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Volume 15, Number 3, July 2014

URI: <https://id.erudit.org/iderudit/1065366ar>
DOI: <https://doi.org/10.19173/irrodl.v15i3.1722>

[See table of contents](#)

Publisher(s)

Athabasca University Press (AU Press)

ISSN

1492-3831 (digital)

[Explore this journal](#)

Cite this article

Huang, R.-T., Hsiao, C.-H., Tang, T.-W. & Lien, T.-C. (2014). Exploring the Moderating Role of Perceived Flexibility Advantages in Mobile Learning Continuance Intention (MLCI). *International Review of Research in Open and Distributed Learning*, 15(3), 140–157. <https://doi.org/10.19173/irrodl.v15i3.1722>

Article abstract

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Exploring the Moderating Role of Perceived Flexibility Advantages in Mobile Learning Continuance Intention (MLCI)



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Abstract

The primary purpose of this study was to explore the key factors that could affect mobile learning continuance intention (MLCI), and examine the moderating effect of perceived flexibility advantages (PFA) on the relationship between key mobile learning elements and continuance intention. Five hundred undergraduate students who had previously adopted mobile devices to learn English took part in this study. Partial least squares (PLS) analysis was utilized to test the hypotheses in this study. It has been found that the perceived usefulness of mobile technology, subjective norm, and self-management of learning could be closely linked to mobile learning continuance intention. With particular respect to the moderating role of perceived flexibility advantages, it has been demonstrated that PFA could moderate the relationship between perceived usefulness of mobile technology and mobile learning continuance intention, as well as the association between subjective norm and mobile learning continuance intention, whereas PFA did not moderate the link between self-management of learning and mobile learning continuance intention. This report has further added to the body of knowledge in the field of mobile learning through empirical examination.

Keywords: Mobile learning continuance intention; perceived flexibility advantages

Introduction

Due to the swift proliferation of mobile technology (Liaw, Hatala, & Huang, 2009; Wang, Wu, & Wang, 2009), the use of mobile devices, like notebook computers, and mobile phones, as learning tools has offered people the flexibility and convenience to acquire new knowledge anytime and anywhere (Chen, 2010; Sarica & Cavus, 2009; Kukulska-Hulme, 2007; Yukselturk & Yildirim, 2008). In light of this, growing attention has been paid to the critical roles of perceived flexibility advantages in mobile and online learning. For example, Marks, Sibley, and Arbaugh (2005) have indicated that perceived flexibility advantages could have a positive influence on online learning outcome. Evans (2008) has revealed that a learner's perceived flexibility advantages could be closely associated with mobile learning acceptance. Although several researchers have highly focused on online and mobile learning studies, relatively little effort has been devoted to examining the link between perceived flexibility advantages and mobile learning outcome. More specifically, the relationship between perceived flexibility advantages and mobile learning outcome has not yet been fully investigated in previous studies.

In addition, because customers' continued use of information technology products and services could be viewed as a central indicator to determine the entire success of products and services, it has been shown that there is a growing interest in investigating users' continuance intention to adopt information technology products, mobile services, and e-learning programs (Lin, 2012). However, limited studies have been conducted to examine the moderators of continuance intention (Lin, 2011). With specific regard to the influence of perceived flexibility advantages on mobile learning outcome, it has been found that there is still a dearth of studies probing into the moderating effect of perceived flexibility advantages on mobile learning continuance intention, which refers to students' continuance intention to use mobile technology to acquire new knowledge. Accordingly, this issue should be worthy of further investigations, and the primary purpose of this study was to explore the key factors that could affect mobile learning continuance intention, and examine the moderating effect of perceived flexibility advantages on the relationship between key mobile learning elements and continuance intention.

