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October 2020

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Investigating the factors influencing librarians' intention toward the adoption of Koha- an Open Source Integrated Library System in Pakistan

Abstract

This study investigated the factors influencing the intention of Pakistani librarians toward the adoption of Koha- an Integrated Open Source Integrated Library System (OSILS). To this end, a conceptual framework consisted of six predictors and one outcome variable was constructed. Adopting a quantitative approach, the survey method was used. Data were gathered through questionnaires from a convenient sample of Pakistani librarians. Multi-variate statistics including Pearson correlation coefficient, multiple and stepwise regression analyses were used for data analyses. The results established perceived usefulness (PU) and perceived ease of use (PEU) as the positive and significant predictors of the librarians' intention to adopt Koha. Further, four external stimuli (social influence (SI), personal innovativeness (PI), organizational readiness (OR) and cost (CT)) were found positive and significant indicators of PU and PEU. All hypothetical relationships (H₁-H₁₀) were supported. Besides, PU and cost were found dominant drivers of intention in the adoption of Koha. The results affirmed that individual differences (PU, PEU, SI, PI, CT, OR) have positive and significant influences on intention to adopt Koha-OSILS that further

authenticate adoption reliance on individuals' cognitive peculiarities. The findings will be helpful in policymaking for the adoption of Koha and other digital innovations.

Keywords: Koha, library management system, integrated library software, library automation, technology adoption, open source software

INTRODUCTION

Modern technological innovations have influenced both librarians' professional capabilities and library management infrastructure. Adopting innovations have reshaped libraries into virtual realities demanding librarians to be competent in the use of technologies (Khan, 2020). While technologies are perceived a potential challenge, its solution still lies in its acceptance that make adoption mandatory for librarians. Librarians' optimistic attitude toward adoption of technologies can improve the quality of their performance and library services (Frambach and Schillewaert, 2002). In modern times, Open Source Integrated Library System (OSILS) is one of the important innovations that has manifold features such as cost-effectiveness, coding options and shared responsibility in solving system issues. Koha is one of the dominant OSILS, developed to manage cost of library automation and has been adopted in more than 15000 libraries of the world (Bissels, 2008). According to Chaputula and Kanyundo (2019), community support, library standards, learning tools and active development features have provided a track to Koha in library automation. In developing countries, technologies are being adopted by libraries

to enhance users' access to information resources (Daniels, 2002). Pakistan is a developing country, where educational policymakers emphasize the adoption of technologies in teaching and learning (Malik and Mahmood, 2014). To this end, National Technologies Adoption Policy-2002 of Pakistan was developed to ensure adoption of technologies (Ramzan and Singh, 2009).

In Pakistan library automation started with in-house developed library databases and steadily progressing toward OSILS which is unsatisfactory. It has been established that technology adoption throughout the country is not uniform (Ramzan and Singh, 2009). Further, researchers have shown little interest in the study of factors affecting the adoption cycle of innovations in Pakistan (Khan *et al.*, 2017). Since, Koha as a technological innovation can manage the challenge of library automation thus it is significant to investigate the factors that motivate or impede its adoption. Several OSILS are available in the market but Koha was selected for this study because of its worldwide popularity, cost-effectiveness and other multiple features explicitly flexibility, customization, and enhanced efficiency. However, according to Khan *et al.*, (2017), librarians in Pakistan are reluctant in the adoption of digital innovations and are dependent on traditional practices of librarianship. Even though, Koha is regarded a significant software for library automation, the researchers have also suggested adoption due to its practicality, ease of use, cost-effectiveness, and maintenance. Admitting that Koha is significant, it is essential to recognize the motivators of and barriers to its acceptance and rejection respectively in

the context of Pakistani librarians. Moreover, in the context of Pakistani librarians the existing gap in literature on adoption of innovations describe that research on identification and validation of determinants of intention to adopt Koha is viable. This study assumed that several factors encourage and impede the adoption of Koha. However, for the study seven dominant constructs were selected from the accessible adoption models namely social influence (SI), personal innovativeness (PI), organizational readiness (OR), cost (CT), perceived usefulness (PU), perceived ease of use (PEU) and Koha adoption intention (KAI). The intended study aimed toto achieve the following research objectives:

RO1: To explore the factors that influence librarians' intention toward adoption of Koha in Pakistan in terms of;

- a) to ascertain that relationship of SI with PU and PEU influences KAI;
- b) To assess that relationship of PI with PU and PEU predicts KAI;
- c) to determine that relationship of OR with PU and PEU affects KAI;
- d) to discover that association of cost with PU and PEU impacts KAI;
- e) to recognize that PU influences the adoption intention of librarians toward Koha;
- f) to know that PEU affects the adoption intention of librarians toward Koha.

RO2: To determine the strongest factors of adoption of Koha among Pakistani librarians.

LITERATURE REVIEW

Adoption of innovations refers to the acceptance of innovative ideas in terms of readiness for them (Oliveira, Thomas and Espadanal, 2014) and is reliant on steady process of transformation from individuals to society (Gruenhagen and Parker, 2020). This concept has been used in multiple models of adoption of technologies and information systems (Lai, 2017). In libraries, it has been linked with automation and implementation of technologies to perform library tasks such as acquisition, cataloguing and circulation (Kumar, 2016). In the 1960s, American and British libraries experimented with computers for library automation and efforts were later extended to other European countries (Rayward, 2002). The same time, MARC was adopted by the Library of Congress (Borgman, 1997) that led to MARC-II in 1968 (Seikel and Steele, 2001). Similarly, in 1967 OCLC- Ohio College Library Centre adopted online cataloguing at the University of Ohio. However, a breakthrough was observed when libraries adopted integrated chips, storage devices and computer networks (Ebunuwele, Ola and Uduebor, 2014). Further, in 2000 the ideas of digital library and collection and remote access to digitized resources were introduced (Ramzan and Singh, 2009). Such advances have changed libraries' practices that redefined the role of library professionals. Further, these developments have also introduced the notion of open-source library integrated systems (OSILS) that enhanced the effectiveness of library services towards teaching, learning and research (Mairaj and El-Hadi, 2012).

Open Source Software (OSS) is any computer programs that offer publicly accessible and modifiable source code with different licensing permissions (Stallman, 2009). It describes software in terms of democratization, cooperative networks, personalization, and service orientation (O'Reilly, 1999). In 1985, Free Software Foundation was established to promote worldwide freedom of creation, distribution and modification of computer software applications (Singh and Sanaman, 2012). In librarianship, OSS was introduced in 1998 by OSI (Open Source Initiative). However, Koha was the first OSILS to use OSS when it was introduced in 1999 in New Zealand (Pruett and Choi, 2013). Even though OSS brings multiple challenges for libraries and other organizations, it is free-of-cost and provides complimentary source code for usability according to the organizational needs (Gallego, Luna and Bueno, 2008). It has solved the issues related to proprietary software and can be installed under any operating system such as Linux and windows (Qu, Yang and Wang, 2011). The OSS is beneficial for data and information management and has demonstrated fewer risks as compared to other software (Choi and Pruett, 2019). The advantages of OSS include stability, less rebooting and productive behaviour (Singh Negi, 2014) and thus doesn't entail the provision of advanced technology systems (Singh and Sanaman, 2012). However, OSS need technical knowledge and skills in terms of installation, maintenance and source code modifications (Hedgebeth, 2007). Besides, community support is likewise indispensable for the adoption, training and follow-up of OSS (Mutula and Kalaote, 2010). Although OSS became famous with the advent of Koha, the existing research instead of

users' perspective has focused on system' features. It is inferred that the current research findings are biased towards OSS developers and have ignored individuals' viewpoint exclusively librarians (Pruett and Choi, 2013). The eminent research studies so far undertaken on OSS in the developing countries are from India, Sri Lanka, Malaysia, Thailand and Pakistan (Rafiq, 2009, Rahoo and Khan, 2020). Since research is limited on OSS from individuals' perspective, thus librarians' reliance on developers' stance to adopt Koha is not enough. In other words, the developers' perspective could not assist in the successful adoption of OSS, and thus in terms of librarians, it is essential to explore the causes of acceptance and refusal of Koha.

