emergence of new technologies is considered a demand for training and educating librarians keeping in view emerging technologies.

Numerous studies have investigated the application of emerging technologies within libraries. Nevertheless, a significant research gap exists: no prior study has systematically explored the adoption and utilization of emerging technologies among librarians in university libraries. This current research aims to bridge this gap.

2 Review of Literature

Saibakumo (2021) study revealed that academic librarians demonstrated awareness, adoption, and readiness to integrate emerging technologies, such as RFID, big data, and digital storytelling, into library activities. Additionally, cloud computing, virtual reality, and augmented reality have been recently adopted in libraries. The study by Omehia, Okwu, and Nsirim (2021) explored the relationship between librarians' ICT capabilities and their use of emerging technologies, emphasizing the need for training in basic computer skills, information retrieval, and web 2.0. The research found a significant correlation between librarians' fundamental computer skills and their adoption of new technologies.

Hussain and Ahmad (2021) showcased the integration of innovative facilities in smart libraries, including voice-activated search, biometric authentication, automated doors, and remote access. However, Pakistani university librarians faced challenges in adopting these smart-library technologies. The study found that none of the participating libraries utilized the full range of available technologies. Instead, libraries employed various electronic devices, such as 3D printing, RFID, and machine learning, to meet user demands. Additionally, emerging technologies like block chain, drones, facial recognition, robotics, and virtual reality were leveraged to enhance library services (Shashikumara, Manu, & Panna Chaudhary, 2019). These technological advancements are expected to shape the future development of library professionals.

Furthermore, research by Lata and Varma (2021) demonstrated the transformative impact of cutting-edge technology on university libraries, redefining librarians' roles and yielding positive

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outcomes. However, Yoon, Andrews, and Ward (2022) illustrated artificial intelligence technologies in public and private university libraries, and librarians have stated their concerns about the new technology in their affiliated libraries and the implementation of artificial intelligence, cloud computing, big data, robots, and the internet in libraries.

Emerging technologies are increasingly being leveraged to enhance various library services, including user, technical, instructional, and management services. This study will focus on nine key aspects of emerging technologies and their applications in delivering these library services.

2.1 Emerging technologies to support user services

Augmented reality (AR) enhances library services and patron support, but its implementation can be daunting for librarians unfamiliar with the technology. Despite this challenge, libraries can leverage AR in outreach initiatives, marketing, and technological programs to boost user engagement and improve services (Mittal, 2017). However, technical hurdles and the lack of computer science knowledge among librarians can hinder the development of AR applications (Berryman, 2012). Nevertheless, librarians should remain aware of this emerging technology. Other studies highlight the potential of AR in libraries, such as enhancing storytelling, navigation, and book discovery (Gul & Bano, 2019). Mobile AR apps, for instance, can facilitate book location, facial recognition, and optical character recognition, ultimately transforming the library. Research by Lund and Agbaji (2018) suggests that mobile technologies, including augmented reality (AR), offer institutions a low-cost opportunity to integrate innovative technologies. Implementing AR is relatively easy, affordable, and convenient, making it an attractive way to enhance library services.

Cloud computing facilitates online storage of library server data, enabling seamless access from various devices via platforms such as Dropbox, Office 365, and Google Drive. Despite its potential benefits, cloud computing poses challenges for librarians due to their limited expertise in emerging technologies. Researchers have identified open-source cloud-based security solutions to address these concerns (Yuvaraj, 2015). However libraries face challenges in finding cloud storage providers that meet their needs, with options like Google Drive and SkyDrive offering ample storage but limited compatibility, while Dropbox provides broader accessibility but limited storage capacity (Sivankalai, 2021). Moreover, cloud computing raises significant privacy and security concerns, particularly when handling sensitive data. Ensuring security and privacy is crucial when creating and utilizing cloud services (Popovic & Hocenski, 2010). Research by Tella, Ukwoma, and Kayode (2020) found that security and maintenance are key factors in adopting cloud computing, with users prioritizing data safety. Another study by Sivankalai (2021) predicts that all library collections, systems, and services will transition to cloud-based platforms within the next five years.

2.2 Emerging technologies to support technical services

According to DeWeese and Segal (2022), the semantic web is a network of interconnected data that is structured with formal and semantic links, enabling meaningful relationships between data entities. Linked Data uses RDF, URI, and other W3C specifications to connect structured data, forming the foundation of the Semantic Web (Web 3.0), an extension of the current web (Li *et al.*, 2016). According to Neish (2015), Linked Data improves search results and resource accessibility by exposing related data. While Linked Data projects excel within specific user communities, many technologies remain complex and not yet ready for general use. Raza, Mahmood, and Warraich (2019) outlined the web's evolution: Web 1.0 (informational), Web 2.0 (dynamic), and Web 3.0 (machine-readable or Semantic Web). The Semantic Web utilizes structured data,

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enabling computers to analyze relationships between data items. Warraich, Rorissa, and Rasool (2021) described the Semantic Web as a collaborative effort between computers and people, creating meaningful information through integrated data technologies, often referred to as the "web of data."