Literature Review and Hypothesis Development

The Definition of Mobile Learning

It has been shown that although there is no universal agreement as to the definition of mobile learning (m-learning), relevant discussions on m-learning are mainly centered on learning flexibility and educational applications of mobile technology (El-Hussein & Cronje, 2010; Park, 2011; Wang et al., 2009). For instance, an early report by Wang et al. (2009) has revealed that “M-learning refers to the delivery of learning to students anytime and anywhere through the use of wireless Internet and mobile devices, including mobile phones, personal digital assistants (PDAs), smart phones and digital audio players” (p. 93). Another recent review by Park (2011) has suggested that “mobile learning refers to the use of mobile or wireless devices for the purpose of learning while on the move” (p. 79). Consequently, based on previous suggestions, mobile learning, in this study, could be broadly described as learning activities through the use of mobile technology.

Perceived Usefulness of Mobile Technology (PUMT)

In prior information technology (IT) research, it has been shown that a person's perception of usefulness toward IT could be closely connected with his or her technology acceptance (Davis, 1989; Roca & Gagné, 2008). According to the technology acceptance model (TAM) proposed by Davis (1989), a person's perceived usefulness of certain IT is described as “the degree to which a person believes that using a particular system would enhance his or her job performance” (Davis, 1989, p. 320). Several online learning studies have indicated a positive link between learners' perceived usefulness and continuance intention (Lee, 2006; Lee, 2010; Roca & Gagné, 2008; Saade & Bahli, 2005). In the mobile learning context, a learner's perceived usefulness of mobile technology (PUMT) is described as the degree to which a learner believes that using mobile devices would enhance his or her English learning performance. It is possible that a learner with higher perceived usefulness of mobile technology would have a more positive MLCI. Hence, this study proposes the following hypothesis.

H1: Perceived usefulness of mobile technology could have a positive influence on mobile learning continuance intention.

Self-Management of Learning (SML)

The self-management of learning (SML), which refers to “the extent to which an individual feels he or she is self-disciplined and can engage in autonomous learning” (Wang et al., 2009, p. 101), has several synonyms such as autonomous, self-directed, self-regulated, and independent learning (Regan, 2003). SML has received much attention in prior research mainly because it could have a positive impact on learning

outcomes (Ommundsen, Haugen, & Lund, 2005). An early review by Chen (2002) has revealed that learners' self-management of learning could be closely associated with their academic performance. Another English learning study by Weschler and Pitts (2000) showed that it could be suitable and beneficial to suggest that English learners with higher levels of self-directed-learning capabilities use electronic dictionaries. This could be because such learners would like to have more autonomous and independent learning opportunities. Wang et al. (2009) indicated that SML could be positively associated with learners' behavioral intention to engage in mobile learning. In mobile learning domains, it is likely that learners with higher SML could have more positive MLCI. Consequently, this study proposes the following hypothesis.

H2: Self-management of learning could have a positive influence on mobile learning continuance intention.

Subjective Norm (SN)

It has been found that advice, suggestions, and viewpoints from critical people such as supervisors, intimate friends, or family members could have a pivotal influence on our decision making process and outcomes (Aggelidis & Chatzoglou, 2009). According to Ajzen (1991), the subjective norm (SN), which is described as "the perceived social pressure to perform or not to perform the behavior" (p. 188), could play a key role in determining people's acceptance and usage of new IT (Aggelidis & Chatzoglou, 2009; Schepers & Wetzels, 2007; Venkatesh & Davis, 2000; Wang et al., 2009). Nevertheless, some IT studies have revealed that SN has no impact on people's behavioral intention (Hsu & Lin, 2008; Yuen & Ma, 2008) and IT system usage (Van Raaij & Schepers, 2008). With specific regard to the effect of SN on continuance intention, it is shown that the positive relationship between SN and continuance intention has been well documented in previous reports (Chen et al., 2012; Lee, 2010). Similarly, in the context of mobile learning, it is possible that mobile learning continuance intention could fall under the sway of subjective norm. Thus, this study proposes the following hypothesis.

H3: Subjective norm could have a positive influence on mobile learning continuance intention.

