DESIDOC Journal of Library & Information Technology, Vol. 38, No. 4, July 2018, pp. 271-277, DOI : 10.14429/djlit.38.4.12676

Determinant Factors in Adopting Mobile Technology-based Services by Academic Librarians

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ABSTRACT

Nowadays, mobile technology seems to become integral part of our life. People with different careers have begun to use it in their jobs. This research aims to identify influential factors in mobile technology adoption at library context. To this end, a conceptual model was presented based on an integrated model of technology acceptance model (TAM) and technology organisation and environment (TOE) model. A researcher-made questionnaire was distributed among 120 academic librarians. Seven Factor out of the integrated model of TAM and TOE were chosen to investigate their influence on mobile technology adoption. The results of the study suggest that the proposed model (integrated model of TAM and TOE) is a favourable one to identify the influential factors in mobile technology adoption at library context. In addition, regression analysis indicated that out of these seven factor, perceived ease of use, perceived usefulness, compatibility, relative advantage and organisational competency are determinant factors in adopting mobile technology-based library services among academic librarians.

Keywords: Academic librarians; Mobile technology adoption; Technology acceptance model

1. INTRODUCTION

The world appears to be on the edge of the revolutionary time of mobile technology use in higher education in general and libraries in particular. Communication technology provided considerable access to information and this matter is challenging knowledge worker to redesign their services adopting the technical changes. The internet and databases of libraries and universities have facilitated information finding. Library and Information centers are no more merely care use of books[1]. Today, libraries, particularly academic libraries should function in a user focused, technology based environment, providing personalised value added facilities, since the academic society heavily depends on information and using this information and communication technology in academic libraries can lead to improve academic society and university students' information level by having fast and less expensive access to scientific resources. As Abdekhoda[2], *et al.* notes 'recently, studies to recognise and forecast human factors and subjects related to technology application have been gradually recognised. Hence, knowledge worker need to be aware of technical changes, peer forward, and prepare for the upcoming of library mobile communication. They must be commensurate with this movement and participate themselves into the mobile dominion if they want to provide improved user services[3].

This study was conducted to identify influential factors on attitude toward mobile technology adoption by presenting a conceptual model, which is based on the integration of classical models of technology organisation and environment (TOE) and technology acceptance model (TAM). Effective factors in the adoption and perception of mobile technology by academic librarians will be addressed in this research.

Received : 07 February 2018, Revised : 22 April 2018
Accepted : 25 April 2018, Online published : 25 June 2018

2. HYPOTHESES

Several theoretical models have been proposed so far by various scholars and researchers who have focused on identifying factors which influence user acceptance behaviour. TAM and TOE models have received considerable attention over the last two decade. TAM introduced by Davis and his colleagues, according to him a real system usage is determined by behaviour intention which is in turn together determined by perceived usefulness (PU) and perceived ease of use (PEOU). PU is the extent to which a person accept that applying technology will improve his/her job performance and PEOU is the extent to which a person trusts that adopting new application will be free of effort[4]. The main components of this model include, PU, PEOU, attitude and usage. The TAM model proposes that PEOU influences PU, because information systems that are easy to use can be more suitable. The following two hypotheses were put forth based on this model regarding PU and PEOU:

H1: There is a positive relationship between PU and attitude toward mobile technology adoption.

H2: There is a positive association between PEOU and attitude toward mobile technology adoption.

TOE model on the other hand, was developed by Tornatzky LG, Fleischer M, Chakrabarti AK. Processes of technological innovation. Lexington books; 1990. which explains the level of information system adoption and information technology products. This model is extensively used for information technology adoption uses three main contexts; technological, organisational, and environmental context and affecting new technology implementation. Relative advantage, compatibility and complexity, are categorised under technology context. Relative advantage means the grade to which a technical factor is supposed as providing better benefit for organisations. Several studies have indicated valid role of compatibility in PU and PEOU. Peng[10], *et al.* believes that compatibility takes into account whether existing values, behavioural patterns, and experiences of a business and its workers are in the reconcilability of a new innovation. Calisir[11], *et al.* defines compatibility as the degree to which the innovation is perceived to be consistent with the potential users' existing values, previous experiences and requirements . Complexity is defined as the perceived degree of difficulty of understanding and using a system. Organisational competency, management support, and training and education are categorised as the organisational context. Organisational competency or organisational readiness is described by Tan[12], *et al.* as 'managers' attitude and evaluation of the degree to which they believe that their organisation has the responsiveness, possessions, and governance' to implement an information technology. Researches on Management support indicated its direct effect on PU and PEOU in adoption of information technologies. It is defined by Salwani[15], *et al.* as the perceptions and commitment of top managers on the effectiveness of technical innovation in generating values for the organisation. Finally environmental contexts contain two variables as competitive pressure and trading partner. The former is defined by Zhu and Kraemer[16] as the degree of pressure that the organisation feels from opponents within the business. However, environmental context is not investigated in this research.