BIBFRAME is a data model for bibliographic description. The limitations of MARC (Machine-Readable Cataloging) in displaying and linking resources based on RDA (Resource Description and Access) entity relationships led the Library of Congress (LC) to initiate the Bibliographic Framework Initiative (BIBFRAME) (Li *et al.*, 2016). This effort culminated in the 2012 release of the BIBFRAME Editor and associated tools by LC and Zepheira, Inc. Research by Steele (2018) highlighted BIBFRAME's advantages over MARC, particularly its ability to accommodate RDA and provide a more robust vocabulary. The study of Sherbini (2018) noted that BIBFRAME enables libraries to create standalone datasets or link them with other datasets. The adoption of BIBFRAME is significant, as vendors are increasingly exploring linked data technologies (McCallum, 2017). Additionally Raza, Mahmood, and Warraich (2019), emphasized that BIBFRAME has revolutionized the way libraries share metadata and information resources on the web, promoting data interoperability and linking metadata elements to the Semantic Web.

2.3 Emerging technologies to support instructional services

Historically, current awareness services (CAS) played a vital role in keeping users informed about the latest literature and notifying them of new library acquisitions. However, the adoption of CAS and selective dissemination of information (SDI) was limited, with most libraries relying on traditional methods. SDI involved librarians proactively searching databases to provide personalized information to library users (Omeluzor & Oyovwe-Tinuoye, 2017). Additionally, research by Fourie (2003) highlighted the importance of CAS in providing selective dissemination of information (SDI) through features like automatic notifications, alert services, and email alerts. Similarly, Cabonero *et al.* (2019) found that CAS facilitates quick access to library materials, supporting researchers and providing timely information to users. Furthermore, Honghai (2019) demonstrated that CAS and SDI enhance the efficiency of library resources, enabling users to access information at the right time and place, and fostering a positive relationship between librarians and users.

RSS (Really Simple Syndication or Rich Site Summary) is a technology that enables the syndication of web content, making it easily accessible and shareable. According to Wusteman (2004), RSS feeds, available as XML files on websites, allowed libraries to disseminate information, including blog posts, announcements, and search resources. The study by Sarkar and Dey (2009) highlighted the effectiveness of RSS feeds in enabling users to share and republish content, and libraries to provide updates on new collections, services, and content. RSS also supported multimedia content, such as audio, video, and PDF files. Additionally, digital library software like DSpace could automatically generate RSS feeds for specific collections. The study by Zhao *et al.* (2006) illustrated that RSS was a simple and efficient way to transfer content, widely used in news websites, blogs, and educational settings to manage distributed learning resources. Moreover, the integration of RSS technology in library environments has been shown to efficiently deliver SDI and CAS services to patrons (Barman, 2020).

2.4 Emerging technologies to support management services

The application of big data in libraries is still emerging, with only a few institutions leveraging it to enhance innovation and services due to limited expertise (Anna & Mannan, 2020). To address

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this, a big data management policy is essential for adoption and sustainability. Simović (2018) proposed a method for managing vast amounts of differential data in smart libraries using the Hadoop environment. This approach integrated a recommendation system, increasing user engagement and offering special features for library administration. The research by Ahmad, JianMing, and Rafi (2019) highlighted the crucial link between librarians' abilities and competencies in adopting big data analytics in academic libraries. Big data services have been shown to enhance cataloging, archiving, research, and reference abilities (Blummer & Kenton, 2018). By utilizing big data analytics, librarians can assess and improve library services, supporting research activities and fostering progress in data management and digital library services (Li *et al.*, 2016). Big data holds significant relevance in library management and decision-making, offering insights into user behavior, resource utilization, and service enhancements (Hamad, Fakhuri, & Abdel Jabbar, 2022). Embracing a big data mindset will stimulate innovation in library management and service delivery, necessitating a shift from resource management to data management.

The Radio Frequency Identification (RFID) technologies provide enhanced security services in libraries, facilitating wireless communication and theft detection. RFID systems, which consist of tag readers and middleware, streamline library operations by facilitating quick and efficient book circulation, including checkouts (Hussain & Ahmad, 2021; Renold & Rani, 2013). Moreover, RFID provides academic libraries with more effective services, influencing customers with unique and convenient experiences (Gupta, 2020). The benefits of RFID in libraries, include reduced librarians' time spent on scanning barcodes and increased user independence in borrowing, searching, and returning materials (Li *et al.*, 2016).