Perceived Flexibility Advantages (PFA)

Previous studies have revealed that learners' perceptions of the flexibility advantages of online learning could positively affect their intention to adopt online learning courses in the future (Hamzaee, 2005; Hollis & Madill, 2006; McGorry, 2003). Arbaugh (2000) proposed that online learning, which gives learners "a high degree of flexibility in when and where they participate in Internet-based courses" (p. 35), is very desirable to some learners. In other words, the time and place flexibility advantages of online learning are very attractive to learners, probably because flexibility advantages allow them to manage working, learning, and personal activities more conveniently and flexibly (Arbaugh, 2000; Kung, 2002; Marks et al., 2005; Sullivan, 2001). In mobile learning

environments, it has been shown that the perceived flexibility advantages, which refer to the time and place flexibility advantages of learning English through mobile devices, could be closely connected with learners' mobile learning continuance intention, perceived usefulness of mobile technology, and self-management of learning. For instance, Evans (2008) has suggested that students highly emphasize the key effect of flexibility advantages in their behavioral intention to adopt mobile learning. An early report by López-Nicolás et al. (2008) has revealed that there is a positive association between perceived flexibility advantages and the perceived usefulness of mobile technology. Another recent language learning review by Gardner and Miller (2011) has indicated that learners' management of self-access language learning could fall under the sway of learning flexibility.

With particular respect to the link between perceived flexibility advantages and mobile learning effectiveness and efficiency, although there is a growing interest in mobile learning studies, little empirical work has been conducted on the moderating effect of perceived flexibility advantages on mobile learning continuance intention (MLCI). Based on the suggestions of previous reports, accordingly, this study proposes the following hypotheses.

H4: PFA could moderate the relationship between perceived usefulness of mobile technology and mobile learning continuance intention.

H5: PFA could moderate the relationship between subjective norm and mobile learning continuance intention.

H6: PFA could moderate the relationship between self-management of learning and mobile learning continuance intention.

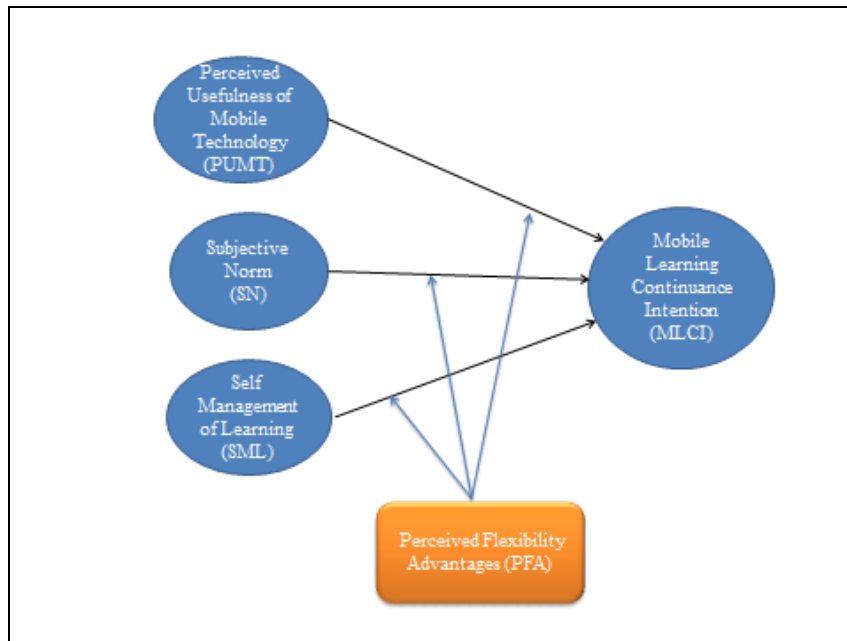


Figure 1. Theoretical framework of the study.

Research Methodology

Data Collection

The data were collected via a pencil and paper survey. Five hundred undergraduate students who had previously adopted mobile devices to learn English took part in this study. Except for four incomplete surveys, the other 496 surveys were usable. As shown in Table 1, there were 245 and 247 male and female participants respectively. Only 23 participants were English major students. In terms of the academic level of participants, it was found that the sophomore group was the largest group, and the freshman group was the second largest group. Finally, it was revealed that most participants in this study were business majors.