Koha- Open Source Integrated Library System (OSILS)- a system that supports both staff interface and online catalogue. It is fully featured with all functional modules like acquisition, cataloguing, serials, patron management, reservation, and OPAC- online public access catalogue (Roy and Kumar, 2017). Koha was introduced as an integrated library system for a group of public libraries in New Zealand that replaced "CataList"- a proprietary library software. It was first initiated as C4 and later its name was changed to Koha (Engard, 2010). In 2000, Koha was first installed in libraries under the General Public License (GPL) as OSS (Ukachi, Nwachukwu and Onuoha, 2014). Koha received librarians' attention when it was; a) adopted by Nelsonville Public Library in Ohio, USA and, b) funded for developing Z39.50 and MARC 21 bibliographic records (Breeding, 2009). Because of worldwide support from different companies, Koha became a popular software among

librarians (Stallman, 2009). Koha is currently in its 20th version (Koha 20.05.00) having thirteen novel features, 275 enhancements and 592 bug fixes (Breeding, 2017).

Koha in Pakistan- the use of Koha started in 2006 at LUMS- University of Management and Sciences (Mahmood, Bhatti and Rehman, 2012). According to a current web-based report, only thirty libraries in Pakistan are using Koha (Wiki, 2019) and thus adoption has been very slow. However, a community has been created in Pakistan for the supervision, maintenance and installation of Koha. This community has organized two international conferences in Pakistan while the 3rd conference scheduled from 16-18 March 2020 was postponed due to Corona pandemic (<http://2020.kohapakistan.org/>). However, it has organized numerous training sessions on installation/adoption of Koha in Pakistan. Despite these initiatives, most of the librarians resist adoption of Koha due to unknown reasons (Khan *et al.*, 2017). These librarians may be facing several problems such as lack of technology skills, knowledge of operating systems, unavailability of Internet facility and lack of organizational and individual interests (Asim and Mairaj, 2019). Further, the contributions of PLA- Pakistan Library Association towards the improvement of librarianship is disappointing and has badly failed to promote adoption of Koha as well as over library automation. A few self-interest vested groups in Pakistan have focused on library automation but paradoxically. That is why librarianship in the country has become a stereotypical profession reliant upon limited traditional practices where adoption of innovations is negligible.

Adoption models/theories- irrespective of disciplines and terrestrial limitations extensive research is available on adoption models and theories (Rafique Shamim and Anwar, 2019). The prior researchers have utilized the adoption models in their contexts (Taherdoost, 2018) for the investigation of users' intention towards the adoption of different technological innovations (Lai, 2017). The adoption theories and models are confronted with two foremost challenges i.e. integration of multiple constructs and practice of using assorted methods to examine adoption (Khan and Qutab, 2016). However, it is evident from the current literature that outcome construct in all adoption models have been assigned with multiple phrases and nomenclatures, for example, use of, adoption of, acceptance, rejection, diffusion, infusion, implementation keeping in view technologies, innovations, ICT, information system and mobile technologies (Calantone, Griffith and Yalcinkaya, 2006). Additional features observed regarding adoption models included flexibility in adaptation, diversity in its nature, the dynamic growth of the multiple aspects and rapid integration of wide-ranging extraneous variables. However, incorporation of the new constructs either extraneous, moderating, or mediating were demonstrated highly significant and valued among the original authors with the intent to augment their model usability and validation across different disciplines (Venkatesh *et al.* 2003). Further, researchers posited that integrating novel constructs in the existing frameworks have extended the scope of model applications toward other fields of knowledge and thus sustain their interdisciplinary characteristics (Holzmann, Schwarz and

Audretsch, 2020). Like other disciplines, the models of adoption for instance TAM (Davis, 1993), UTAUT (Venkatesh *et al.* 2003) and TOE (Tornatzky and Fleischer, 1990) have extensively used in librarianship (Khan and Qutab, 2016) and are dominant in the study of users' behavioural intention towards the adoption of technologies (Singeh, Abrizah and Kiran, 2020). Besides the fact that current literature is rich on adoption models still, researchers have described their use with certain limitations. These limitations have strong links with local needs-based customization that have resulted in the modified version of the adoption models (Ajibade, 2018). However, keeping in view the present research, few relevant models were identified that assisted in the construction of an integrated framework for this study. A brief discussion is presented about these models in the below sections, followed by a comprehensive debate on the framework and constructs of this study.

In the intended study, the first dominant theory that assisted in the identification, understanding and selection of outcome variable is the theory of reasoned action (TRA). This theory was produced in 1875 by Fishbein and Azjen (Ajzen 1991) and later extended to the theory of planned behaviors-TPB (Pal, Modi and Patel, 2016). Recently, both TRA and TPB have been extended as an integrated behavioural model (IBM) by incorporating performance as an additional construct (Trinh and Vo, 2016). The constructs in this theory are believed to shape individuals' behaviour toward the adoption of innovations (Lippert and Davis, 2006). Its underpinning assumptions validated intention as the strong predictor

of human behaviour, where behaviour is expressed according to the attitude (Nguyen, 2009). According to Taherdoost (2018), to understand the correlation between users' behaviour, attitude and intention towards adoption the TRA model linked three cognitive factors that are the attitude to act, subjective norms, and behavioural intention (Taherdoost, 2018).

