



Intention to Adopt Mobile Applications Services: A Study Among Pakistani Academic Librarians

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Not much is really known to what extent academic librarians in Pakistan are interested in adopting and embracing mobile application for enhancing their services and work performance. In addition, little is also known about the factors that may shape or influence their behaviour with regards to mobile application services. Against this background, a study was undertaken with the aim of examining the behavioural intention of adopting mobile application services in the context of academic librarians in Pakistan. A research model was developed based on the Unified Theory of Acceptance and Use of Technology (UTAUT) model. Five constructs, namely performance expectancy, effort expectancy, perceived credibility, facilitating conditions and social influence were hypothesised to have significant relationship with intention to adopt mobile applications. Using a survey research methodology, data was collected from 212 academic librarians in Pakistan. The results revealed that performance expectancy, effort expectancy and facilitating conditions were significant in determining behavioural intention. The findings have contributed significantly to the body of knowledge from several perspectives, namely theoretical, managerial and practical.

Keywords: *Mobile Application Services, Predictors, Adoption, Academic Librarians*



Introduction

Academic librarians play imperative and diverse roles in the life of the university. According to Dold (2013), academic librarians address all levels of information needs for the university: “its acquisition, its production, its storage, and instruction for its safe and gainful use”. In other words, academic librarians “see themselves as service providers, as partners with the teaching faculty, and as builders of strong systems and collections” (Alsop & Bordonaro, 2007). To shoulder these huge responsibilities, academic librarians need to equip themselves with the tools and technology that will further enhance their work performance and service delivery. In the time and age where mobile applications or apps have become the norm for all individuals of all ranks and professions, librarians with no exceptions are also dragged into adopting or embracing mobile apps that are suitable and appropriate with the nature of their work.

Mobile applications or apps consist of software or a set of programs that runs on a mobile device and perform certain tasks for the user. The main advantage of an app is that it allows users to access specific resources or services without having to open a web browser first. Today, there exist many free and commercial apps that are targeted for different audiences, including librarians and information professionals. Studies have shown that the utilisation of apps to support work tasks help improve work productivity. However, not much is really known to what extent academic librarians in Pakistan are interested in adopting and embracing mobile application for enhancing their services and work performance. In addition, little is also known about the factors that may shape or influence their behaviour with regards to mobile application services. Against this background, a study was undertaken with the aim of examining the behavioural intention of adopting mobile application services in the context of academic librarians in Pakistan.

Literature Review

Today, many businesses and organisations, including libraries have developed their own apps. For libraries, these apps can fall into one of two categories, (i) traditional library services amended to be available with mobile devices and (ii) services created specifically for mobile devices (Liu & Briggs, 2015). Common library services that have been updated to be mobile-friendly include a mobile website (either as a mobile version of the library’s regular site, an app, or both), mobile-friendly interfaces for the library’s catalogue and databases, access to books in electronic format, and information literacy instruction which makes use of mobile devices (Liu & Briggs, 2015). Chang (2013) stated that “library apps can provide users access to the library catalogue, databases, and library guides from the palm of their hand”. In addition, “users can also look up library locations, borrower information, library news, and ways to contact librarians” (Chang, 2013).

There are also many free and commercial apps that are targeted at librarians or information professionals for the purposes of supporting their work tasks. According to Mishra et al. (2017), before adopting apps, librarian or information professionals need to fully understand the primary types of mobile apps and their distinct features and functionalities. Knowing the strengths and weaknesses of apps can help decide which apps will fully meet their needs. Hennig (2014) presented a guide for librarians in choosing the appropriate apps for them to improve their services and performance. MastersinLibraryScience.net (2020) listed 45 useful aids that can aid librarians for different purposes (Table 1)