Table 1

Profile of Participants

Demographic variable	Items	Frequency	Percentage of respondents
Gender	Male	245	49
	Female	247	50
	Missing data	4	1
Academic level	Freshman	156	31
	Sophomore	188	38
	Junior	64	13
	Senior	68	14
	Missing data	20	4
English major	Yes	23	5
	No	473	95
College major	Business	263	53
	Engineering	42	8
	Social Sciences	138	28
	Sciences	53	11

Instrumentation

A 7-point Likert scale was used to measure the level of agreement of each construct. Items which measured learners' perceived usefulness of mobile technology, subjective norm, and mobile learning continuance intention were adopted from Davis (1989), Venkatesh and Davis (2000), as well as Roca et al. (2006), respectively. Four items which measured perceived flexibility advantages were chosen from Huang et al. (2012) and Marks et al. (2005). In addition, four items which measured self-management of learning were selected from Wang et al. (2009).

Data Analysis and Results

Partial least squares (PLS) analysis was utilized to test the hypotheses in this study. The PLS analysis, one of the structural equation modeling (SEM) techniques, was more suitable not only to analyze the relationship between predictors and outcome variables (Fornell & Bookstein, 1982), but also to give readers a clear picture of variances explained by predictor variables in this study (Barclay, Higgins, & Thompson, 1995). First, with respect to the reliability and internal consistency of measuring scales, according to Table 2, it was found that the factor loading of each variable was all above .70, and the composite reliability (CR) of each construct exceeded .90 (Fornell & Larcker, 1981). Hence, it was demonstrated that all scales indicated an adequate internal consistency.

Moreover, according to Table 3, it was shown that the convergent and discriminant validity were all satisfactory not only because the average variance extracted (AVE) for each construct was higher than the suggested value of 0.5 (Fornell & Larcker, 1981), but also because the square root of AVE values on the diagonal were greater than the off-diagonal correlation values (Fornell & Larcker, 1981). As this study further examined path coefficients of the structural model and hypotheses, it was found that hypothesis 1, 2, and 3 were all supported by the study results, which indicated that the perceived usefulness of mobile technology, subjective norm, and self-management of learning explained a total of 41.8 % of variance in mobile learning continuance intention (see Figure 2).

Finally, in order to determine the moderating effect of perceived flexibility advantages on the relationship between key mobile learning elements and continuance intention, based on the median score of perceived flexibility advantages = 4.75, 496 participants were divided into two groups: high flexibility advantages group ($n = 236$), and low flexibility advantages group ($n = 260$). The PLS analysis was subsequently carried out to explore the path structures for both models (see Figure 3 and 4). Additionally, the analysis of path coefficient comparison, which was suggested by Keil, Tan, Wei, and Saarinen (2000), was conducted to examine the moderating effect of flexibility advantages in this study. As shown in Table 4, it was demonstrated that except hypothesis 6, hypothesis 4 and 5 were supported by the study findings, which revealed that the perceived flexibility advantages moderated the relationship between perceived usefulness of mobile technology and mobile learning continuance intention, as well as the link between subjective norm and mobile learning continuance intention.