Further, in the integrated model of this study, two constructs perceived usefulness and perceived ease of use were identified from TAM-Technology Acceptance Model and UTAUT- Unified Theory of Acceptance and Use of Technology. UTAUT, an extension of the TAM model (Venkatesh *et al.*, 2003) consists of four different constructs namely social influence, effort expectancy, performance expectancy and facilitating conditions (Holzmann, Schwarz and Audretsch, 2020). Both models have been widely used among the researchers for the study of adoption intention. These models have validated users' perception of usefulness and easiness as the foremost indicators of acceptance of technologies. Moreover, in the past, such models have been used in numerous studies for factorial validation and adoption of innovations (Lin, Fofanah and Liang, 2011). TAM based on TRA was introduced by Davis (1993) has been extensively utilized by different researchers for the study of the adoption of technologies (Lippert and Davis, 2006). The supporting assumption of TAM is that PU and PEU are the significant indicators of the intention to adopt innovations. According to Yoon (2016), TAM has been used in the context of libraries with special reference to information technologies and systems. It has

been a significant model that identified users' intention towards the adoption of digital libraries (Miller and Khera, 2010). Khan and Qutab (2016) used TAM and UTAUT models for the formulation of their study framework and evaluated users' intention toward the acceptance of HEC digital library (DL). Their findings established PU and PEU as the critical success factors in the adoption of HEC DL. Similarly, Park *et al.* (2009), Miller and Khera (2010) and Xu *et al.* (2010) integrated TAM and UTAUT to study the impact of PU and PEU on the adoption of a digital library. Their findings indicated that PU and PEU are the individual differences that have a positive and significant impact on students' intention to adopt digital library in developing countries. Similarly, researchers such as Booker *et al.* (2012), Aharony and Prebor (2015) and Joo and Choi (2015) have also used TAM and UTAUT for the study of e-resources in the context of libraries and claimed that PU and PEU are the important dimensions of the adoption of innovations. Likewise, the UTAUT model has been dominant among the researchers for the study of different aspects of librarianship. For instance, Saravani and Haddow (2011), Chang (2013) and Rafique Shamim and Anwar (2019) have used UTAUT model for the study of mobile libraries and validated several constructs as a predictor of the adoption of technologies among the librarians.

Similarly, the Technology-Organization-Environment (TOE) framework is a stable adoption model (Hassan *et al.*, 2017) used for the study of the adoption of innovations. This model proposed three important contexts namely; 1) technological stance- consisted

of factors influencing intention to adopt innovations; 2) organizational standpoint- provide indicators related to organizations describing its size, scope and structure; 3) environmental viewpoint- composed of dimensions that signify elements in the surrounding of an organization (Zhu, Kraemer and Xu, 2003). This model was introduced by Tornatzky and Fleischer (1990) that examined the adoption of multiple information systems from three perspectives namely technology, organizational and environmental. In terms of IT, the use of the TOE framework is regarded as a dominant practice of analyzing users' intention of adoption towards innovation (Zhu *et al.*, 2004). Several researchers such as Zhu and Kraemer (2005) and Hossain and Quaddus (2011) have declared TOE framework as more persuasive than other models in the examination of intention to adopt technologies and thus provide users' holistic perspectives (Wen and Chen, 2010). Several researchers have adapted the TOE framework according to their indigenous requirements and thus widely used in studies on technology adoption at the organizational level (Legris, Ingham and Colletette, 2003). However, few researchers have stated that the TOE framework is very generic and should be used together with other models such as TAM, UTAUT (Riyadh Akter and Islam, 2009).

Proposed Framework and Hypotheses

The above discussion on adoption models and critical review of related studies on the adoption of technologies assisted in the construction of a conceptual framework (CFW) for this study. The CFW as indicated in Figure 1, consist of seven constructs namely

Perceived Ease of Use (PEU), Perceived Usefulness (PU), Social Influence (SI), Personal Innovativeness (PI), Organizational Readiness (OR), Cost (CT) as independent variables while Koha Adoption Intention (KAI) as the dependent variable. The incorporation of these constructs in the CFW is mainly according to its dominance, relevancy, reputation, significances and integration in models of adoption of information system in other fields of knowledge. According to Rafique, Shamim and Anwer, 2019), for the selection and integration of constructs in an entirely new CFW, it is mandatory to confirm its dominance, relative advantage and contextual pertinence. Ten research hypotheses were proposed that are discussed below under each independent variable.

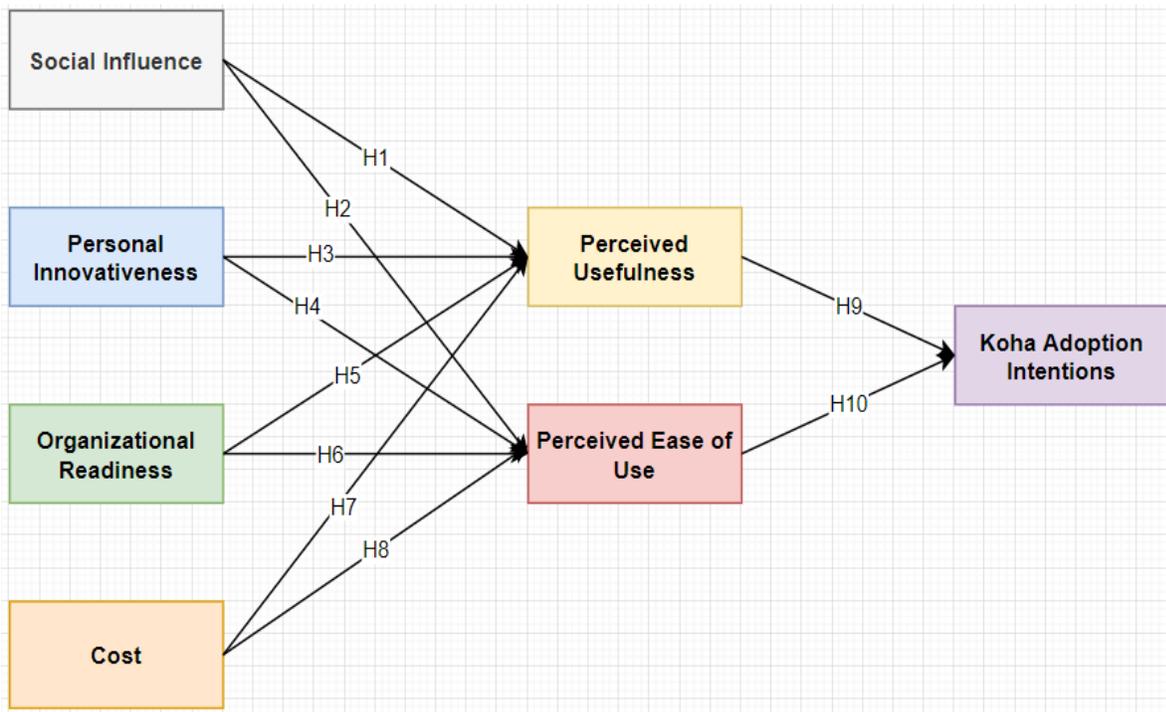


Figure 1: An integrated conceptual framework of the study

Social influence (SI) denotes efforts exerted on behaviours prompting people towards the adoption of innovations (Konana and Balasubramanian, 2005). It is an external pressure that predicts the adoption of innovations (Damanpour and Schneider, 2006). Since influences come from society or group of individuals, thus it may stimulate adoption without individuals' willingness and probably influence usefulness and easiness of an innovation. Based on this supposition researcher further theorizes that intention to adopt may be perceived from two broad perspectives namely individual and social. However, the influence of SI on the adoption of innovations should not be interpreted in the sense that it diminishes the usefulness and ease of use of innovations. Instead, it is inferred that SI optimistically shapes individuals' perception of usefulness and easiness of innovations that enhance performance (Shen *et al.*, 2006). According to Venkatesh *et al.* (2003), SI is individuals' perception of adoption of innovations manipulated by others including friends, family members, and parents, and thus adopters under the social influence either accept or reject innovations. To support the hypothetical association between SI, usefulness and ease of use in the intended study several researchers in the past such as Kim and Garrison (2009) have designated a significant and positive association between these three constructs. Their findings have established that SI is the strongest predictor of adoption and use of innovations. Likewise, Sathye *et al.* (2018) posited that SI has positive effects on PU and PEU and therefore influence the intention to adopt innovations. Besides, Bonn *et al.* (2016) and Zhang *et al.* (2020) adopted SI as a construct in their