Table 1: Mobile Apps for Librarians

Purpose	Apps Name
Better reading	Kindle, Nook, Kobo, Free Books, iBooks, Good Reader, Bookviser, Audiobooks, Readu, Freda+
Boosting Productivity	Box, Outliner, Pages, World Book – This Day in History, iNapkin, Things 2, LanSchool Teachers Assistant for iOS, History – Maps of the World, Dropbox, Docs Anywhere, Keynote, eClicker Presenter, Moodboard, Offline Pages Pro, Dictionary, Wikipanion, Osfoora 2, Quickoffice, Wolfram Alpha, ReferenceUSA, ArticleSearch, Farlex, Mango Mobile, TurboScan, Cam Dictionary, Google Goggles, Adobe Reader, iAnnotate PDF, Offline Pages
Staying Up to date on The News	The Guardian Eyewitness, CNN, NewsRack, USA Today

Theoretical Framework

Figure 1 depicts the theoretical framework used in the study. The framework was adapted from the Unified Theory of Acceptance and Use of Technology (UTAUT) formulated by Venkatesh et al. (2003). Performance expectancy, effort expectancy, facilitating condition, social influence and intention to adopt are the original constructs of UTAUT while perceived credibility is the additional construct taken from previous studies (Amin et al., 2007; Yu, 2012).

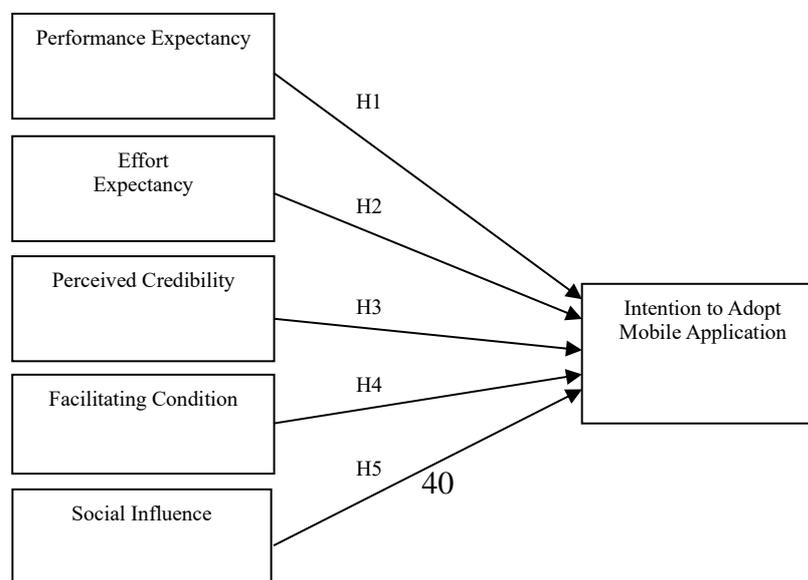


Fig. 1 Theoretical Framework

Intention to Mobile Applications Services

Intention to use refers to a measure of the strength of individual's intention to perform a specific behaviour or use the apps. Venkatesh et al. (2003) consider that the intention to use is the main indicator of the effective use of an information system and the usage intention of mobile apps is also a form of information system adoption. There are many factors that can be associated with behavioural intention and these factors can be grouped into (i) individual characteristics such as IT experience, IT efficacy, (ii) innovation characteristics such as performance expectancy, effort expectancy and perceived credibility, (iii) external characteristics such as facilitating conditions and social influence. In the context of the present study, the focus will be on the innovation characteristics (i.e. the mobile apps) and the external characteristics.