By integrating two models (TAM and TOE), to address the main questions of the study the following hypotheses were suggested.

H3: There is a direct relationship between relative advantages and PU.

H4: There is a direct relationship between compatibility and PU.

H5: There is a direct relationship between complexity and PU.

H6: There is a direct relationship between relative advantages and PEOU.

H7: There is a direct relationship between compatibility and PEOU.

H8: There is a direct relationship between complexity and PEOU.

H9: There is a direct relationship between organisational competency and PU.

H10: There is a direct relationship between management support and PU.

H11: There is a direct relationship between organisational competency and PEOU.

H12: There is a direct relationship between management support and PEOU.

Summary of hypotheses and proposed integrated model is illustrated in Fig. 1.

3. METHODOLOGY

In this cross-sectional study with analytical approach, the participants were 134 academic librarian working at Tabriz University, Tabriz University of Medical Sciences, research centers and hospitals that were chosen based on convenient sampling. A developed questionnaire based on literature was used as the method of data collection[17-21]. The face validity of the questionnaire was approved by 10 professors of Tabriz University of Medical Sciences and reliability analysis showed Cronbach's of α= 0.7 proving the reliability of data collection instrument. As well as the face validity, the CVR and CVI are also calculated. The items of the questionnaire were framed on five point Likert scale in which; 'Strongly agree', 'Agree', 'Natural', 'Disagree', 'Strongly disagree' were assigned to test the items. From 134 questionnaire distributed, 127 were returned completed. 7 questionnaire out of 127 questionnaire considered inappropriate for analysis because of presenting wrong information or partially filled out questions. In order to investigate the correlation coefficient of the variable, a correlation analysis and regression analysis were carried out for the data. Furthermore, the conceptual model was expanded and tested by using AMOS16.0. To end, authorised conceptual model was presented. Table 1 indicates the survey questions used to measure the constructs of TAM -TOE.

4. RESULTS

As it is mentioned before, the participants of the study were 134 librarians working at Tabriz University, Tabriz University of Medical Sciences, research centers and hospitals.

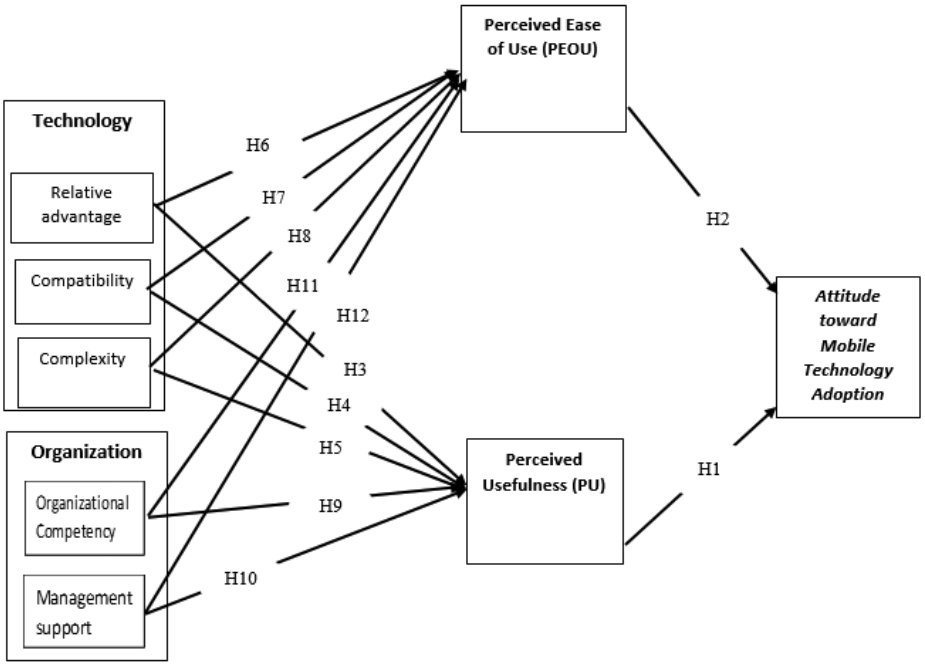

Figure 1. Hypotheses and the proposed integrated model of TAM-TOE.