The increasing adoption of mobile technologies has transformed relationship management, enabling users to access various services anywhere, anytime (Alzaza, 2007). Mobile applications enable ubiquitous access to information, allowing libraries to leverage mobile technologies to facilitate information transmission and access, supporting lifelong learning and education. (Ocran, Underwood, & Arthur, 2020). The widespread adoption of mobile phone library services demonstrates the potential of mobile technology to enhance access to knowledge and facilitate learning in diverse contexts. Similarly Kumbhar and Pawar (2014) found that various university libraries offer mobile services, including SMS/text messaging, to keep patrons informed about library events and information, while also providing convenient access to library resources, reference services, and Wi-Fi internet. WeChat Library is also a mobile platform offering various services, including catalog searches, book tracking, and notifications. It provides benefits like low costs, cross-platform compatibility, and real-time consulting. Some libraries have integrated self-checkout and other mobile services, such as digital resource retrieval and personalized services, into WeChat Library (Wei & Yang, 2017).

The above discussed emerging technologies are revolutionizing library services across user, technical, instructional, and management areas. Therefore, various research studies has explored the various aspects of emerging technologies regarding libraries. However, no comprehensive study has examined the adoption and implementation of these technologies among university librarians. This study seeks to address this gap and provide new insights.

3 Statement of the Problem

The rapid advancement of technology is transforming the library landscape, creating a growing need for librarians to adopt and integrate emerging technologies into their practice (Kajewski,

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2007). The increasing presence of new technologies is driving changes in library systems, enabling innovative services and operations (Racheal, 2020). While library and information science professionals are leveraging cutting-edge technologies in various sectors, many libraries, particularly in Pakistan, face challenges in adopting these tools due to limited resources and infrastructure (Hussain & Ahmad, 2021). As a result, Pakistani libraries lag behind their international counterparts in terms of technological adoption and innovation.

Extensive research has explored the impact of emerging technologies on library services, covering aspects such as awareness, adoption, trends, and application (Cabonero *et al.*, 2019; Gul & Bano, 2019; Hussain & Ahmad, 2021). Additionally, studies have investigated the competencies and skills required by librarians to effectively utilize emerging technologies (Ahmad, JianMing, & Rafi, 2019; Yang & Li, 2016). Nevertheless a significant knowledge gap remains, as no research has specifically examined the preparedness of university librarians to leverage emerging technologies in delivering library services. This study aims to address this gap, contributing to the existing body of literature.

Emerging technologies play a vital role in university libraries, and supporting librarians in this context is crucial. By doing so, librarians' work will become more efficient, accurate, and rapid. This study aims to identify the skills librarians need to effectively utilize emerging technologies and encourage them to update their skills to meet modern demands. The research findings will raise awareness among librarians about emerging technologies, inform future developments, and facilitate informed decision-making to enhance library productivity. Ultimately, this study will empower librarians to leverage emerging technologies and optimize library services.

4 Objectives and hypothesis of the Study

This study aimed to investigate the readiness of university Library and Information Science (LIS) professionals to utilize emerging technologies in delivering diverse services in academic libraries. To achieve this objective, specific hypotheses were formulated to guide the research.

- University LIS professionals are prepared to support the user services in libraries through their knowledge of emerging technologies.
- University LIS professionals are prepared to support the instructional services in libraries through their knowledge of emerging technologies.
- University LIS professionals are prepared to support the library management services in libraries through their knowledge of emerging technologies.
- University LIS professionals are prepared to support the technical services in libraries through their knowledge of emerging technologies.

5 Research Methodology

This study employed a quantitative survey research design, a widely accepted and efficient methodology in social sciences, particularly in library and information sciences. A questionnaire was utilized to collect data from respondent librarians. The study's population consisted of librarians from 30 university libraries located in three major educational cities in Pakistan: Rawalpindi, Islamabad, and Lahore.

A questionnaire was selected as the data collection tool due to its ability to transcend geographical limitations, while also reducing time, cost, and effort. The self-administered questionnaire consisted of statements adapted from previous related studies and was reviewed by four field experts, whose suggestions were incorporated to enhance its validity. The final questionnaire assessed librarians' awareness of emerging technologies in four service areas: user services, technical services, instructional services, and management services. A five-point Likert scale was

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employed to evaluate the statements, ranging from "Not at all prepare" (1) to "Extremely prepare" (5). The questionnaire demonstrated strong internal consistency, with Cronbach's Alpha coefficients ranging from 0.94 to 0.95 across the four constructs, indicating high reliability.

A total of 235 questionnaires were distributed to potential respondents via email, postal mail, WhatsApp, and in-person visits. A satisfactory response rate of 92% (218 respondents) was achieved. The study employed convenience sampling to select participants. The collected data was subsequently analyzed using the Statistical Package for Social Sciences (SPSS) software.

6 Results

This study asked participants to assess their perceptions of their knowledge of emerging technologies to offer various services in university libraries. A five-point Likert scale was used to measure these perceptions, ranging from "Not at all aware" (1) to "Extremely Aware" (5). The statements related to emerging technology factors were ranked in tables based on their mean scores, from highest to lowest. In cases where mean scores were tied, factors with lower standard deviations were prioritized. The study examined the application of emerging technologies in four key areas of library services: user services, technical services, instructional services, and management services.