Performance Expectancy

Performance expectancy relates to “the degree to which an individual believes that using the system will help him or her to improve job performance” (Ventakatesh et al., 2003). Mpoeleng, Totolo & Jibril (2015) examined performance expectancy of the librarians regarding the potential of Web 2.0 tools and the results showed that the majority agreed that Web 2.0 tools could improve job performance. Mohideen et al (2019) studied the adoption of open source library information systems among librarian in Malaysia and found that performance expectancy was a significant predictor. Chang's (2013) study also showed that performance expectancy determined users' behavioural intention of using library mobile applications. Based on the aforementioned studies, the researcher also argued that performance expectancy is one of the crucial factors in determining the intention of the librarian in adopting the mobile services. Against this background, the following hypothesis is established:

H1: Performance expectancy significantly affects intention to adopt mobile applications services

Effort Expectancy

Effort expectancy is mainly associated with “the ease of use of the technology, and users also expect that using this system will be free of additional effort” (Venkatesh et al., 2003). Ease of use has been well established as one of the critical dimensions of end user computing (Doll & Torkzadeh, 1988). Mobile application services that are difficult to use and require a great deal of time will surely prevent users from embracing them. In a study on the acceptance of Radio-Frequency Identification (RFID) by the librarians, effort expectancy has been found to be a significant predictor (Mohideen et al. 2018). Hendrawati (2013) surveyed the Indonesian librarians with regard to the acceptance of integrated library systems. The study confirmed that



effort expectancy was a significant predictor of the librarian acceptance. Adu, Appiah & Yamson (2016) conducted an empirical study through surveying academic librarians in Ghana with a focus on the University of Ghana Library System. The statistical results showed that effort expectancy was significant in predicting library professionals' reactions toward the acceptance of technology change. Drawing upon the aforementioned findings, the present study also expects that effort expectancy will be a significant predictor of the intention to adopt mobile application services. Hence, the following hypothesis is put forward:

H2: Effort expectancy significantly affects intention to adopt mobile application services

Perceived Credibility

Perceived credibility (PC) is the extent to which a user believes that the use of mobile application services will have no security or privacy threats. Michael (2019) stressed that mobile apps posed a greater danger than Facebook when it comes to privacy and security. Most of the free mobile apps would normally share sensitive information such as users' location, mobile phone data, and phone status. Many studies especially in the context of mobile banking apps have found that perceived credibility is a significant predictor of technology acceptance (Amin et al., 2007; Yu, 2012). In fact, the study by Luarn & Lin (2005) revealed that perceived credibility has more impact on the consumers' intention to use mobile banking than perceived usefulness and perceived ease-of-use. Given that mobile apps for the library services to some extent share similar characteristics and features with that of mobile banking apps, the same concern and worries also apply to librarians when it comes to adopting mobile application services.

H3 – Perceived credibility significantly affects individual intention to adopt mobile application services

Facilitating Condition

Facilitating conditions are defined as the degree to which the librarians believe that an organisational and technical infrastructure exists to support the use of mobile application services. Many studies involving librarians have shown that the lack of organisational and technical infrastructure will result in low adoption rate (Saravani & Haddow, 2011; Lwonga & Questier, 2015 and Umar, 2017). Saravani & Haddow (2011) used the qualitative approach based on the constructs of Unified Theory of Acceptance and Use of Technology (UTAUT) to examine librarian preparedness in relation to delivering services through mobile technologies. The findings suggest that the responses by both the library managers' and systems librarians' met the criteria of the UTAUT constructs which include facilitating conditions. Lwoga & Questier (2015) found that the low adoption of the open access by both faculty members and librarians was due to low support and the lack of ICT infrastructure. Umar (2017) explored the



factor that influenced the use of open access resources for research productivity by academic librarians in federal universities in the North-western states of Nigeria. The study found that almost all facilitating factors were considered by about three quarters of all the respondents as important or very important determinant factors for using open access resources. Driven by the findings of the aforementioned studies, this study hypothesises:

H4 – Facilitating condition significantly affects individual intention to adopt mobile applications services