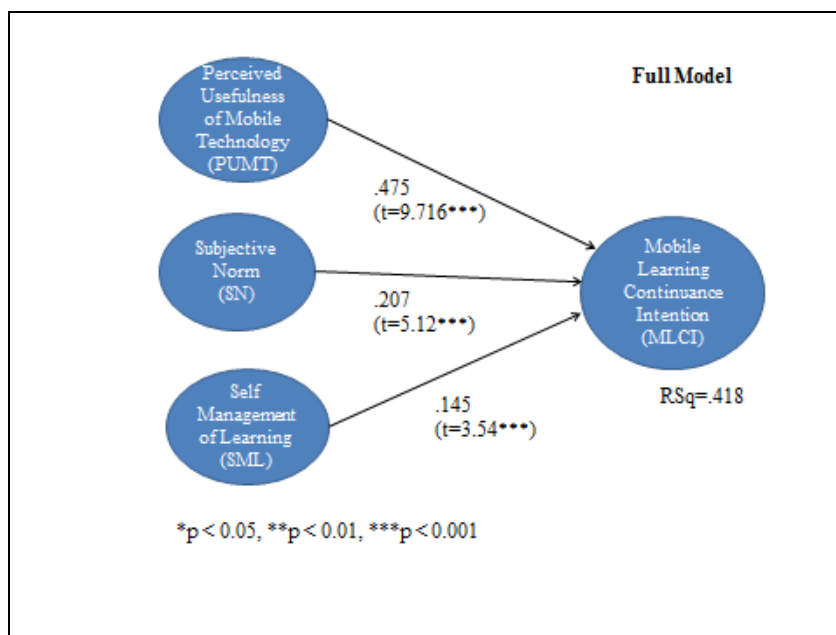


Figure 2. PLS solution for full data set.

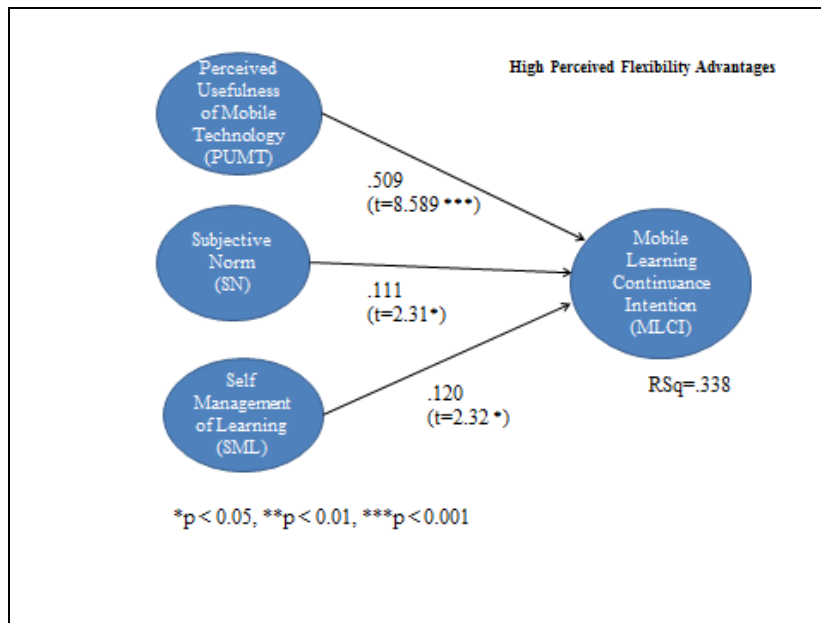


Figure 3. PLS solution for high perceived flexibility advantages group.

