

Cultural Factors Determining the Adoption of m Learning on Adult Learners: Evidence from Bangladesh

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ABSTRACT: *M-learning for adult learners become an important initiative among the public and private universities in Bangladesh in the last few years. The factors determining m-learning adoption have been a well-considered research area for normal cohort student. However, it is become essential in modern knowledge based society to explore the role of cultural factors in the adaption of m-learning for adult learners, particularly in developing countries. In this study, we investigate the influence of culture in the adoption of m-learning on adult learners in Bangladesh. This study developed a more adequate research framework by integrating Hofstede's cultural dimension model and the Unified Theory of Acceptance and Use of Technology (UTAUT). A Structured questionnaire was used to collect data from different public and private universities in Bangladesh. The partial least square method, a statistical analysis technique based on the Structural Equation Model, was used to analyze the collected data. The study found that cultural dimensions such as Power Distance and Masculinity had significant impacts on Intention to Use m-learning, whereas Uncertainty Avoidance and Collectivism had no significant impact on Intention to Use m-learning in Bangladesh. The results also revealed that performance expectancy, effort expectancy and cognitive needs of learners were a significant indicator of adoption decisions, whereas facilitating condition had no significant influence of on adult learners' intention to use m-learning adoption. Conclusion: The findings of the study may assist government, organizations, and policymakers to understand the key factors affecting m-learning adoption and to develop strategies to enhance m-learning service for adult learners in Bangladesh.*

Keywords: *m-learning, adult learners, least square method, structural equation model, cultural dimensions.*

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1. INTRODUCTION

As society moves from an industrial to an information base, adults are rapidly becoming involved in using the Internet and mobile for professional, personal, and educational purposes [1]. A greater demand for knowledge-workers concerns adults, as they make up the majority of the productive knowledge-workers. Given the fact that the aging population in the world generally has risen as a result of the baby boom phenomenon [2], the governments around the world, particularly in developing countries are taking heed of the demands of this rapid change in employability of these adult knowledge-workers [2][3][4]. With the emergence of a knowledge society and the process of globalization, the nature of education is evolving into a complex mix of formal and informal education and life-long education [5]. This according to Jarvis is a major conceptual shift from education to learning in the past decade. The population of nontraditional students is projected to increase significantly. For the period 2008 to 2019, enrollment of students aged 25 to 34 years and 35 and older is expected to increase 28% and 22% respectively, compared to 12% for students' aged 18 to 24 years [6].

Although the history of mobile learning goes back to the 1980s [7], until now an emphasis on technical aspects has prevailed whilst pedagogical and cultural issues remain underexplored. The recent approaches to mobile learning have shifted the focus from the mobility of the devices to the mobility of students and the context of learning [8] in addition to concepts of agency, structure and cultural practices, an emphasis on technologies as driver of change is still dominant [9]. It is observed that more attention should be paid to the interplay between mobile technologies, cultural practices and learning opportunities, especially in the field of adult education. Indeed, if mobile devices are understood as cultural and learning resources, we need to better understand how adults appropriate them, especially considering the new forms of nomadism characterizing in the contemporary societies. More research has begun to gain insight into m-learning appropriation processes among young people [10] [11]. However, those studies could not confirm what cultural factors play significant role on learners' behaviors and practices to use m-learning as for example, a study by Ibrahim Arpacı [12] who investigate the cultural difference on the adoption of m-learning for undergraduate students only. Furthermore, the m-learning adoption literature shows that the understanding of what influences students' adoption behavior is dominated by works that focus on technology-related enablers [13] [14]. For instance, most of previous works adopted information system (IS) adoption theories to ground their study (eg, technology acceptance

model). Limiting the understanding only to technology-related enablers is not likely to provide a clear understanding of what influence students' intention to adopt m-learning. This is because students today are becoming more sensitive about their culture and social norms [12]. Therefore, the researchers try to bring the focus on cultural and motivational issues along with technology enablers [13]. According to the scholars; Culture and society always dominate and motivate the cognitive part of the human behavior. This cognitive factor in behavior become responsible for thinking and reasoning, problem solving and understand any situation based on their perceived surrounding and regional influence [15]. In academia, it have also confirmed that the acceptance and use of information and cmmunitation technology is culturally dsitinguished and cannot be generalized under single condition [15]. To date, cultural have not been prominent in the study of information and communication technology adoption particularly in developing countries such as Bangladesh where the growing number of adult learners are trying to learn new skills and keep up with new changing work environment [16].