Table 1. Survey questions used to measure the constructs of TAM -TOE

Construct	Item number	Items
	1	Mobile technology adoption results in more efficiency.
Perceived usefulness	2	Mobile technology adoption leads to do the job requirements more rapid.
	3	Mobile technology adoption results in more success to achieve job objectives.
	4	Advantages regarding mobile technology adoption including lack of time and place limitations, and ease of use improves peoples' knowledge and capability.
	5	Learning how to adopt mobile technology and its achievements is easy.
Perceived ease of use	6	Making vivid and understandable connections with mobile technology adoption is easy.
	7	Using mobile technology is easy in all its steps.
	8	Using mobile technology and its achievements has outstanding flexibility.
Attitude toward mobile technology adoption	9	I like mobile technology adoption .
	10	Mobile technology adoption brings joy with it.
	11	Mobile technology adoption is hopeful.
	12	The idea of mobile technology adoption is considered a wise one.
Compatibility	13	Mobile technology is compatible with libraries' need.
	14	The compatibility of mobile technology with libraries need results in its usefulness.
	15	The compatibility of mobile technology with libraries need leads to its ease of use.
	16	The complicatedness of mobile technology adoption diminishes its usefulness.
Complexity	17	The complicatedness of mobile technology adoption decreases its efficiency.
	18	The complicatedness of mobile technology adoption decreases its effectiveness.
	19	The complicatedness of mobile technology adoption results in work quality reduction.
	20	Due to some mobile technology adoption advantages including lack of time and place limitations, and ease of use it is claimed to be better than its similar previous technologies.
Relative advantage	21	Mobile technology promotion and its achievements lead to flexibility of its use.
	22	Makes it easy to learn how to use it.
	23	Helps to get vivid and understandable connections with it.
	24	Causes the easiness of its use.
Management support	25	Mobile technology adoption enjoys top management support.
	26	Mobile technology adoption needs to be supported by top library management and provided with appropriate situation to use it.
	27	Mobile technology usefulness results in more support from top library management and more appropriate situation to use this technology.
	28	Top management support results in more efficiency of mobile technology.
	29	Mobile technology adoption needs organisational competency (being capable of providing necessary resources to adopt mobile technology).
Organizational competency	30	Organisational competency leads to the easiness of mobile technology adoption.
	31	Organisational competency leads to the usefulness of mobile technology adoption.

31.7 per cent were male, and 55.8 per cent were female. 12.5 per cent didn't mention their gender. Concerning the education degree, the majority of them were Bachelor (52.5). About their major, it's worth mentioning that 17.5 percent studied medical librarianship at the University, and 30.8 percent studied librarianship. The rest of participants graduated with different majors.

Table 2 indicates the association between variables of proposed integrated conceptual model of TAM and TOE. As it is evident, there is a significant and positive association between TAM variables i.e. PU and PEOU and attitude toward mobile technology adoption. Concerning the technological factors, there is significant and direct relationship among Compatibility and PU, PEOU, and attitude toward mobile technology adoption and the association among relative advantage and PU, PEOU, attitude, and compatibility is positive.

Table 2. Results of Correlation analysis between variables of proposed integrated model

Constructs	Perceived usefulness	Perceived ease of use	Attitude	Compat-ibility	Com-plexity	Relative advantage	Manage-ment support	Organisa-tional competency
Perceived usefulness	1							
Perceived ease of use	0.618*	1						
Attitude toward mobile technology adoption	0.622*	0.567*	1					
Compatibility	0.704*	0.610*	0.718*	1				
Complexity	0.016	0.156	0.71	0.037	1			
Relative advantage	0.310*	0.391*	0.312*	0.277*	- 0.023	1		
Management support	0.335*	0.483*	0.565*	0.556*	0.148	0.322*	1	
Organizational competency	0.369*	0.424*	0.525*	0.513*	0.022	0.316*	0.682*	1