models of study demonstrating its effects on PU and PEU in the context of the adoption of green energy. Their findings affirmed a positive and significant relationship between these constructs and validated SI as the strongest predictor of intention to adopt innovations (Damanpour and Schneider, 2006). In addition to the studies that establish a positive link between SI, PU and PEU and intention to adopt innovations, few researchers such as Paul and Fuloria (2011) have also validated that SI is the strongest predictor of resistance to adoption. Moreover, SI is also perceived as environmental persuasion to adoption and should be treated as external stimuli (Vannoy and Palvia, 2010). It is described as considering others' opinion and suggestion while making their own decisions (Lu, Yao and Yu, 2005). The study of SI is significant because of its impacts on individuals' behaviours towards the adoption of technologies (Ali *et al.*, 2019). According to Cheung, Lee and Chan (2015), SI has three dimensions; 1) *compliance*- willingness to adopt innovations as enforced by others if individuals perceived that prerequisite skills are lacking, 2) *identification*- individuals believe in facilitating association with social groups and innovations is adopted and, 3) *internalization*- innovation is matched with organizational objectives and perceive it as an opportunity. Knowing that Koha is a technological innovation and SI can push librarians towards its adoption, the following hypothetical relationships are assumed:

H₁: SI has a positive and significant relationship with PU of Koha

H₂: SI has a positive and significant relationship with PEU of Koha

Personal innovativeness (PI) enables adopters to envisage innovations optimistically (Khan and Ullah, 2014). It has positive effects on adoption (Rouibah and Abbas, 2010) and has been integrated into different adoption models (Amoroso and Lim, 2015). Lack of PI has predicted evasion of adoption because of latent risks of innovations and is envisioned distinctly (individual differences). Innovative individuals perceive easiness and effectiveness as fundamental for adoption (Khan and Qutab, 2016) and utilization of innovations (Lu, 2014). On the contrary, the absence of PI delays adoption and negatively affects learning making innovation difficult and less valuable (Parveen and Sulaiman, 2008). Several prior researchers such as Yi, Fielder and Park (2006), Erdogmus and Esen (2011), Fagan, Kilmon and Pandey (2012), Amoroso and Lim (2015), Ngafeeson and Sun (2015), Hong, Lin and Hsieh (2017), Al-Jundi, Shuhaiber and Augustine (2019) and Sheera, Singh and Kaur (2019) have incorporated PI in their study model and examined its influence on the PU and PEU in the context of users' intention towards use and adoption of innovations. If PI influences PU and PEU and prompt intention towards the adoption of Koha, then in the context of librarians this study assumed the below two hypothetical relationships:

H₃: PI has a positive and significant relationship with PU of Koha.

H₄: PI has a positive and significant relationship with PEU of Koha.

Organizational readiness is an interplay of organizational material, personnel and system resources including key performance indicators (Alfonsus, 2008). It refers to

organizational insight and appraisal of the extent to which organizations are ready in terms of responsiveness, funds, obligations and power to adopt innovations (Molla and Licker, 2005). To ensure optimal performance organizations should be ready to adopt contemporary technology innovations (Detwiller and Petillion, 2014). OR indicates that innovations are dynamic in nature and organization are ready for adaptability (Holt *et al.*, 2007). Organizational readiness highlights the worth of innovations (Ingersoll *et al.*, 2000) and potential risks (Lehman, Greener and Simpson, 2002). It improves the effectiveness of systems and workforce through technology adoption (Zheng *et al.*, 2009). According to Malik and Mahmood (2014), Pakistani organizations are ready to adopt technologies but still, adoption is slow and is unknown what factors impede or motivate the adoption of innovations among librarians. To understand individuals' intention toward the adoption of innovations, abundant researchers in the past have integrated organizational readiness in their operational models and validated its association with PU and PEU. For example, Walczuch, Lemmink and Streukens (2007), Kwahk and Lee (2008), Esen and Ozbag (2014), Gangwar, Date and Ramaswamy (2015), Pak, Li and Chung (2019) and Vaittinen and Martinsuo (2019) designated that organizational readiness has a significant link with PU and PEU and therefore motivate towards the adoption of innovations. Knowing that organizational readiness is the indicator of usefulness and easiness of innovations, two hypotheses are formulated in the context of Pakistani librarians:

H₅: OR has a positive and significant relationship with PU of Koha

H₆: OR has a positive and significant relationship with PEU of Koha

Cost is regarded as a significant construct in different models of adoption such as UTAUT and is an indicator of adoption of innovation. According to Hujran (2012), at the early and later adoption stages, adopters evaluate the cost of the innovations. Cost of innovation is an individual perception that brings balance between the price paid and benefits achieved or expected from innovations. Hence, the cost may be treated as a potential challenge if desired benefits were not attained from innovations (Venkatesh, James, and Xu, 2012). That is why adopters compare the cost of innovations with pre-determined benefits which lead to the possibility of both positive and negative consequences (Okumus and Bilgihan, 2014). According to Almuraqab (2017), the cost has a positive relationship with the adoption of technological innovations. However, Shin (2010) asserted that cost has negative effects on adoption and further elaborated that costly innovations are less adopted. Several researchers, for example, Phan and Daim (2011), Cho and Sagynov (2015), Ozbek *et al.* (2015) and Youn and Lee (2019) have integrated perceived cost of innovations as a construct in their research frameworks. Their models recognized that keeping in view the cost of innovations users always focus on its perceived value and ease of use (Youn and Lee, 2019). Thus, cost shapes users' intention towards adoption and directly impact PU and PEU. In other words, the perceived cost of technologies has a significant link with PU and PEU. Recognizing both positive and negative effects of cost on the adoption of innovations, it is assumed that perceived cost

may be a significant indicator of PU and PEU in the context of librarians towards the adoption of Koha. Hence, the following two hypotheses are formulated:

H₇: Cost has a positive and significant relationship with PU of Koha.

H₈: Cost has a positive and significant relationship with the ease of use of Koha

Perceived usefulness (PU) denotes individuals' insight into innovation's effectiveness and extent of the outcome (Park *et al.*, 2009). PU facilitates the adoption of innovation if useful (Khan and Qutab, 2016). PU impacts intention to adopt (Deb and Kar, 2003) and is an indicator of innovations usability (Hu *et al.*, 1999). Similarly, Ma, Gam and Banning (2017) and Yoon (2016) posited that PU is a stronger predictor than PEU in interpreting the intention of users towards the adoption of technologies. Similarly, Rafique, Shamim, and Anwar (2019) also asserted that PEU is a stronger interpreter of adoption of innovation as compared to PU. Believing that PU is the predictor of adoption, the following hypothetical relationship is assumed:

H₉: PU has a positive and significant relationship with the intention of Koha adoption