Technological perfection and smart search skills are meaningless without student motivation to seek information in the first place [17]. Motivation is the spark that propels student to invest time and interest in their studies; without it, students are more likely to quit. As Delrooz, and Farahani [18] concluded in their study concerning learning strategies and academic achievement among university student in Iran, "academic motivation affects learning and that affects academic achievement itself. Thus, in order to get a better understanding of what influences adult learners' decision to adopt m-learning, this study examines this issue from a cultural and motivational perspective. In this study, motivation as enablers are selected because they have been identified as an essential perspective to help understand why users prefer certain learning platforms compared with others [19].

Moreover, this study is also different from others as it focuses on the adoption of m-learning by adult learners. This study defines adult learners as students who are over the age of traditional students [20][21]. The reason why the adult learner is selected because they face difficulties with online learning as many institutions tailor their online programs to support the needs of traditional, aged students [22]. Based on the adult learners' literature, this group of students has been identified to have a different set of needs compared with traditional students [23]. Adult learners are also said to exhibit significant differences in their academic and live involvement compared with traditional students [24]. Thus, examining their needs in using m-learning is essential. It can help in promoting the

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use of mobile application as one of the medium to support their learning. Our theoretical basis for examining m-learning user motivations is Uses and gratifications Theory (UGT), which is a communications research paradigm that determines motivations by focusing on what people do with mass media [25][26]. Many theorists believe that uses and gratifications is a research tradition eminently suited for m-learning study [27][28][29][30], because the facilities of an Internet's become efficient and effective medium of knowledge expansion. Additionally, insights from this study will help service provider and educational institutions avoid developing platform and service tools that will receive strong resistance from students having different regional and cultural perceptions.

Finally, this study contributes to the m-learning adoption body of knowledge in two ways: (1) it extends the current understanding of m-learning adoption by examining this issue from a cultural and a motivational perspective and (2) the adoption of m learning in the adult learner context for developing country. In order to do so, this study employed Hofstede's cultural model along with UTAUT. This model is extended to additional variable – Cognitive needs and Social needs. These construct are included from uses and gratification theory (UGT) which has prominently used by researchers to investigate motivational issues in technology for learning purposes. Especially for adult learners those who needs self-interest and existence need to learn and survive in the dynamic work environment [31][32][33][34] (Guo, 2010; Mondri, 2008; T. F. Stafford, 2005)(Thomas F Stafford, 2005).

2. LITERATURE REVIEW

2.1. M-learning for adult learners

According to Park [35], the rapid advancement of information and communication technologies (ICT) is changing the landscape of how learning is delivered to students. Education providers are using ICT as alternative media to conventional face-to-face interaction between professor and students within a classroom setting. Based on the adult learning literature, they can be characterized as self-directed, highly motivated and know what they want to achieve from their education program [36]. These students are usually over the age of 25 and usually working either full time or part time [37][23]. They are usually aided by their life experience, and their reflections and actions are integral components of their learning process [38]. According to Ruey [39] for the online learning process to be successful, adult learners should be able to

interact with the course materials, discuss and collaborate between instructor and other students, and integrate their past experience with the course content or assignment. Two major observations can be made from the literature: (1) prior research that examined m-learning intended to focus heavily on technology-related enablers to explain students' intention to adopt m-learning; and majority of these works surveyed traditional age students, who are doing their first-degree program. Hence, this study proposes to extend the existing body of knowledge by examining m-learning adoption from a cultural and motivational perspective in the context of adult learners'.