6.1 Emerging technologies to support user services

The research study asked the participants to gauge their preparedness regarding 'augmented reality, virtual reality, and cloud computing', subdivisions of emerging technologies to offer user services in libraries. Table 1 demonstrates the mean score of participant's visions that they 'moderately prepare' with the subsequent seven elements: Librarians' are prepared to 'support user engagement', enhance physical book stack browsing', 'improve the technological program', use smart phone to locate book stacks on a specific topic', 'enhance the optical character recognition', 'use cutting-edge library services', and 'enhance the facial recognition' (M = 3.90, 3.87, 3.86, 3.83, 3.80, 3.76, and 3.67 respectively).

Regarding virtual reality, findings revealed that majority of the university librarians had also 'moderately aware' regarding 'online virtual tour of the library' (M=4.18) and 'to use in library for storytelling; (M=3.76). Data analysis of cloud computing illustrated that all the LIS professionals were moderately aware in adoption for user satisfaction (M=4.06), in keeping users data secure and safe (M=4.02), towards adoption for user-friendliness (M=3.90), towards perceived security for users (M=3.83).

Table 4.1 Librarians' preparedness regarding emerging technologies to support user services

S.No	Statements Librarians' are prepared to----------	*Mean*	*Std. Deviation*
	Augmented Reality		
1	support user engagement	3.90	0.86
2	enhance physical book stack browsing	3.87	1.09
3	improve the technological program	3.86	0.93
4	use smart phone to locate book stacks on a specific topic	3.83	1.05
5	enhance the optical character recognition	3.80	1.06
6	use cutting-edge library services	3.76	1.09
7	enhance the facial recognition	3.67	1.12
	Virtual Reality		
8	use virtual reality for online virtual tour of the library	4.18	1.124
9	use virtual reality in library for storytelling	3.76	1.044

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	Cloud Computing		
10	use cloud computing in adoption for user satisfaction	4.06	0.911
11	use cloud computing in keeping users data secure and safe	4.05	0.952
12	use cloud computing towards adoption for user-friendliness	3.90	1.027
13	use cloud computing towards perceived security for users	3.83	1.005

6.2 Emerging technologies to support technical services

The study enquired about the target population to estimate their preparedness regarding 'semantic web, and BIBRAME', subdivisions of emerging technologies to offer user services in libraries. Table 2 demonstrates the mean score of participants that they 'moderately prepare' with the subsequent four elements of semantic web and five of BIBFRAME: Librarians' are prepared to enable the linking of entities on the web (M=3.86), use library metadata available for reuse (M=3.84), assess relevant material for collection (M=3.80),use as an extension of Web 3.0 (M=3.68), use in place of MARC (M=3.96), accommodate RDA vocabulary (M=3.83), link with other dataset (M=3.77), data model (M=3.73), promotes data interoperability (M=3.66)

Table 2 Librarians' preparedness regarding emerging technologies to support technical services

S.No	Statements Librarians' are prepared to----------	*Mean*	*Std. Deviation*
	Semantic Web		
1	enable the linking of entities on the web	3.86	0.93
2	use library metadata available for reuse	3.84	0.88
3	access relevant material for collection	3.80	0.93
4	use as an extension of Web 3.0	3.68	1.13
	BIBFRAME		
5	use BIBFRAME place of MARC	3.96	1.11
6	use BIBFRAME in accommodating RDA vocabulary	3.83	1.08
7	use BIBFRAME in linking with other dataset	3.77	1.12
8	use BIBFRAME in data model	3.73	1.19
9	use BIBFRAME to promotes data interoperability	3.66	1.13

6.3 Emerging technologies to support Instructional services

The university librarians who participated in the study were requested to scale up their preparedness concerning 'current awareness services and RSS feed', subdivisions of emerging technologies to offer user services in libraries. Table 3 demonstrates the mean score of participants that they were 'moderately prepare' with the subsequent eleven elements of current awareness services and RSS feed': Librarians' are prepared to update new information by email alerts (M=4.50), alert library users about new acquisitions in the library (M=4.44), update information to users about their demand from the library (M=4.39), update new information about conference announcements (M=4.40)

Librarians' preparedness to utilize RSS feeds was assessed across various contexts, yielding the following mean scores: using RSS feeds with library websites (M=4.24), digital libraries (M=4.17), and integrated library management systems (M=4.11). Additionally, librarians reported being prepared to enable users to share materials online (M=4.06), update current information (M=4.04), and utilize automatically generated RSS feeds from digital library software like DSpace (M=3.95), as well as access RSS feeds available on websites as XML files (M=3.83).