Perceived ease of use (PEU) means fewer efforts applied for the utilization of innovations (Miller and Khera, 2010). It promotes usability if innovation is envisioned to be easy (Jeong, 2011). PEU establishes the worth of innovations (Davis, 1993) and predicts adoption (Thong, Hong and Tam, 2002). It enhances the rate of adoptions (Cho, Cheng

and Lai, 2009). According to Khan and Qutab (2016), individuals perceiving innovations easy to use are willing to adopt. Likewise, Ma, Gam and Banning (2017) and Yoon (2016) theorized that PEU is stronger interpreter than PU in amplification of intention of adoption of technologies. Similarly, Rafique, Shamim, and Anwar (2019) also proclaimed that PEU is a stronger indicator of adoption intention as compared to PU. Establishing that PEU motivates and enhances adoption, the following hypothesis is framed:

H₁₀: PEU has a positive and significant relationship with the intention of Koha adoption

METHODOLOGY

Instrument development and data analysis techniques- adopting a quantitative approach and cross-sectional survey method this descriptive research was carried out from December 2019 to May 2020. Eight-section survey questionnaires were administered to a convenience sample of librarians in Pakistan. Survey method has several benefits such as maximum response rate, cost-effectiveness and easy to use (Kumar, Talib and Ramayah, 2013). It is suitable for the study of attitude, behaviour and opinion regarding any trends, practices and patterns (Creswell and Zhang, 2008). The inclusion criteria emphasized that the study participants must know Koha-OSILS. The 1st section of the survey instrument gathered data on demographic features. The other seven sections consisted of different items that measured the librarians' response about the study constructs on a five-point

Likert scale anchored as 1-strongly disagree and 5- strongly agree. As exhibited in Table 1, the study instrument was adapted from previously validated scales. To corroborate reliability and validity, a pilot-test was conducted on a convenience sample of forty-five librarians. The appraisal of these librarians examined the psychometric features and suggested multiple changes. Their feedback was incorporated in the final version of the survey instrument. For data analyses, SPSS (ver. 20) was used including both descriptive and inferential statistics. For testing of ten hypotheses, this study used correlation and both multiple and stepwise regression analyses.

Sampling techniques and data collection- this study used convenience sampling method. It is the approach of recruiting participants based on their availability, proximity. This sampling method is easy to execute, efficient and less expensive (Jager, Putnick and Bornstein, 2017). In this study, the main reasons for using a convenience sample are its simple data collection procedures, absence of population frame, managing the challenge of limited resources, and resistance to participating in the study due to Corona pandemic. Further, the data collection procedure was principally dependent on the web-based survey (Google forms), administered to a sample size of 210 librarians in Pakistan. Twenty-nine librarians showed willingness for participation if provided with a hard copy of the questionnaire. Accordingly, paper-based questionnaires were provided to them in physical visits. Sample inclusion and exclusion criteria recruited librarians having knowledge of and experience in the use of Koha. Links to the online survey were shared

through Facebook, Yahoo groups, WhatsApp groups, emails. Finally, 185 completed questionnaires were returned with a response rate of eighty-eight per cent. Response confidentiality was assured through the aggregate utilization of the results.

Development of constructs- as shown in Table 1 for dimensionality, validity and reliability the exploratory factor analysis (EFA) including principal axis factoring and Cronbach's alpha value were used. According to factor analysis, the KMO values were higher than 0.6 and BTS was found to be significant establishing appropriateness of sample size and use of factor analysis (FA) method. As per FA, the extracted factors explained seventy-two per cent of the variance. Similarly, scale reliabilities were above the recommended standard of 0.7 (Taber, 2018).

Table 1: Measurement sources criterion, reliability values and factor loadings

Item codes	Criteria	Measurement sources	Pre-composite reliability ($\alpha > 0.70$)	Post-composite reliability ($\alpha > 0.70$)	Factor loadings
PUq1	Perceived usefulness	Khan and Qutab (2016) Khan <i>et al.</i> (2017)	0.823	0.714	0.811
PUq2					0.827
PUq3					0.702
PUq4					0.734
PUq5					0.688
PUq6					0.761
PEq7	Perceived ease of use	Khan and Qutab (2016)	0.851	0.807	0.913
PEq8					0.633
PEq9					0.840
PEq10					0.735
PEq11					0.781
PEq12					0.744
Slq13	Social influence	Holt <i>et al.</i> (2010)	0.912	0.796	0.752
Slq14					0.832
Slq15					0.881
Slq16					0.744
Slq17					0.802
Slq18					0.779
Plq19	Personal innovativeness	Khan, Masrek and Mahmood (2019)	0.859	0.751	0.841
Plq20					0.692
Plq21					0.741
Plq22					0.792
Plq23					0.766
ORq24					Organizational readiness
ORq25	0.891				
ORq26	0.822				
ORq27	0.788				
ORq28	0.799				
CTq29	Cost	Kante, Oboko and Chepken (2019)	0.872	0.753	
CTq30					0.762
CTq31					0.796
CTq32					0.853
CTq33					0.677
IAq34					Intention to adopt Koha
IAq35	0.851				
IAq36	0.877				
IAq37	0.891				
IAq38	0.844				

Results

Demographic profile- as shown in Figure 2, out of 185 respondents, most of the participants were male (59%, n=109) as compared to female librarians (41%, n=76). Age-wise distribution indicated major participation within the age group of 25-35 years (57%, n=106) followed by 36-45 years (31%, n=57), less than 25 years (7%, n=13) and more than 45 years (5%, n=9). To determine how librarians know about Koha, majority of the participants established participation in Koha conferences as the dominant source (48%, n=89), followed by workshops (28%, n=51), peer librarians (15%, n=28) and Internet (9%, n=17). However, the results are alarming in terms of Pakistan Library Association (PLA) which has zero contribution in creating awareness about Koha. Likewise, "other sources" received zero responses which affirmed that only four sources (conference, workshop, peer librarians and Internet) were used for learning about Koha. Lastly, majority of the librarians are using Koha between 1-5 years (63%, n=117), followed by less than 1 year (31%, n=58) and more than 5 years (6%, n=10). It implies that Koha has been adopted by Pakistani librarians primarily in the last five years.