2.2. Contextual Variable

Researchers have used the Theory of Planned Behavior (TPB) as the theoretical foundation to construct an influential model of Unified Theory of Acceptance and Use of Technology (UTAUT) [40][41][42]. Considering the main goal of this study was not to verify the UTAUT model but to explore the moderating effects of cultural values on the predictive paths of various motivation factors on m-learning adoption. We chose not to include the moderating variables in the original UTAUT model but kept the two core constructs: Performance expectancy and Effort expectancy. Since self-directed use of technology for learning is an individual behavior, we further considered the two constructs, [23][43][32]. Mondy argued to be critical to individual technology adoption for the adult learners' contexts: cognitive needs (CN, i.e., to seek information in order to be creative thinkers), and social needs (i.e., to assist they collaborate with other fellow) from user gratification theory (UGT). UGT is an approach to understand why and how people actively seek to specific media to satisfy their needs. It is an audience-centered approach to understand m-learning communication system to identify the influencing factors for adult learners'. Thus, Cognitive needs and Social needs were hypothesized to predict usage behaviors via users' intention of adoption. Huang, H.M. [43] and Mondy [32] further conceptualized that in the adult learners' technology adoption context.

2.3. Cognitive Needs and Social Needs

Cognitive needs refer to learners' motivation to use technology to seek for information in order to be critical and creative thinkers [32]. Adult learners' are more likely to have positive attitude to use m-learning services to acquire experience with a wide range of information and ensure the quality and accuracy of the information. On the other hand, Social needs refer to students' motivation to use a technology that is able to assist them to interact and collaborate with other fellow students during

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the learning process. Students are more likely to have positive attitude toward adopting m-learning services if it is able to assist them in making a consensual meaning and co-creating knowledge. M-learning services is able to support across time and space communication is said to be able to fulfill students' social needs [31]. Thus, to make adult learners' online course a success, the m-learning service should be able to support these needs. Tools that offer these needs are said to have better likelihood to be used and adopted by adult learners [23][43].

2.4. Cultural values as moderators

There has been an increasing volume of literature evidencing the moderating effects of individual cultural values on technology use for informal learning. Previous studies have found that uncertainty avoidance negatively moderates the influence of technology use and positively moderates the impact of social needs on attitudinal components [42]. For individuals, with high uncertainty avoidance, their performance expectancy would have less impact on their intention to adopt a technological application. Because the tendency of people towards avoiding unstructured events might offset the potential influence of their belief on the usefulness of the technological application [44][45][46] [47]. Moreover, the use of technological resources beyond the classroom often involves authentic learning materials and contexts, which more or less pushes adult learners out of their comfort zone. Thus, for individuals with high uncertainty avoidance, intention to use a new technology may be less likely to result in actual use (TU) [48][49]. Thus, we hypothesized that:

H1: UA would negatively moderate the influence of PE on BIU

H2: UA would positively moderate the influence of SN on BIU

H3: UA would negatively moderate the influence of BIU to UB

Individuals with Collectivist (COL) orientations prefer group and are thus likely to influence largely by social normative beliefs such as social needs and to a lesser extent by performance expectancy [50][51][52]. Zhang [53] et al., meta-analysis of cultural differences and technology adoption further found that performance expectancy matters less and effort expectancy matters more in COL cultures. COL cultural orientations may strengthen the influence of effort expectancy by collective use of resources and greater ease of technology use to adopt the group's decision and affiliations [50] [28]. People holding collectivist values are more concerned about maintaining group cohesiveness [54]. This cohesiveness will bolster their motivation and willingness to make extra contributions to the collective [55] [56]. Under this condition, collectivistic people tend to exert extra effort in their work, and actively propose constructive ideas

and suggestions. Secondly, collectivism promotes people to establish interdependent relationships with their colleagues, and consequently develop close relationships with them. Such interpersonal relationships are beneficial for strengthening knowledge sharing and information exchange, which can facilitate employees' innovative behaviors [57]. Thus, knowledge and information exchange work as an incremental benefit to foster individual creative thinking to fulfil cognitive needs at the individual level [57]. Furthermore, COL cultural orientation is positively moderate the influence of intention to use on actual technology use [58]. Thus, we hypothesized that:

H4: COL would negatively moderate the influence of PE on BIU

H5: COL would positively moderate the influence of SN on BIU

H6: COL would positively moderate the influence of CN on BIU

H7: COL would positively moderate the influence of EE on BIU

H8: COL would positively moderate the influence of BIU to UB

Power distance has significant influence on social needs [59] [60]. It refers to how adult learners' make decision to fulfill their social needs. In a hierarchical society, learners will respond to their social needs according to his/her superior in the organization [61]. Those adult learners are more likely to accept a hierarchical structure and demonstrate greater respect for position, age, and/or authority[62].As using technology to support learning is the dominant discourse, these individuals' compliance with authoritative discourse might have boosted self-efficacy and hence strengthened the link between behavioral intentions and actual behaviors [63] [64]. Thus, we hypothesized that:

H9: PD would positively moderate the influence of SN on BIU

H10: PD would positively moderate the influence of BIU on UB

Given that, the majority of technological developments require long-term planning and investment [61]. Characteristics normally associated with the positive role of this dimension should be associated with higher levels of creativity to influence the cognitive needs positively [65] [66]. Researchers have found that the stronger the long-term orientation an individual adopts for learning, the stronger the impact of performance expectancy on intention to use [59] [67]. Likewise, for individuals with long-term cultural orientations, behavioral intentions might have an influence on actual behaviors. Adult learners' readiness to learn become essential for job performance. Therefore, their focus on continuous learning might positively reinforce their behavioral intentions. Thus, we hypothesized that:

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H11: LTO would positively moderate the influence of PE on IU

H12: LTO would positively moderate the influence of CN on IU

H13: LTO would positively moderate the influence of BIU on UB

Consequently, we constructed a conceptual model that hypothesized the interaction of individual cultural value orientations with technology adoption constructs in influencing adult learners' use of m-learning platform outside the classroom (see Fig. 1).

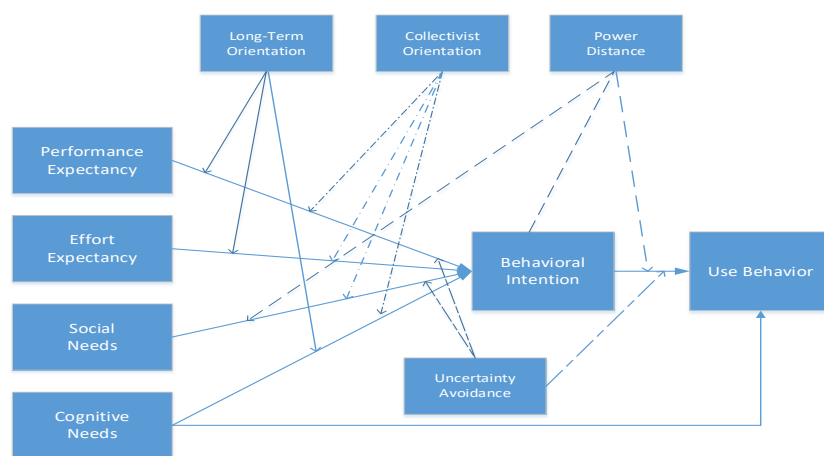


Figure 1: Propose model.