Table 3 Librarians' preparedness regarding emerging technologies to support instructional services

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S.No	Statements Librarians' are prepared to----------	*Mean*	*Std. Deviation*
	Current Awareness Services		
1	update new information by email alerts	4.50	0.78
2	alert library users about new acquisitions in the library	4.44	0.85
3	update new information about conference announcements	4.40	0.72
4	update information to users about their demand from the library	4.39	0.71
	RSS Feed		
5	use with library websites	4.24	0.88
6	use with digital libraries	4.17	0.92
7	use with integrated library management systems	4.11	0.84
8	enable users to disseminate the material on the Internet	4.06	0.90
9	update current information	4.04	.932
10	generate RSS feed automatically by digital library software such as DSpace	3.95	1.03
11	provide RSS feed on the websites as an XML file	3.83	1.08

6.4 Emerging technologies to support management services

The study's participants were asked to assess their preparedness regarding 'Big Data, Cloud Computing, and RFID', a subset of emerging technologies used to deliver user services in libraries. As shown in Table 4, the librarians reported being moderately prepared in thirteen key areas related to Big Data, Cloud Computing, and RFID, indicating 'moderately prepare' to leverage these technologies in their libraries: Librarians' are prepared to utilize a large amount of data for storage, utilize a large amount of data for collection, and utilize a large amount of data for analysis (M = 3.99, 3.97, and 3.84 respectively).The mean scores to store library files through Google Drive, store library files through Cloud storage, and store library files through office 365 were 4.41, 4.26, and 4.12 respectively.

Librarians' preparedness to utilize RFID was gauged across various contexts, yielding the following mean scores: to use for book issue/return (M=4.52), use for security gate (M=4.36), use for automatic doors (M=4.35), use for Dropbox (M=4.38). Additionally the mean scores regarding mobile based library services, to provide message alert service, instant messaging (IM) (M=4.31), to offer mobile phone services through the reference desk (M=4.31), to use WeChat library were 4.31, 4.31, and 3.92 respectively.

Table 4 Librarians' preparedness regarding emerging technologies to support management services

S.No	Statements Librarians' are prepared to----------	*Mean*	*Std. Deviation*
	Big Data		
1	utilize a large amount of data for storage	3.99	0.99
2	utilize a large amount of data for collection	3.97	1.02
3	utilize a large amount of data for analysis	3.84	1.06
	Cloud Computing		
4	store library files through Google Drive	4.41	0.92
5	store library files through Cloud storage	4.26	1.11
6	store library files through office 365	4.12	1.09

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	RFID		
7	use RFID for book issue/return	4.52	0.89
8	use RFID for Dropbox	4.38	1.04
9	use RFID for security gate	4.36	0.98
10	use RFID for automatic doors	4.35	1.01
	Mobile Based Library Services		
11	provide message alert service, instant messaging (IM)	4.31	0.92
12	offer mobile phone services through the reference desk	4.31	0.99
13	use WeChat library	3.92	1.05

7 Discussion

The following discussion addresses the findings related to the objectives of the study, which investigated the preparedness of university librarians regarding emerging technology to offer services in libraries in Pakistani context. In today's information landscape, librarians are expected to possess a high level of skills about emerging technologies to effectively support their institutions' missions and objectives, as well as meet the evolving needs of their users. To achieve this, librarians must possess the necessary knowledge and skills related to emerging technologies. This study drew on the nine essential elements of emerging technologies to assess the preparedness of Pakistani university librarians, which are discussed below.

The mean scores for augmented and virtual reality ranged from 4.18 to 3.67, suggesting that the respondents demonstrated a moderate level of preparedness in leveraging these technologies to deliver user services in libraries. They are good in performing online virtual tours, supporting user engagements, browsing physical book stacks, and technological programs. However, they require more improvements in performing cutting-edge technologies, enhancing facial recognition, and online storytelling. Study findings are consistent with the study verdicts of Mittal (2017), Gul and Bano (2019), and Kaladhar and Rao (2018) which indicated that professionals possessing high augmented and virtual realities has performed user services in better way.

The result of study explores that all respondents are moderately prepared regarding cloud computing and its adoption for user services. The high mean scores of statements like use of cloud computing for user satisfaction, securing their data, and adoption for user friendliness shows that librarians are well prepared in this context. The study findings are steady with the results of Tella, Ukwoma, and Kayode (2020) who elaborated that perceived security and maintenance are good determinants for cloud computing adoption and users of technologies always want to utilize any technology that keeps their data secure and safe. Therefore, the university librarians should be more prepared regarding the use of cloud computing especially the perceived security of users to support the user's services in the library. The above discussion proves the first hypothesis true.

Data analysis regarding emerging technologies to support technical services in libraries explore that all university librarians are moderately prepared regarding semantic web to enable the linking of entities on the web, use library metadata available for reuse, accessing relevant material for collection, and use as an extension of Web 3.0. The verdicts are aligned with the study findings of Warraich, Rorissa, and Rasool (2021), Neish (2015), Li *et al.* (2016), and Gonzales (2014) which indicated that linked data improve search results and make resources easier to access by exposing related data for collection and use as an extension of web 3.0.