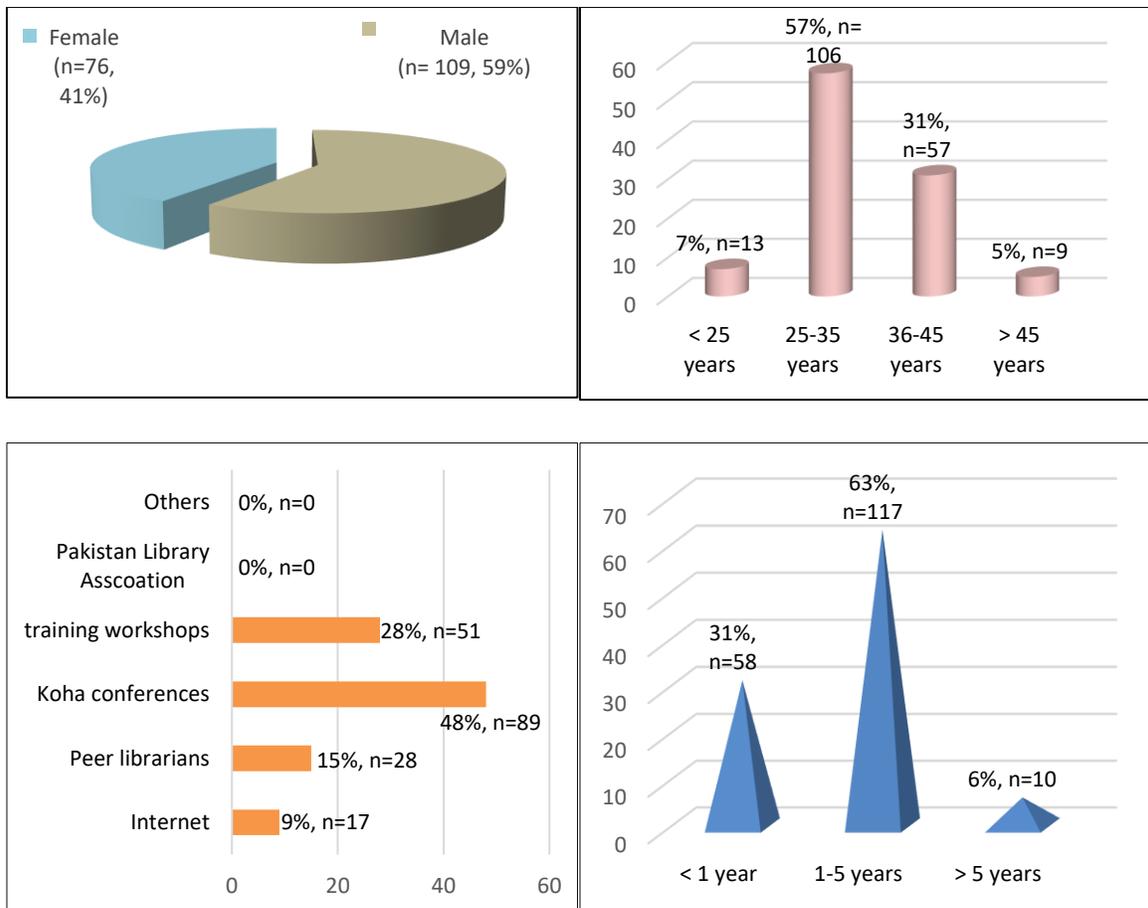


Figure 2: Demographic Profile

Correlation analysis- as shown in Table 2, the inter-correlation values ($r = 0.33$ to 0.48) indicated medium but significant correlation among the study constructs.

Table 2: Results of correlation analysis

Tags	Constructs	M	SD	1	2	3	4	5	6	7
1	KAI	4.1	0.71	1						
2	PU	3.8	0.84	.44**	1					
3	PEU	3.4	0.81	.43**	.38**	1				
4	SI	3.6	0.73	.37**	.41**	.35**	1			
5	PI	3.5	0.77	.36**	.38**	.37**	.47**	1		
6	OR	3.7	0.73	.48**	.44**	.42**	.39**	.36**	1	
7	CT	3.3	0.75	.39**	.37**	.38**	.35**	.41**	.37**	1

Correlation is significant at 0.01 level (2-tailed)

Hypotheses testing- to test the research hypotheses (H₁-H₁₀), multiple regression analysis was used. The findings as described in Table 3, affirmed that perceived usefulness (PU) and perceived ease of use (PEU) are the significant indicators of Koha adoption among librarians in Pakistan, explaining forty-six per cent (R²=0.455) of variance. Hence, hypotheses H₉ and H₁₀ are supported. In terms of direct influences, PU was found to be a stronger indicator ($\beta=0.544$) than PEU ($\beta=0.432$) of Koha adoption. Furthermore, the effects of all four extraneous constructs on PU and PEU were found to be significant and accordingly all eight hypotheses (H₁-H₈) are supported. Out of these two, PU explained variance of fifty-seven per cent (R²=0.572) while PEU explained variance of sixty-four per cent (R²=0.635) in the adoption of Koha. Explaining the direct impacts, results found that three indicators are the strongest predictors of PU i.e. social influence ($\beta=0.512$), personal innovativeness, ($\beta=0.503$) and organizational readiness ($\beta=0.452$) as compared to PEU where the beta values are social influence ($\beta=0.506$), personal innovativeness ($\beta=0.457$), organizational readiness ($\beta=0.411$). However, the effect of cost on PEU ($\beta=0.368$) was significantly stronger than PU ($\beta=0.312$).

Table 3: Results of multiple regression analysis

Constructs	R^2	Predictors	β	t	Sig.
Koha Adoption Intentions (PAI)	0.455	Social Influence-SI (H ₁)	0.512	8.231	0.000**
		Social Influence-SI (H ₂)	0.506	10.405	0.041*
Perceived Usefulness (PU)	0.572	Personal Innovativeness-PI (H ₃)	0.503	3.325	0.013*
		Personal Innovativeness-PI (H ₄)	0.457	6.137	0.000**
Perceived Ease of Use (PEU)	0.635	Organizational Readiness-OR (H ₅)	0.452	3.162	0.002**
		Organizational Readiness-OR (H ₆)	0.411	7.551	0.011*
		Cos-CT (H ₇)	0.312	3.154	0.017*
		Cost-CT (H ₈)	0.368	4.790	0.033*
		Perceived Usefulness-PU (H ₉)	0.544	7.865	0.000*
		Perceived Ease of Use-PEU (H ₁₀)	0.432	11.704	0.001**

* $p < 0.05$; ** $p < 0.01$

Further, stepwise multiple regression analysis was employed to determine the strongest indicator of Koha adoption among the Pakistani university librarians. The results are provided in Tables 4, 5 and 6. To this end, all the six predictors (SI, PI, OR, CT, PU and PEU) were recorded as independent constructs. As are shown in Tables 4, 5 and 6, the results indicated that out of six indicators PU ($R = .522$; $R^2 = .221$) and CT ($R = .578$; $R^2 = .251$) were found to be the strongest predictors of Koha adoption. Approximately twenty-eight per cent of variation was explained by PU and CT affirming them as the strongest predictors of Koha adoption among Pakistani librarians. It implies that PU and cost have positive influences on the adoption of Koha. Based on the results, the revised model of the study is provided in Figure 3.

Table 4: Model summary of Stepwise Multiple Regression between predictors and Koha adoption

Model	R	R Square	Adjusted Square	R Std. error of the Estimate
1	.522 ^a	.221	.219	.71274
2	.578 ^b	.251	.284	.67513

a. Predictors: (Constant), Perceived Usefulness- PU
b. Predictors: (Constant), Perceived Usefulness-PU, Cost- CT
c. Dependent construct: Koha Adoption Intentions- KAI

Table 5. ANOVA of Stepwise Multiple Regression between predictors and Koha adoption

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	43.467	1	43.469	88.235	.000a
	Residual	119.638	241	0.468		
	Total	163.105	242			
2	Regression	47.872	2	25.285	49.953	.000b
	Residual	115.233	240	0.493		
	Total	163.105	242			

a. Predictors: (Constant), Perceived Usefulness- PU
b. Predictors: (Constant), Perceived Usefulness- PU, Cost- CT
c. Dependent construct: Koha Adoption Intentions- KAI

Table 6: Coefficients^a of Stepwise Multiple Regression between Predictors and Koha adoption