3. METHODOLOGY

3.1. Data collection

The research instrument for this study was adopted from previous works [41] [32]. It consisted of 34 items. This research measurement is adopted because it focused specifically on understanding user's motivation to adopt m-learning as medium of learning. Furthermore, all items are measured using 5-point Likert scales ranging from 1 (strongly disagree) to 5 (strongly agree). A pilot survey was conducted to establish the reliability of the research instrument. The pilot survey follows the procedures of the real data collection phase. The survey only involved 25 postgraduate (PG) adult students studying in the open universities of Bangladesh. The measurement and structural model were analyzed (using WRAP PLS 6.0 and from the analysis, the research instruments indicated satisfactory reliability and validity of the measures [68]. This study used survey as the main method to collect data. The survey was open to respondents for almost 2 months. Adult students doing postgraduate (PG) degree from three universities of Bangladesh. At each participating university, we

contacted teaching staff from the departments to elicit their help in announcing the study via in mass emails and posts in course management systems. The survey responses were collected through questionnaire, and 350 survey responses were collected. After discarding incomplete questionnaires, 313 valid questionnaires were retained. The participants' average age was 33. The majority of them were in their postgraduate studies (73%). The participants reported a wide range of cultural value orientations along the four dimensions. As the study was based on a self-reported questionnaire on a single set of respondents' students, and at a single point of time cross-sectional design, it was subject to common method bias. Full collinearity variance inflation factors (VIFs) and Harman's single factor test using principal component factor analysis were adopted to check for common method bias [69] [70]. The principal component factor analysis showed that general construct accounted for 23% of the variance (<50%), and the full collinearity VIFs of all the latent variables were less than 5. Thus, these tests ruled out the concern of common method bias in the data.

4. RESULTS

We employed factor-based partial least squares (PLS) modeling to test the conceptual model using Warp PLS 6.0. PLS is a structural equation modeling (SEM) technique. Unlike co-variance-based SEM whose aim is to confirm theories or use theories to explain a phenomenon, PLS "has the overriding objective of predicting the dependent latent variables" [71]. We used PLS for model analysis because it matched the purpose of the study pulling together research evidences on cultural effects from other research fields to construct a model on how cultural values interact with other socio-psychological factors to predict adult learners' use of technology for learning, which is of predictive nature rather than theory confirmation. Furthermore, PLS is most appropriate for research data with non-normal distribution and for testing a large number of moderating effects [71] [72].

4.1. Measurement model

Tables 1 and 2 present the measurement model results of the final model, including factor loadings and cross-loadings and various reliability and validity values. A confirmatory factor analysis (CFA) was performed to test the item convergence and discriminant validity, and two items the loadings and cross-loadings of the remaining 33 items supported internal consistency and discriminant validity (Table 1). The construct reliability was measured by the Cronbach α values and the composite reliability coefficients, and all the composite reliability coefficients and the values of

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the Cronbach alpha were 0.70 and above, with the exception of one construct, LTO, suggesting that the scales were reliable [73]. The AVEs of all constructs exceeded 0.50, suggesting satisfactory convergent validity. The square root of the AVE for every construct was greater than the correlations of that construct with all other constructs, suggesting satisfactory discriminant validity (Table 2). The participants reported engaging in self-directed use of m-learning platform for learning outside the classroom an average of 1-3 h per week. They reported slightly more positive attitudes towards m-learning (e.g., for PE, $M=4.83$, $SD = 0.86$; for HM, $M = 4.56$, $SD = 0.97$) but less positive perceptions of their ability to do so ($M = 4.24$, $SD = 1.00$) and their evaluation of the social pressure ($M = 4.08$, $SD = 0.95$) and support available ($M = 4.24$, $SD = 0.93$) in the surrounding environments. In-terms of their cultural orientations, the participants reported holding slightly long-term ($M = 4.53$, $SD = 0.76$) and collectivistic ($M = 4.34$, $SD = 0.83$) orientations, and slightly high uncertainty avoidance ($M = 4.44$, $SD = 0.85$) but low power distance ($M = 2.48$, $SD = 1.11$).