Social Influence

Social influence has always been an important factor when it comes to technology adoption studies. Cialdini (1993) stated that one of the outcomes of social influence is the development of social norms i.e. the ways of thinking, feeling, or behaving that are shared by group members and perceived by them as appropriate”. Venkatesh et al., (2003) defined social influence as “the degree to which an individual perceives that important others believe he or she should use the new system”. Many previous studies focusing on librarians had showed that social influence played an important role in shaping the intention of librarians in adopting technology. For instance, Dowdy (2020) surveyed 202 public librarians two South-eastern states in the USA and found that that social influence along with other constructs from UTAUT were significant in determining intention to adopt new technology. In an earlier study, Joo, Choi & Harper (2019) also found that social influence together with perceived usefulness, perceived ease of use, attitude, and behavioural control were significant in determining librarian’s intention to adopt social media for library marketing. Using the grounded theory approach, Galoozis (2019) studied factors that influence librarian’s decision to adopt new teaching practices. The results showed that hearing success stories from other librarians, formally or informally was one of the critical factors that shaped their decision. Drawing upon the aforementioned studies, this study hypothesises:

H5 – Social influence significantly affects intention to adopt mobile application services

Research Methodology

This research falls under the positivism paradigm and used a quantitative research approach. Following the guidelines by Noordin & Masrek (2016), the survey research method was chosen for this study. A questionnaire was used for collecting the research data. Scales used from previous studies (Masrek & Gaskin, 2016; Masrek & Samadi, 2017) were referred to and adapted in the development of the questionnaires. Each of the constructs used several items. For each item, a Likert scale of five anchoring was used. The respondents were required to indicate the extent which they agree or disagree with the items by ticking the Likert scale

labelled as 1 = “strongly disagree”, 2 = “disagree”, 3 = “undecided”, 4 = “agree” and 5 = “strongly agree”. The adaptation of the scale was done through pre-test involving several experts and prospective respondents. Based on their feedback and suggestions, revisions were made to the scales or questionnaire. The unit of analysis was individual, and the population of the study was librarians working in selected libraries in Pakistan. A convenient sampling technique was used in the study. This is in line with Hulland et al., (2017) who pointed out that a non-probability sampling is deemed more fitting when the purpose of the study is to test the proposed theoretical assumptions. The questionnaires were sent to the targeted respondents through emails. Statistical software, SPSS Version 22.0 and SmartPLS Version 3.0 were used to analyse the data.

This study used Partial Least Square Structural Equation Modeling (PLS-SEM) for analysing the connection between constructs and for testing the research hypothesis. The reason for choosing this approach was because of the exploratory nature the study. The use of PLS-SEM analysis involves two steps, the assessment of the measurement model followed by the assessment of the structural model. Measurement model in SEM is of two types, namely reflective model and formative model. In this study, a reflective measurement model was adopted for all constructs. The measurement model was assessed in terms of the convergent validity and discriminant validity. Convergent validity refers to “the level items explicitly represent the intended latent construct as well as correlate with other measures of the same construct” (Hair et al., 2017) while discriminant validity refers to the extent to which constructs factors are distinct and uncorrelated. The convergent validity is assessed in terms of composite reliability (CR) and average variance extracted (AVE). Both Cronbach’s Alpha and composite reliability (CR) measures the internal consistency of a scale (i.e. the questionnaire) while the average variance extracted (AVE) measures the total amount of variance in the items or indicators accounted for by the latent constructs.

The Fornell & Larker (1981) criteria of assessment was used to evaluate the discriminant validity of the model. According to the criterion, discriminant validity can be assumed when the square root of the AVE of the construct is larger the correlation value between other constructs. The assessment of the structural model is done by (i) evaluating the lateral collinearity using the VIF (ii) assessing the significance and relevance of the structural model relationship (iii) assessment of level of R^2 (coefficient of determination) (iv) assessment of the level of effect size (f^2) and (v) assessment of the predictive relevance (Q^2) respectively. Both R^2 and Q^2 assess the predictor power of the model. R^2 is the measure of the model’s predictive accuracy and can be viewed as the combined effect of exogenous variables on endogenous variables while Q^2 can be considered a type of model fit indicator.