*p-value is significant at 0.01 levels

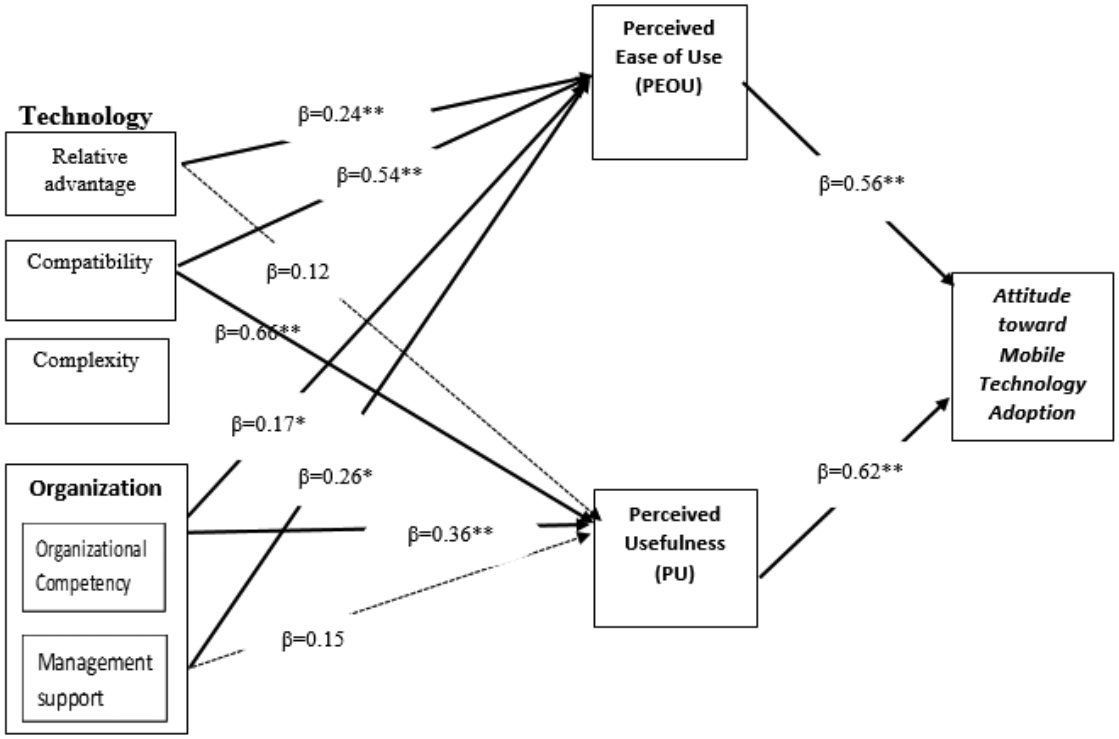

Figure 2. Validated proposed integrated Model's outcomes (p-value ≤ 0.01, *p-value ≤ 0.05).**

However, there is a negative relationship between Complexity and relative advantage as technological factors. Regarding organisational determinants, there is positive and significant association among management support and PU, PEOU, attitude, compatibility, and relative advantage. Finally, there is direct and significant relationship between organisational competency and PU, PEOU, attitude, compatibility, relative advantage and management support. Interestingly enough, there is negative association between complexity and relative advantage.

The results of regression analysis are shown in Fig. 2. According to Fig. 2, PU and PEOU have positive and significant effect on attitude toward mobile technology adoption (dependent variable), (β= .62, p-value≤ 0.01; β= .56, p-value≤ 0.01). Regarding technology factors, relative advantage showed to have positive and significant effect on PEOU (β=.24, p-value≤ 0.01) but no significant effect on PU (β=.12, p-value ≥ 0.05) was found. Compatibility suggested a positive and strong effect on both PU and PEOU (β=.66, p-value≤ 0.01, β= .54, p-value≤ 0.01 respectively). Regarding complexity, no association was

found between this variable and all other variables and it was even negative in case of relative advantage. So this variable is ignored and eliminated from the final proposed model.

Concerning Organisational context determinants, organisational competency indicated a positive though not so much significant effect on both PU and PEOU. (β=. 26, p-value ≤ 0.05, β=. 17, p-value ≤ 0.05, respectively). Finally, management support showed a positive and strong effect on PEOU (β=.36, p-value ≤ 0.01). However, it appeared to have no significant effect on PU (β=.15, p-value ≥ 0.05)

5. DISCUSSIONS

As data analysis indicated, the variables of TAM (i.e. PU and PEOU) and variables of TOE including technological context factors (i.e. relative advantage, compatibility, and complexity), organisational context factors (i.e. organisational competency and management support) are important determinants to affect librarians' attitude toward implementing mobile technology in library environment.