4.2. The structural model

The structural model was built to identify the relationships among the constructs in the research model. The bootstrap method was used to test the hypotheses (Efron & Tibshirani, 1994). The detailed results (path coefficient b and t statistics) are summarized in Table 4. Cultural dimensions such as PDI ($t=5.620$, $b= 0.4839$) and masculinity ($t=2.978$, $b =0.3152$) have significant influence on intention to use m-learning. Thus, H5 and H8 were supported. However, collectivism ($t =0.394$, $b= 0.0592$), and UAI ($t =0.057$, $b =0.0003$) have no significant effect on intention to use m-learning. Thus, H6 and H7 were not supported. On the other hand, PE ($t =5.635$, $b =0.359$), EE ($t = 3.484$, $b = 0.197$) and CN ($t =5.359$, $b =0.306$) had a significant effect on adult learners intention to use m-learning service. Thus, H1, H2 and H9 were supported. However, FC ($t = 0.263$, $b=-0.016$, $t = 1.170$, $b = 0.082$) had no significant effect on elderly's intention and actual use of m-health services. Thus, H3 not supported. Finally, the result confirmed that behavioral intention to use is positively associated with actual use ($t = 4.523$, $b = 0.426$), supporting H7 (Table 3). The result also indicated that our research model can explain 64.0% of the variance in intention to use m-learning ($R^2 = 0.640$). Lastly, the result of the single linear regression between intention to use m-learning and actual use confirmed that intention to use is positively associated with actual use of m-learning ($t = 14.836$, $b = 0.6513$). Thus, H4 was supported.

5. DISCUSSION

This study found that UTAUT with UGT was a valid model in explaining learners' m-learning beyond the classroom, accounting for 71% of the variation in adult learners' intention to use technology. This corroborated Venkatesh et al. [59] suggestion that an affect construct should be added to the original UTAUT model to understand individual learners' technology adoption. Adding moderating effects of individual cultural values improve the explanatory power of the model, which suggested that the model is robust in explaining adult learners' intentions with respect to out-of-class self-initiated use of technology for learning purposes in different cultural settings. The cultural influence as moderator are significant and influence the explanatory power of the model. This suggests that the influence of cultural values more manifested in moderation effects than indirect effects in the context of adult learners' technology adoption for m-learning [47] [75].

It would be interesting to see whether the same differentiated effects hold in different technology adoption contexts. More studies that contrast the direct and moderating effects of individual cultural values needed to enhance and clarify our understanding of the exact nature of cultural influence on technology adoption in different contexts [74]. In this study, the structural model explained a large proportion of variation in technology use behavior but a small proportion of variation in the intention to technology use. This finding is consistent with Taras et al's [76] meta-analytic finding that cultural values had greater predictive validity with respect to more tangible outcomes such as behaviors than more intangible outcomes such as emotions and attitude. The consistency between behavioral intention to use technology and technology use indicated a strong intention behavior link, which Nistor [78] argued to be the result of multiple sequence of events co-existing in complex adoption environments such as cultural and educational contexts.

DeOca & Nistor [78] suggested examining these multiple contexts to understand better intention-behavior link. According to this study the long-term orientation and collective cultural value orientation, contribute to fulfil cognitive needs that facilitates the intention-behavior link even among a group of learners who reported long-term orientation in general. Thus, m-learning platform helps to fulfill adult learners' cognitive needs to utilize the resources from pedagogical experts, such as teachers or senior peer learners, to build a strong applied knowledge for further up gradation in career path [79] [80]. Performance expectancy found to be strong predictors of adult learners' intention to adopt m-learning outside

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the classroom. The relationship between performance expectancy and attitude found more significant in long term than in collective and uncertainty-avoidance cultural orientation. It proves that the stronger the long-term orientation an individual adopts for learning, the stronger the impact of performance expectancy on intention to use [45] [67]. Because people believe that, they need to learn new skill and use new technology to perform better than the others. It also confirms that performance expectancy is robust predictor of technology acceptance [81] [82] and suggests that it is important to technology adoption in informal learning contexts, as its predictive power is influenced by learners' long-term cultural orientations.