Study findings illustrate that all university librarians are moderately prepared to use BIBFRAME in place of MARC. Respondents are moderately prepared for accommodating RDA vocabulary, in linking with another dataset, and data models and to promote data interoperability. These findings

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are consistent with the study results of Steele (2018) and Raza, Mahmood, and Warraich (2019) whose studies assessed that BIBFRAME replaces the MARC and compared to MARC 21, BIBFRAME claims to accommodate RDA and its vocabulary better. Libraries can use BIBFRAME to establish an environment where they link with other datasets. Consequently librarians working in universities might be well prepared regarding emerging technologies so they can support technical services in libraries. The preceding discussion also lends support to the confirmation of the second hypothesis.

The outcomes of the study explore that respondents are highly moderate about current awareness services to offer instructional services in libraries. They are prepared to update new information by email alerts, alerting library users about acquisitions in the library, update information to users about their demand from the library, and update information about conference announcements. These findings align with previous studies by Omeluzor and Oyovwe-Tinuoye (2017) and Cabonero *et al.* (2019), which revealed that librarians' current awareness services played a vital role in helping users discover and stay updated on new information, supporting researchers, providing rapid access to information, and offering general information services.

The mean scores of the study indicate that respondents are moderately prepared concerning RSS feed to offer instructional services in libraries which also prove the 3rd hypothesis of study. They possess good ability of RSS feed to work with library websites, use it with digital libraries, use it with integrated library management systems, enable users to disseminate material on internet, update current information generated automatically by digital library software such as DSpace, and available on the websites as an XML file. The outcomes are steady with previous research by Sarkar and Dey (2009) and Barman (2020) which highlighted the versatility of RSS feeds, which can be easily accessed on websites as XML files, enable users to share and republish content online, and can be automatically generated by digital library software like DSpace. Additionally, RSS feeds can be seamlessly integrated with various library systems, including digital libraries, library websites, and blogs, making it a valuable tool for librarians to support instructional services. These findings suggest that librarians in this context are likely to be familiar with emerging technologies that enhance library services and especially RSS feed technology.

The responders are again moderately prepared regarding big data and its utilization for collection, storage and analysis to perform management services in libraries. Findings are consistent with the findings of Ahmad, JianMing, and Rafi (2019) and Blummer and Kenton (2018) which demonstrated a significant link between the abilities and competencies needed for librarians to adopt big data analytics in academic libraries, enabling librarians to utilize a substantial amount of data for library tasks such as data collection, storage, moderation and evaluation.

The mean scores show that respondents are highly moderate to use Cloud computing in order to perform management services. They can store of library files through services like Google Drive, Cloud storage, and Office 365. These results are consistent with the findings of previous studies by Kutty (2019), Dutt (2015), and Yuvaraj (2015), which revealed that cloud computing enables libraries to store their servers online, allowing users to access files from multiple devices, such as Dropbox, Office 365, and Google Drive. This technology also enables users to access email and services from any device, back up files, and librarians will have these skills.

The data analysis indicate that respondent librarians are once again moderately prepared regarding RFID and its applications in book issues/returns, security gates, automatic doors, and Dropbox to perform better management services in libraries. These outcomes are somewhat steady with the study conducted by Hussain and Ahmad (2021) and Dhanalakshmi and Mamatha (2009)which

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explored that RFID was found to provide security and wireless communication services and was used in library security purposes for different types of library materials, such as Dropbox, book issue return, automatic doors, and security gates and librarians have to know this technology.

Additionally, data analysis also revealed that the respondents demonstrated a moderate level of preparedness in providing mobile-based library services, including message alerts, instant messaging, mobile phone services at the reference desk, and WeChat library services. These findings are largely in line with previous studies by Kumbhar and Pawar (2014) and Wei and Yang (2017) which found that many university libraries offer mobile services through their reference desks, providing users with convenient access to information, time-saving features, and services like MS alerts, instant messaging, and OPAC access on mobile devices. Notably, WeChat libraries have emerged as a significant mobile service mode, contributing to enhanced user experiences and services. The preceding discussion provides evidence to support the validation of the 4th hypothesis.

9 Conclusion and recommendations

This study investigated the preparedness of university librarians in Pakistan regarding emerging technologies to offer services in libraries. The findings indicate that librarians demonstrated a moderate level of preparedness in leveraging various emerging technologies, including augmented and virtual reality, cloud computing, semantic web, BIBFRAME, current awareness services, RSS feeds, big data, RFID, and mobile-based library services.

The study's results align with previous research, highlighting the importance of emerging technologies in enhancing library services. The findings suggest that librarians in Pakistani universities have a foundation in emerging technologies but require further development to effectively support instructional, technical, and management services in libraries.

The study's hypotheses were validated, indicating that university librarians in Pakistan are moderately prepared to offer user services, support technical services, and perform management services using emerging technologies. The results of this study provide insights for library administrators, policymakers, and professionals to develop strategies for enhancing librarians' skills and knowledge in emerging technologies, ultimately improving library services in Pakistani universities. Future research directions could include investigating the perspectives of library users in relation to the emerging technology skills possessed by university librarians.