Findings

Assessment of Common Method Bias

The use of single source of data i.e. one respondent answering all questions in the survey, could expose the possibility of common method bias in the research data. Hence, to ascertain whether such problems exist, the Harman's single factor test was executed. All items were constrained to one factor and the results indicated that the total variance explained was 19.3%, less than the recommended value of not more than 50.0%. The results suggest that the questionnaire used in this study was free from the problem of common method bias.

Profiles of Respondents

Table 2 depicts the profiles of the respondents. Out of 216 respondents who participated in the study, the majority were male (61.1%). In terms of highest academic qualifications, the majority indicated that they hold MLISC (657.9%). Age wise, 96 or 44.4% of respondents indicated that they were above 27 years old.

Table 2: Profiles of Respondents

		Frequency	Percent
Gender	Female	84	38.9
	Male	132	61.1
Highest Academic Qualification	MLISC	125	57.9
	MS/M.Phil	74	34.3
	Ph. D	17	7.9
Age	22-24 Years	55	25.5
	25-27 Years	65	30.1
	Above 27 Years	96	44.4

Measurement Model

The results of the analysis measurement model assessment or Confirmatory Factor Analysis (CFA) are illustrated in Figure 2 and Table 3. The factor loadings for each item measuring the constructs are well above 0.6 while the Composite Reliability (CR) and the Average Variance Extracted (AVE) for each construct surpassed the recommended values of 0.7 and 0.5 respectively (Hair *et al.*, 2017).

Table 3: Results of convergent validity assessment

Construct	Item Code	Factor Loading	Composite Reliability (CR)	Average Variance Extracted (AVE)
Effort expectancy	EE1	0.772	0.87	0.626
	EE2	0.826	:	:
	EE3	0.781	:	:
	EE4	0.784	:	:
Facilitating Condition	FC1	0.870	0.839	0.637
	FC2	0.830	:	:
	FC3	0.683	:	:
Intention	IN1	0.896	0.774	0.857
	IN2	0.885	:	:
	IN3	0.858	:	:
Perceived Credibility	PC1	0.879	0.925	0.754
	PC2	0.901	:	:
	PC3	0.858	:	:
	PC4	0.833	:	:
Performance Expectancy	PE1	0.820	0.872	0.634
	PE2	0.849	:	:
	PE3	0.874	:	:
	PE4	0.615	:	:
Social Influence	SI1	0.816	0.890	0.670
	SI2	0.846	:	:
	SI3	0.807	:	:
	SI4	0.806	:	:

Discriminant validity assumes that items should correlate higher among them than they correlate with other items from other constructs that are theoretically supposed not to correlate. The discriminant validity can be assessed by comparing the square root of each construct AVE to its correlation with other variables (Fornell & Larker, 1981). This approach requires that the value of the square root of each construct AVE should be higher than the correlation values

among constructs. If this requirement is fulfilled, discriminant validity can be assumed. Table 4 displays the results and apparently, discriminant validity of the instrument can be assumed.

Table 4: Results of discriminant validity assessment

	Effort Expectancy	Facilitating Condition	Intention	Perceived Credibility	Performance Expectancy	Social Influence
Effort Expectancy	0.791	:	:	:	:	:
Facilitating Condition	0.654	0.798	:	:	:	:
Intention	0.664	0.685	0.88	:	:	:
Perceived Credibility	0.411	0.506	0.399	0.868	:	:
Performance Expectancy	0.637	0.637	0.652	0.556	0.796	:
Social Influence	0.497	0.561	0.518	0.636	0.597	0.819

Structural Model

Before assessing the structural model, the Variance Inflation Factor (VIF) was assessed to detect whether the issue of multicollinearity exists in the model. The results as shown in Table 5 suggest that multicollinearity could not be detected as all and the VIF values are less than the threshold value of 3.00. For assessing the structural model, a bootstrapping procedure was used and the results are shown in Table 5. The guideline used in interpreting the results are: accept the hypothesis when $p < 0.01$ ($t > 1.645$) or $p < 0.05$ ($t > 1.96$) or $p < 0.001$ ($t > 2.58$). The results clearly showed that H1, H2, H4 and H7 are accepted while H3 is not accepted. For a substantial model, Cohen (1988) suggests that R^2 should be about 0.35 or greater. In this study the R^2 is 0.591, indicating that the estimated model is substantial.