The research model also find that the influence of Collectivism had a strong and positive moderating effect in line with social needs, attitude and use behavior. This further validate that adult learners' always try to fulfil collaboration needs and maintain their group status [83][84], even though some earlier studies have not supported it [47][75]. Furthermore, informal learning is often situated in non-didactic, authentic life experience that is characterized by complexity and ambiguity [85][86], which is further compounded by the additional levels of uncertainty and challenge brought on by the use of technologies in such learning contexts. Adult learners with high uncertainty avoidance were likely to be discouraged from engaging in such learning behaviors. Fortunately, this study found that for such learners, the greater the social influence they perceived, the greater the intention they had to adopt technologies for learning. Thus, if educators want to boost self-directed use of technology for informal learning in regions with high uncertainty avoidance on average, strengthening social influence is particularly important [87][47][48].

6. IMPLICATION OF THE RESEARCH

The findings of this study offer a significant theoretical contribution to the literature. This research has applied the Hofstede cultural dimensions with UTAUT and Cognitive needs to determine adult learners' behavioral intention to adopt m-learning services in the context of developing countries [82]. Most of the prior studies primarily adopted the basic TAM or UTAUT model with PE and EE constructs and implemented them either in the context of a developed nation or with little focus on the adult learners' adoption of m-learning in the context of developing nations [50]. Theoretically, the main contribution of this paper is that it extends the understanding of what Cultural factors motivate adult learners to adopt m-learning. This is an early attempt at examining adult learners' m-learning

adoption intention. In addition, the findings of this study are able to provide researchers and practitioners with new insights of what influence adult learners' attitude to adopt m-learning. In practical terms, this study can help practitioners motivate adult learners to adopt m-learning. From the results, adult learners' attitude to adopt m-learning can be increased by making it mandatory to use (1) embedded m-learning platform with varieties of collaborative communication applications (ie, Wiki, Facebook, Twitter) that allow them to work in group and update themselves in knowledge sharing community. Based on the survey, high power oriented adult learners are using this service to show their status and to make them influential in the team. Adult learners in developing countries are showing individualistic behavior and based on this findings the m-learning platform should allow adult learners to personalize and customize learning styles and preferences; and (3) providing adequate learning resources that are supported by the m-learning platform. This is because the finding suggests that adult learners are using mobile technology to acquire information related to the course and skill needed at workplace.

7. CONCLUSION

This study conceptualized and tested a model on the influence of individual espoused cultural value on technology adoption in m-learning context. Adult learners' self-directed use of technology for learning beyond the classroom. It found that UTAUT plus UGT was a robust model in explaining learners' intention to adopt technology, influenced by individual cultural value orientations. Individuals' cultural value orientations contributed indirectly to technology use, accounting for a proportion of the variation in learners' frequency of technology use. The study supports the argument that individual cultural value orientations do influence adult learners' use of technology for learning beyond the classroom.

This influence mainly comes from their moderating effects on technology use rather than their direct effects. The study thus adds to our understanding of how individual-level cultural values influence adult learners' self-directed use of technology for m-learning. It also suggests that the moderation effects of cultural value orientations on technology adoption may depend on the nature of the Adult learning context. Furthermore, the participants consisted of primarily male students, and thus the findings might be biased. However, despite including gender as a moderator in their UTAUT model, did suggest that the moderating effect of gender might disappear for generations raised and educated in

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technology-pervasive environments [23]. Previous research has shown no significant gender difference in language learners' technology use for learning beyond the classroom [39] [50] [54]. Besides, researchers have also found that the observed gender effects might not lie simply in the biological assignment but more in culturally shaped personality traits, such as locus of control, neuroticism and risk propensity [60]. These traits were captured in the cultural values examined in this study, which made the gender-bias of the participants less a threat to the findings.

In informal learning contexts, actual learning behaviors are largely influenced by learners' learning motivation and their prioritization in arranging their leisure time [49], and in this study technology use was measured by survey responses only and on both the breadth, variety and depth of the use. Notwithstanding these limitations, this study did find that individual-level cultural orientations influenced adult learners' self-directed use of technology for learning beyond the classroom indirectly through moderating the influences of other core predictors of technology adoption.