10 References

Ahmad, K., JianMing, Z., & Rafi, M. (2019). An analysis of academic librarians competencies and skills for implementation of big data analytics in libraries: a correlational study. *Data Technologies and Applications, 53*(2), 201-216. doi: 10.1108/DTA-09-2018-0085

Alzaza, N. S. (2007). *Mobile-based library loan service (MBLLS)* (PhD), Universiti Utara Malaysia, Changlun.

Anna, N. E. V., & Mannan, E. F. (2020). Big data adoption in academic libraries: a literature review. *Library Hi Tech News, 37*(4), 1-5. doi: 10.1108/LHTN-11-2019-0079

Barman, B. (2020). Changing the Ways the Libraries Reach to the User: RSS and its Applications in Libraries with Special Reference to Feedburner. *Library Philosophy and Practice*, 1-11.

Berryman, D. R. (2012). Augmented reality: a review. *Medical reference services quarterly, 31*(2), 212-218.

Blummer, B., & Kenton, J. M. (2018). Big data and libraries: identifying themes in the literature. *Internet Reference Services Quarterly, 23*(1-2), 15-40. doi: 10.1080/10875301.2018.1524337

ISSN E: 3006-1466
ISSN P: 3006-1458
CONTEMPORARY JOURNAL OF SOCIAL SCIENCE REVIEW
CJSSR
CONTEMPORARY JOURNAL OF SOCIAL SCIENCE REVIEW
Vol.03 No.03 (2025)

Cabonero, D. A., Tindaan, C. B., Attaban, B. H.-o., & Manat, D. A. S. (2019). The effectiveness, reasons and problems in current awareness services in an academic library towards crafting an action plan. *Library Philosophy and Practice*, 1-26.

DeWeese, K. P., & Segal, D. (2022). *Libraries and the semantic web*. London: Springer Nature.

Dhanalakshmi, M., & Mamatha, U. (2009). *RFID based library management system.* Paper presented at the ASCNT, Noida.

Dutt, M. (2015). Cloud computing and its application in libraries. *International Journal of Librarianship and Administration, 6*(1), 19-31.

Fourie, I. (2003). How can current awareness services (CAS) be used in the world of library acquisitions? *Online information review, 27*(3), 183-195. doi: 10.1108/14684520310481409

Gonzales, B. M. (2014). Linking libraries to the web: linked data and the future of the bibliographic record. *Information Technology and Libraries, 33*(4), 10-22.

Gul, S., & Bano, S. (2019). Smart libraries: an emerging and innovative technological habitat of 21st century. *The Electronic Library, 37*(5), 764-783. doi: I 10.1108/EL-02-2019-0052

Gupta, A. (2020). Internet of things based book tracking system for smart library. *International Journal of Computer Science and Mobile Computing, 9*(7), 12-18. doi: www.ijcsmc.com

Hamad, F., Fakhuri, H., & Abdel Jabbar, S. (2022). Big data opportunities and challenges for analytics strategies in Jordanian Academic Libraries. *New Review of Academic Librarianship, 28*(1), 37-60.

Honghai, G. C. (2019). An Analysis of Current Awareness Services and Selective Dissemination of Information in University of JOS Library. *Villanova Journal of Science, Technology and Management, 1*(1), 14-26.

Hussain, A., & Ahmad, P. (2021). Adoption of smart technologies in university libraries of Pakistan: A qualitative review. *Library Philosophy and Practice*, 1-10.

Kajewski, M. A. (2007). Emerging technologies changing public library service delivery models. *Australasian public libraries and information services, 15*(4), 420-429.

Kaladhar, A., & Rao, K. S. (2018). Internet of Things: a route to smart libraries. *Journal of Advancements in Library Sciences, 4*(1), 29-34.

Kumbhar, S., & Pawar, R. (2014). *Mobile based services: application and challenges.* Paper presented at the Changing Trends Acad. Lib. Librarianship Digital Env. , Kolhapur.

Kutty, A. A. (2019). Cloud computing in libraries *Library Philosophy and Practice*, 1-13.

Lata, S., & Varma, S. (2021). Transforming university libraries with emerging technologies. . *The Journal of Academic Librarianship, 47.*(4), 23-45. doi: 10.1016/j.acalib.2021.102345

Li, D.-Y., Xie, S.-D., Chen, R.-J., & Tan, H.-Z. (2016). *Design of Internet of Things system for library materials management using UHF RFID.* Paper presented at the 2016 IEEE international conference on RFID technology and applications (RFID-TA).

Lund, B. D., & Agbaji, D. A. (2018). Augmented reality for browsing physical collections in academic libraries. *Public Services Quarterly, 14*(3), 275-282.

McCallum, S. (2017). BIBFRAME development. *JLIS. it, 8*(3), 71-85.