Concerning H1, the findings showed there is a considerable and direct association between PU and attitude toward mobile technology adoption (β= .62, p-value≤ 0.01). So *H1* was supported. The findings also revealed that PEOU has direct and significant effect on attitude (β=.56, p-value≤ 0.01). So, *H2* was accepted. In similar vein, Tung concluded that 'compatibility', PU, PEOU, and 'trust' all have strong direct influence on 'behavioural intention'[22]. These findings are in line with other studies already done in the field like[2, 7, 9, 23, 24].

The literature indicated positive and significant effect of relative advantage on both PU and PEOU, the researchers implied that the users would be more delighted to implement mobile technology at their work if it had some sort of relative advantage[2,6,17,25-27]. Concerning this association, *H6* was supported in this study. Thus there is a positive relationship between relative advantage and PEOU (β=.24, p-value≤ 0.01) whereas *H3* was rejected since the standard coefficient was .12 and p-value ≥ 0.05.

Compatibility was another variable regarding technological context which suggested to have positive and significant effect on both PU and PEOU (β=.66, p-value≤ 0.01; β=.54, p-value≤ 0.01 respectively). Thus, *H4* and *H7* both supported in this study. Some studies that their findings are in line with this study[28,9].

The Fifth and eights hypotheses were put forth to find out whether there is a positive association between complexity and PU and PEOU as variables a TAM model. Some studies carried out by some researchers in order to find any possible relationship. They came to this conclusion that association among them is negative and direct which implies that the more the mobile technology services become complicated, the less they are used by the people[2,23-25,29,30]. This research showed that there is no association among them. Similarly, Wu has noted that complicatedness had no indirect effect on Electronic Customer Relationship Management (E-CRM) acceptance. So no regression analysis can be done to see which one influences the other one. Thus, *H5* and *H8* were both rejected and complexity is eliminated from the proposed model.

The organisational readiness like being equipped with sufficient technological resources showed to have significant effect on successful use of a particular technology. Both *H9* and *H11* were supported in this research. The former says there is a positive association between organisational competency and PU (β=. 26, p-value ≤ 0.05). The latter claims this relationship is also positive between organisational competency and perceived ease of use. (β=. 17, p-value ≤ 0.05). Gangwar[6] also reported this in the literature.

Although the literature indicated a significant association between management support and PU as in[17,26,31], who reported that PU, PEOU, and management commitment have considerable effect on doctors' attitudes toward Electronic Medical Records' implementation, the results of this study are the opposite way around showing that management support does not have a significant effect on perceived usefulness (β=. 15, p-value ≥ 0.05). So *H10* was rejected. However, *H12* was supported in this study since the standard coefficient was .36 and p-value≤ 0.01, hence there is significant and positive relationship between management support and PEOU. This finding is in line with what have been achieved by Kowitlawakul and Gangwar.

6. CONCLUSIONS

The general aim of this survey was to find out which factors influence librarians' attitudes toward mobile technology adoption at libraries. In so doing, an integrated model of TOE and TAM was offered, extended and tested by the researcher and it is proved to be an appropriate model. The results of the study identified five determinants including relative advantage, compatibility, organisational competency, with PU and PEOU as mediating variables. The regression analysis suggested that among these factors, compatibility was the most influential one on PU and PEOU, compared with Management support, organisational competency, and relative advantage. Thus, it's really important to consider these factors at libraries since they affect librarians' attitudes toward using mobile technology-based services.

6.1 Recommendations for Further Research

The comparison between the findings of this research with other related researches suggests that the results vary when the participants are different; so this study can be replicated in other contexts with other participants and in-depth investigation might provide the scholars and researchers with lots of insights and the reasons behind such different findings.

6.2 Limitations of the Research

Due to the sampling type of this research (convenient sampling) in which available academic librarians are chosen, it seems that for such descriptive studies more participants are needed to conduct the research more effectively and to get more confident results.

6.3 Ethics statement

Different ethical aspects of present research were approved by the Ethics Council of Tabriz University of Medical Sciences (IR.TBZMED.REC.1395.96126 (and all the participants signed the consent form of the research.

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