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
	B	SE	Beta			Tolerance	VIF
1 (Constant)	1.513	.211		7.314	.011		
PU	0.621	.051	.508	8.821	.021	1.000	1.000
2 (Constant)	1.453	.311		6.145	.000		
PU	0.421	.086	.511	3.955	.003	.475	2.164
CT	0.242	.071	.310	2.655	.025	.463	2.164

a. Dependent construct: Koha Adoption Intentions

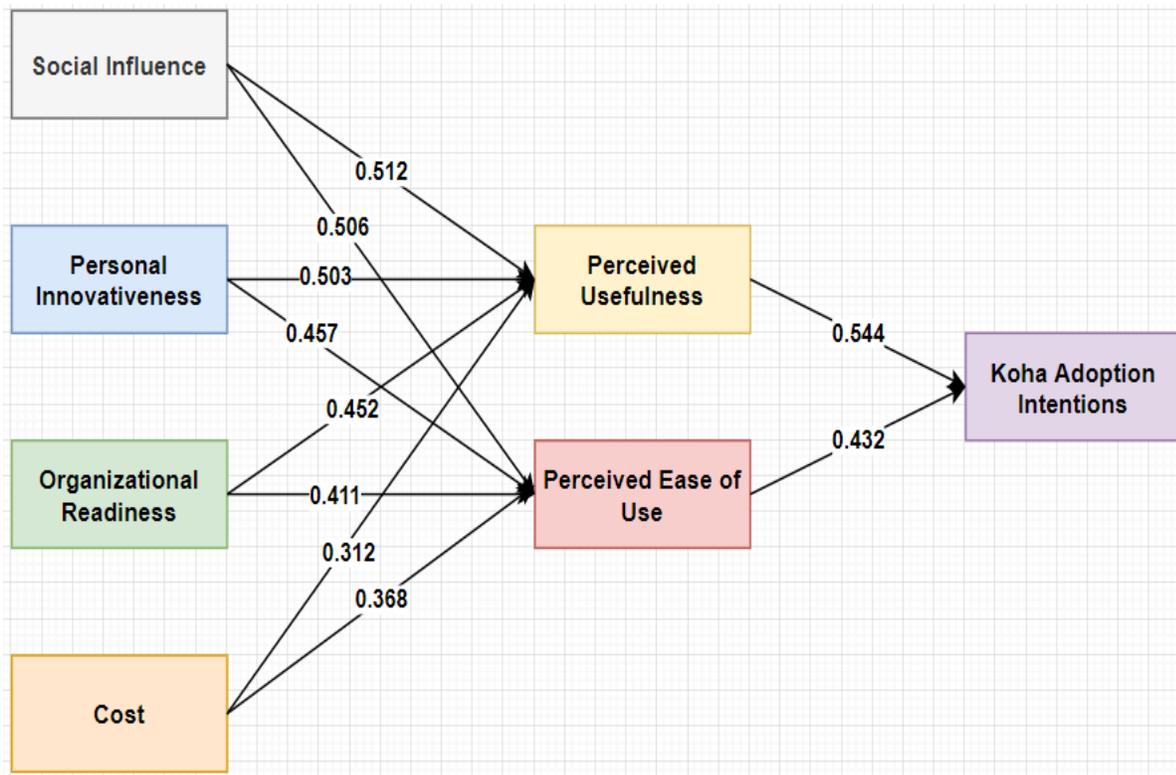


Figure 3: A revised conceptual framework of the study

Discussion

The result validated PU and PEU as the positive and significant indicators of adoption of Koha-OSILS among the Pakistani librarians. These findings supported several theories of adoption especially TAM and UTAUT where PU and PEU are the significant and positive predictors of intention to adopt innovations. These results supported several previous findings, for example, Miller and Khera (2010), Jeong (2011), Khan and Qutab (2016) in the past established that usefulness and ease of use are the positive and significant interpreters of the digital library. Their findings determined that PU and PEU are the significant constructs that stimulate a positive attitude of towards technology-based

services- perceiving innovations useful regardless of difficulties. Further, as indicated in the revised model provided in Figure 3, the influence of PU is higher than PEU. It infers that librarians observe the use of Koha-OSILS as a valued software and could adopt Koha because of its usefulness and ignore usability complexity. It is deduced that during the adoption librarians perhaps prefer usefulness over easiness of Koha. These results are parallel with the findings of Ma, Gam and Banning (2017), and Yoon (2016) who stated that PU is stronger than PEU in predicting users' intention to adopt and use technologies. However, the results have rejected the findings of Rafique, Shamim, and Anwar (2019), who established that PEU is the strongest predictor of intention to adopt innovations as compared to PU. The findings may suggest that for successful adoption, it is essential to adequately elucidate the benefits of Koha to Pakistani librarians. According to Hong *et al.* (2002), PEU alone is not enough for adoption, so other factors such as usefulness can attract users toward adoption. Thus, the present results are significant to affirm that Pakistani librarians have a higher preference for usefulness. In other words, even if Koha is perceived difficult to use, but highlighting its usefulness to Pakistani librarians may augment its adoption. Instead of focusing on risks, the related authorities and promoters in Pakistan are urged to emphasize the benefits of Koha to enhance librarians' intention towards the adoption of Koha. As PU was also established the strongest predictor of adoption of innovations, thus it possibly augments the adoption of Koha among librarians even in the presence of other factors that demotivate its espousal. Further, this study also

explained the effects of the four external constructs (SI, PI, OR and CT) on PU and PEU. The results showed a positive and significant relationship of these four constructs with PU and PEU respectively. Thus, the whole CFW is validated in the context of acceptance of Koha among librarians in Pakistan, and thus extended the scope of adoption theories towards librarianship. The significant results of this study including all four external constructs, supported the findings of Talukder *et al.* (2019) who established that these constructs have positive and significant influences on PU and PEU and further impact the adoption of technological innovations.

In case of the impacts of social influences (SI) on PU and PEU of this result were found significant. These results supported several research findings in the past such as Kim and Garrison (2009), Sathye *et al.* (2018), Bonn *et al.* (2016), and Zhand *et al.* (2020) who validated positive and significant effects of SI on PU and PEU and further elaborated that relationship among these constructs prompt to the adoption of innovative ideas. The significant results perhaps indicate that Pakistani librarians are socially motivated towards the adoption of Koha. The SI including social including the activities such as professional networking, training sessions, seminars and workshop probably highlight the usefulness and PEU of the Koha and motivate them towards its adoption (Venkatesh *et al.*, 2003). This may be one of the reasons that mostly Pakistani librarians are working in isolation in terms of library automation due to the poor role PLA towards automation, absence of a stable platform for professional collaboration, and deprived quality of the LIS course

contents which are highly criticised due to mismatch with employer job demands (Malik and Mahmood, 2014). It is inferred that despite all these issues, Pakistani librarians may still optimistic about the SI and as a result perceive PU and PEU of Koha as an opportunity that may augment intention towards adoption. Besides, it is elaborated that Pakistan is a collectivistic cultural society where preference is given to the group interests and thus extending this assertion to the context of the adoption of innovations among Pakistan librarians it is presumed that adoption of Koha either low or high is based on the collective benefits. In contrast, librarians' interests always prefer the usefulness of innovation irrespective of its challenges in favour of the parent institutions and library users. Although adoption of innovations is very slow among the librarians in Pakistan based on results it is suggested that intention to adopt Koha may be improved if it's PU and PEU are promoted through social influence. Several researchers such as (Lu, Yao and Yu (2005) and Ali *et al.* (2019) have reported that there is need to reveal the adopters about the PU and PEU as characteristics of individual differences and predictors of adoptions that should be interpreted through SI. Hence, comparing the present results with past it is suggested that for successful adoption of Koha, SI should be exerted in the form of professional networks such as PLA that currently lack collectivism aspects and generated trivial factions of librarians at regional level which are less significant towards the adoption of innovations including Koha. It may be equally observed from comparative evaluation of results with demographics where PLA has never been used as a platform for the