Mittal, A. (2017). Emerging Technologies and their Impact on the Libraries. *Indian Journal of Science and technology, 10*(3), 1-4. doi: 10.17485/ijst/2017/v10i31/158399

Neish, P. (2015). Linked data: what is it and why should you care? *The Australian Library Journal, 64*(1), 3-10. doi: 10.1080/00049670.2014.974004

ISSN E: 3006-1466
ISSN P: 3006-1458
CONTEMPORARY JOURNAL OF SOCIAL SCIENCE REVIEW
CJSSR
CONTEMPORARY JOURNAL OF SOCIAL SCIENCE REVIEW
Vol.03 No.03 (2025)

Ocran, T. K., Underwood, P. G., & Arthur, P. A. (2020). Strategies for successful implementation of mobile phone library services. *The Journal of Academic Librarianship, 46*(5), 1-9. doi: 10.1016/j.acalib.2020.102174

Omehia, A., Okwu, E., & Nsirim, O. (2021). Librarians' ICT Competencies and Utilization of Emerging Technologies in Academic Libraries in Rivers State, Nigeria. *Library Philosophy and Practice (e-journal)*, 1-20.

Omeluzor, S. U., & Oyovwe-Tinuoye, G. O. (2017). Assessment of information and communication technology for selective dissemination of information and current awareness services: A case study of university libraries in the south-west zone of Nigeria. *Evidence Based Library and Information Practice, 12*(4), 233-249. doi: 10.18438/B84X09

Popovic, K., & Hocenski, Z. (2010). *Cloud computing security issues and challenges.* Paper presented at the The 33rd international convention mipro, Opatija.

Racheal, A.-O. F. (2020). Global trends and emerging technologies in libraries and information science. *Library Philosophy and Practice (e-journal)*, 1-13.

Raza, Z., Mahmood, K., & Warraich, N. F. (2019). Application of linked data technologies in digital libraries: a review of literature. *Library Hi Tech News, 36*(3), 9-12. doi: 10.1108/LHTN-10-2018-0067

Renold, A. P., & Rani, R. J. (2013). *An internet based RFID library management system.* Paper presented at the 2013 IEEE Conference on Information & Communication Technologies, Thuckalay.

Saibakumo, W. T. (2021). Awareness and acceptance of emerging technologies for extended information service delivery in academic libraries in Nigeria. *Library Philosophy and Practice*, 1-11. doi: https://digitalcommons.unl.edu/libphilprac/5266

Sarkar, P., & Dey, N. C. (2009). *RSS feeds and its application in library services.* Paper presented at the 7th International CALIBER, Puducherry.

Shashikumara, A., Manu, T., & Panna Chaudhary, V. A. (2019). *Emerging Technology Trends for Libraries and Library Professionals.* Paper presented at the Librarianship Development Through Internet of Things and Customer Service, Mehsana.

Sherbini, N. (2018). Implementing BIBFRAME: A Review of the Literature *Cataloging & Classification Quarterly, 56* (1), 34-51. doi: 10.1080/01639374.2017.1389394

Simović, A. (2018). A Big Data smart library recommender system for an educational institution. *Library Hi Tech, 36*(3), 498-523. doi: 10.1108/LHT-06-2017-0131

Sivankalai, S. (2021). Academic libraries support e-learning and lifelong learning: A case study. *Library Philosophy and Practice (e-journal)*, 1-18.

Steele, T. D. (2018). What comes next: understanding BIBFRAME. *Library Hi Tech, 37*(3), 513-524. doi: 10.1108/LHT-06-2018-0085

Tella, A., Ukwoma, S. C., & Kayode, A. I. (2020). A two models modification for determining cloud computing adoption for web-based services in academic libraries in Nigeria. *The Journal of Academic Librarianship, 46*(6), 1-15. doi: 10.1016/j.acalib.2020.102255

Warraich, N. F., Rorissa, A., & Rasool, T. (2021). An in-depth qualitative study of Pakistani academic library professionals' conceptions of linked data technology. *Information Discovery and Delivery, 49*(4), 280-286. doi: 10.1108/IDD-03-2020-0029

Wei, Q., & Yang, Y. (2017). WeChat library: a new mode of mobile library service. *The Electronic Library, 35*(1), 198-208. doi: 10.1108/EL-12-2015-0248

Wusteman, J. (2004). RSS: the latest feed. *Library Hi Tech, 22*(4), 404-413. doi: 10.1108/07378830410570511

Yang, S. Q., & Li, L. (2016). *Emerging technologies for librarians: a practical approach to innovation Practical Art Of Motion Picture Sound*.

Yoon, J., Andrews, J. E., & Ward, H. L. (2022). Perceptions on adopting artificial intelligence and related technologies in libraries: public and academic librarians in North America. *Library Hi Tech, 40*(6), 1893-1915. doi: 10.1108/LHT-07-2021-0229

Yuvaraj, M. (2015). Security threats, risks and open source cloud computing security solutions for libraries. *Library Hi Tech News, 32*(7), 16-18. doi: 10.1108/LHTN-04-2015-0026

Zhao, C., Wan, L., Yu, Y., & Luo, Q. (2006). *Construction of a distributed learning resource management system based on RSS technology.* Paper presented at the Web Information Systems–WISE 2006 Workshops: WISE 2006 International Workshops, Wuhan.