Thus, it helps educators understand the specific contribution of cultural factors to the variation in adult learners' m-learning and informs the development of culturally responsive approaches to foster self-directed technology use for continuous development. The study further identified long-term orientation, the relatively less studied cultural value orientation in the technology adoption literature, as critical to technology adoption in adult learning contexts. This suggests the importance of incorporating this cultural value orientation, which includes the time dimension indecision making, when examining the interaction of culture and technology adoption [82].

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APPENDIX

1. Pls loadings and cross-loadings

Table 1: Descriptive Statistics, Correlation and Discriminant Validity.

		UB	BI U	PE	EE	SN	CN	LTO	COL	PD	UA
UB	UB1	.70									
	UB2	.72									
	UB3	.83									
	UB4	.80									
BIU	BIU1		.86								
	BIU2		.89								
	BIU3		.88								
	BIU4		.79								
PE	PE1			.89							
	PE2			.90							
	PE3			.87							
EE	EE1				.75						
	EE2				.87						
	EE3				.89						
	EE4				.88						
SN	SN1					.86					
	SN2					.85					
	SN3					.79					
	SN4					.78					
CN	CN1						.87				
	CN2						.84				
	CN3						.85				
	CN4						.88				
	CN5						.89				
LTO	LTO1							.69			
	LTO2							.79			
	LTO3							.88			
	LTO4							.58			
COL	COL1								.79		
	COL2								.88		
	COL3								.87		
	COL4								.90		
PD	PD1									.60	

	PD2										.87	
	PD3										.80	
	PD4										.57	
UA	UA1										.88	
	UA2										.93	
	UA3										.77	
	UA4										.60	

2. The survey constructs

Technology adoption constructs
Performance Expectancy (PE)
I find mlearning service useful Using mlearning service enhances my success in skill development Using mlearning service enhances my learning effectiveness
Effort Expectancy (EE)
I find its easy to select and find appropriate course needed to enhance appliedknowledge It would be easy for me to become skilled at using this service I find it easy to get this service to do what I want them to do for learning Learning how to use this effectively for learning is easy for me
Social Needs (SN)
People who influence me think that I should use mlearning service to support learning People who are imperative to me think that I should use it to support my development People whose opinions that I value prefer that I use mlearning to support my upgradadtion Members in my learning community support the use of mlearning
Cognitive Needs (CN)
I use my mobile device to help me know many things. I use Internet on my mobile device to search for new information. I carry out Internet search through my mobile device to answer questions coming from class discussions. I use Internet on my mobile device to explore topics of interest beyond my normal school assignment.
Intention to Use (IU)
I intend to continue using technologies for language learning in the future I will always try to use technologies for language learning I plan to continue to use technologies for language learning frequently
Technology Use (TU)
Help grasp well what's learned in the language class

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<p>Get more information about the language and culture outside the class Expand opportunities to use the language Sustain/enhance motivation and interest in learning the language Seek engaging learning activity or experience</p>
Cultural Value Orientations
Long-term Orientation (LTO)
<p>I persist in the pursuit of goals despite opposition I focus more on long-term success than immediate gains I'm willing to give up today's fun for success in the future (dropped)</p>
Power Distance (PD)
<p>People in higher positions should make most decisions without consulting people in lower positions People in higher positions should not ask the opinions of people in lower positions too frequently (dropped) People in lower positions should not question or disagree with decisions by people in higher positions</p>
Uncertainty Avoidance (UA)
<p>It is important to have instructions spelled out in detail so that I always know what I'm expected to do It is important to closely follow instructions and procedures Rules and regulations are important because they inform me of what is expected of me</p>
Collectivism (COL)
<p>Being loyal to a group is more important than individual gain I followed the norms of the group I followed the procedures used by the group I accepted the rules of the group</p>