adoption of innovation because of lacking the aspect of collectivism. Thus, a significant contribution of this study includes that for effective Koha adoption, the PU and PEU of innovation (Koha) should be stated in the form of SI. Several researchers in the past have supported that emphasizing the benefits and easiness of innovation through the influence of social networks (SI) perhaps enhances adoption (Sathye *et al.*, 2018). The discussions in social networks on benefits and easiness facilitate the adoption of innovations. In contrast, the prevalence of negative perceptions about Koha may adversely affect SI and may lead to rejection or poor adoption (Lu, Yao, and Yu, 2005).

The results also explored PI as a significant predictor of PU and PEU and thus supported the results of Khan *et al.* (2017) and Khan, Masrek and Mahmood (2019) which affirmed a similar link of PI with PU and PEU in the context of digital libraries. The findings imply that innovative librarians can recognize PU and PEU of innovations and may successfully adopt them. Although PI indicates willingness towards trying an innovative idea, thus it is essential to evaluate the desired level of skills for the adoption of innovations (Rouibah and Abbas, 2010). Several researchers such as Khan, Masrek and Mahmood (2019) posited that the absence of adequate skills may adversely affect the PEU of innovations and therefore desired benefits (PU) may vanish. It is deduced that innovativeness ensures maximum benefits and successful adoption (Amoroso and Lim, 2015). In this regard, it is suggested that Pakistani librarians should focus on PI that

possibly supports the building of positive perceptions about usefulness of and risks in adoption of Koha (PEU).

Similarly, results determined that organizational readiness is a positive and significant predictor of Koha adoption. These results supported the findings of Yusof and Aziz (2015) who stated that organizational readiness has positive effects on adoption if organizations perceive innovations to be valuable and easy to use. The results imply that without organizational readiness, there is a possibility of failure of the adoption of Koha in Pakistan. It is also assumed that organizations should understand the usefulness and difficulties attached to the adoption of Koha. Since organizations have multiple responsibilities, thus before adoption it is necessary to determine whether they are familiar with the usefulness and challenges of innovations (Molla and Licker, 2005). In addition, organizational readiness may also enhance librarians' occupational commitment (Singh and Kaur, 2019).

Finally, results also validated cost as a positive indicator of PU and PEU and thus has a significant link to the adoption of innovations. Hence, despite the perceived difficulties, Koha is still cost-effective and may motivate librarians towards adoption. The findings supported the study of Habib, Alsmadi and Prybutok (2020), positing that cost has a positive relationship with PU and PEU and influenced adoption. Since Koha is free, this might be significant for its adoption in Pakistan. However, it is suggested that cost like other factors may be critical success factors in the adoption if adopters are adequately

educated about the benefits (PU) and challenges (PEU) related to Koha. Since the results also established cost as the strongest predictor of adoption of Koha, it is inferred that cost could attract librarians towards adoption and should be emphasized.

Implications and limitations

Theoretical implications- this study augmented the current literature on technology innovations explicitly in the context of Koha. This study explored factors influencing librarians' behaviour and established their positive and significant effects on adoption. While all factors were validated as contributory, two constructs namely perceived usefulness and cost were explored to be extraordinary. These validated factors may augment the adoption of Koha-OSILS. This study extended the scope of the models of adoption especially TAM and UTAUT to librarianship.

Practical implications- for this study different models and studies were reviewed. The critical review augmented the process of selection, identification and integration of the influencing factors of adoption of innovations that further assisted in the construction of a CFW. The reviewed studies facilitated the identification of multiple factors for incorporation in the CFW that extended the scope of study in terms of; a) integration of factors from the previously validated adoption models into a new framework, b) CFW can be used for the appraisal of other technological innovations and, c) extended the scope of adoption models to Koha-OSILS. Likewise, results on cost and perceived usefulness

may suggest that if authorities should emphasize this might stimulate more rapid adoption of Koha-OSILS. Equally, related authorities should consider these validated factors while formulating policies for adoption. Lastly, this study combined TAM and UTAUT to formulate a new CFW where the impacts of PI, CT, SI and OR were examined in the context of librarians and found significant.

Limitations-. Although results were positive and significant, the adoption of the innovations process has yet to be clearly explained to Pakistani librarians. The notion of adoption of Koha-OSILS is still vague among the Pakistani librarians. During this research, it was observed that Pakistani librarians perceive adoption of innovations merely a process of library automation and was not explored in this study. Further, this study could not examine the overall or specific features of Koha that distinguish it from other OSILS. Since this study was undertaken on a formulated CFW, thus several factors were excluded that could have impacted the findings significantly. Because of corona pandemic, this study could not utilize random sampling techniques and thus findings may be biased in terms of sample size, type and generalization. Likewise, this was limited to those librarians which had knowledge of and skills in the use of Koha. Thus, the results may not be generalized to all kind of libraries. Also, Pakistan is a developing country where the adoption of technologies in libraries is very slow. Thus, the generalization of findings to other developing countries may not be viable. Lastly, this study was limited to the exploration of determinants of adoption of Koha to motivate its successful adoption and couldn't

assess users' satisfaction with the quality of Koha. Further, research is required to understand the challenges and quality issue of Koha before and after its adoption. Also, it is significant to understand the level of satisfaction of librarians in all developing countries with the quality of Koha.

Conclusion

The rapid growth of technological innovations has significantly impacted the management of libraries, the structure of information services and users' utilization of knowledge resources. Throughout the world, librarians have responded to the adoption of these technological innovations within the limits of existing resources. One of the responses is library automation for which commercial, as well as OSS, are being used. The current situation of the adoption of library automation software is not uniform. As a response, this study was undertaken in the context of Koha-OSILS to recognize the factors that influenced the adoption intention of librarians in Pakistan. The results of this study affirmed that system characteristics of innovations should not be the solitary indicator of adoption of innovation. The adoption of Koha should also be examined from individual perspective including SI, PI, OR, CT, PU and PEU. This study found positive effects of these constructs on Koha adoption. This study also determined that PU and CT are the strongest predictors of the adoption of Koha. To this end, for effective adoption of Koha, the promoters should highlight its benefits and cost-effectiveness to the librarians. Since this study presented a noteworthy insight of Koha-OSILS in terms of Pakistani librarians to

facilitate intelligent decision making for adoption, thus further research is suggested to examine the Koha adoption process and other constructs that were not incorporated in the CFW of this study. The future researcher may also validate the CFW and results of this study in other contexts. Lastly, the results always suffer from the challenge of generalization, thus these results may not be fully generalized in other contexts. Some mediating or moderating variables that may be incorporated into the existing model with these constructs to validate the model of this study.

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