Table 5: VIF Assessment

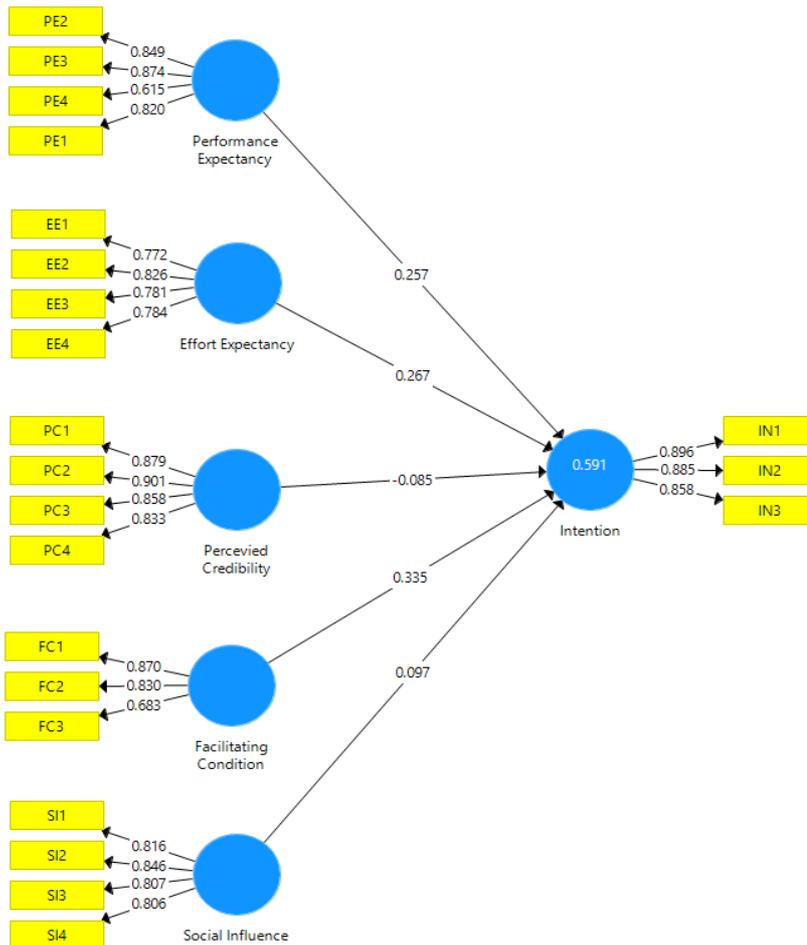
	Intention
Effort Expectancy	2.053
Facilitating Condition	2.200
Perceived Credibility	1.859
Performance Expectancy	2.303
Social Influence	2.073

In analysing the predictive relevance, the blindfolding procedure was executed using omission distance $D = 7$ as suggested by Hair et al. (2017). According to Hair et al. (2017), the calculation of Q^2 value is based on the cross-validated redundancy approach that fits the PLS-SEM analysis perfectly. The results showed that the Q^2 value is 0.416, which is greater than zero, suggesting that the model in this study has predictive relevance for all its endogenous constructs.

Effect size refers to whether the latent independent variable has a considerable effect on the dependent variable. Using the formula $f^2 = R^2 / (1 - R^2)$ by Cohen (1988), the effect size is computed. Based on the value of f^2 , 0.35 or above is considered a large effect, between 0.15 and 0.349 is considered a moderate effect while 0.03 or less is considered a small effect (Cohen, 1988). As exhibited in Table 6, the results showed that the effect is either small or moderate, hence, effect size is negligible.

Table 6: Results of Path Analysis

	Standard Beta β	Standard Error	t-value	f^2	Decision
H1: Effort Expectancy \rightarrow Intention	0.267	0.073	3.671***	0.085	Accept
H2: Facilitating Condition \rightarrow Intention	0.335	0.087	3.854***	0.125	Accept
H3: Perceived Credibility \rightarrow Intention	-0.085	0.065	1.318	0.010	Reject
H4: Performance Expectancy \rightarrow Intention	0.257	0.084	3.051***	0.070	Accept
H5: Social Influence \rightarrow Intention	0.097	0.068	1.429	0.011	Reject



Discussion

The proponents of UTAUT had pointed out that the model should be adjusted to meet the nature and type of technology being queried (Venkatesh et al., 2003). To this effect, in this study, perceived credibility had been integrated with other UTAUT constructs. Consistent with previous studies (Chang, 2003; Saravani & Haddow, 2011; Hendrawati, 2013; Mpoeleng, Totolo & Jibril, 2015; Lwonga & Questier, 2015; Adu, Appiah & Yamson, 2016; Umar, 2017; Mohideen et al., 2019) the findings showed that performance expectancy, effort expectancy and facilitations were found to be a significant predictor of behavioural intentions. From the practical perspective, the findings send a strong message to apps developers on the importance of providing access. The strategy of providing a trial period or basic features used by a commercial apps developer is really commendable. However, for a developing country like Pakistan, the price for purchasing these commercial apps is really a burden for them. Therefore, apps developers should consider providing special discounts for users coming from countries like Pakistan. A trial period of one month may also not be sufficient to provide in depth



exposure and experience on the use of the apps. Extending the trial period would probably increase the chance and likelihood for these librarians to subscribe and continue using the apps.

From the managerial perspective, the findings should alert the authorities on the steps and measures that need to be undertaken. Support in terms of funding, training and internet access are examples of facilitating conditions that will also translate into an increased performance expectancy and effort expectancy. An appropriate budget should be allocated for funding the purchase of commercial apps required by the librarians. Continuous training on the use of different apps will also provide an opportunity for the librarians to assess and evaluate the suitability and practicality of the apps in supporting their work activities. Poor internet access is a universal issue which hinders the users from embracing mobile apps. Hence, the authorities concerned should address this issue.

Contrary to our expectation, both social influence and perceived credibility were found to be insignificant in determining behavioural intention. Possible reasons for this finding could be attributed to the fact that the apps used for mobile services do not require extensive and repetitive monetary transactions. In other words, the issue of privacy and security is not really a concern for respondents. With regards to social influence, the plausible explanation would be that many academic librarians in the study were not exposed to many of the mobile apps. As they were not familiar or users of the apps, it would not be possible and logical for them to recommend the apps to others.

Conclusion

The aim of this study is to examine the factors that influence the behavioural intention of adopting mobile application services of librarians working in the Pakistan universities. The results of the study have further extended our understanding on this phenomenon. Just like in many previous studies, performance expectancy, effort expectancy and facilitating conditions have exhibited their predictive power in determining behavioural intention. The findings further strengthen the applicability of UTAUT constructs in explaining user behaviour in relation to technology adoption. Given the dearth of literature in the context of Pakistan, the conduct of this study has provided empirical evidence on the factors that would influence the librarians in embracing mobile application services.

While this study has successfully achieved its objectives, there are several limitations which can be exploited for future research. First, this study examined librarians in only one national context (i.e. Pakistan). Future studies should consider examining the phenomenon in several national contexts and this would enable comparative analysis across different countries. Second, is related to the method. As opposed to this study which used single method only,



future studies should consider using a mixed method approach as it would provide a richer and more in depth explanation about the phenomenon.



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