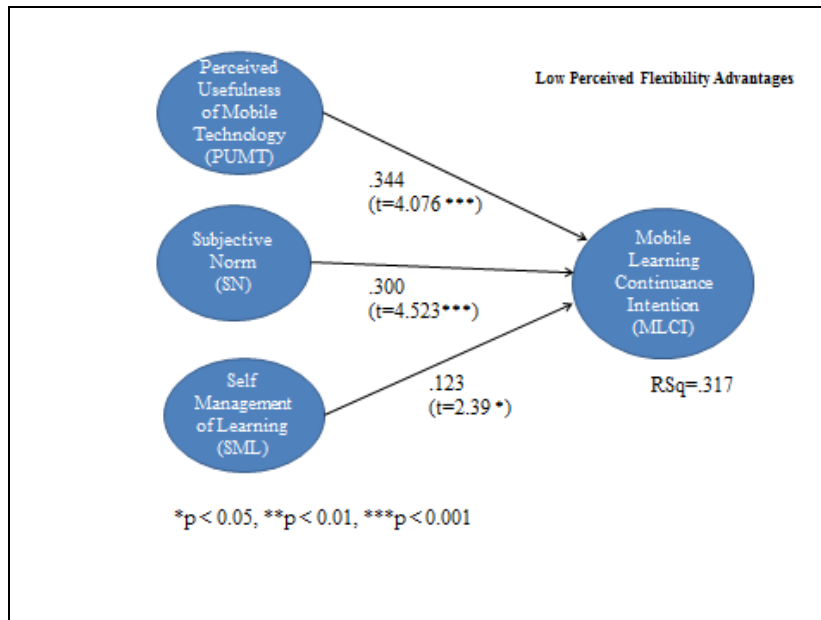


Figure 4. PLS solution for low perceived flexibility advantages group.

Table 2

Confirmatory Factor Analysis of Each Model

Item	PUMT			SML			SN			MLCI		
	FM	H	L	FM	H	L	FM	H	L	FM	H	L
PUMT1	.89	.86	.88									
PUMT2	.92	.90	.92									
PUMT3	.88	.85	.87									
PUMT4	.88	.85	.87									
SML1				.88	.86	.91						
SML2				.90	.90	.89						
SML3				.86	.87	.77						
SML4				.87	.90	.80						
SN1							.88	.90	.84			
SN2							.93	.93	.93			
SN3							.82	.92	.90			
MLCI1										.91	.91	.88
MLCI2										.91	.90	.88
MLCI3										.88	.86	.86
CR	.94	.92	.93	.93	.93	.90	.93	.93	.92	.92	.92	.90
AVE	.80	.75	.78	.77	.77	.71	.83	.83	.79	.81	.79	.76
Cronbach's Alpha	.91	.88	.90	.90	.90	.86	.90	.90	.87	.88	.87	.84

Note. PFA, perceived flexibility advantages; FM, full model; H, high perceived flexibility advantage group; L, low perceived flexibility advantage group; PUMT, perceived usefulness of mobile technology; SML, self-management of learning; SN, subjective norm; MLCI, mobile learning continuance intention; CR, Composite Reliability; AVE, Average Variance Extracted

Table 3

The Correlations of Each Latent Variable among Different Models

Full Model	PUMT	SML	SN	MLCI
Perceived Usefulness (PUMT)	.80			
Self-Management of Learning (SML)	.27	.77		
Subjective Norm (SN)	.37	.29	.83	
Mobile Learning Continuance Intention (MLCI)	.59	.33	.42	.81
PFA-HIGH	PUMT	SML	SN	MLCI
Perceived Usefulness (PUMT)	.75			
Self-Management of Learning (SML)	.20	.77		
Subjective Norm (SN)	.19	.19	.83	
Mobile Learning Continuance Intention (MLCI)	.55	.24	.23	.79
PFA-LOW	PUMT	SML	SN	MLCI
Perceived Usefulness (PUMT)	.78			
Self-Management of Learning (SML)	.11	.71		
Subjective Norm (SN)	.33	.19	.79	
Mobile Learning Continuance Intention (MLCI)	.45	.22	.44	.76

Note. Diagonal elements are the square root of Average Variance Extracted; PUMT, perceived usefulness of mobile technology; PFA, perceived flexibility advantages; MLCI, mobile learning continuance intention; SML, self-management of learning; SN, subjective norm

Table 4

Statistical Comparison of Each Path

Hypothesis	Path	HIGH PFA (N=236)		LOW PFA (N=260)		Comparison
		Path coefficient	Standard error	Path coefficient	Standard error	
H4	PUMT→MLCI	.509	.059	.344	.084	25.08***
H5	SN→MLCI	.111	.048	.300	.066	-36.16***
H6	SML→MLCI	.120	.051	.123	.051	-.65

Note. PUMT, perceived usefulness of mobile technology; PFA, perceived flexibility advantages; MLCI, mobile learning continuance intention; SML, self-management of learning; SN, subjective norm

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Discussion and Implications

The primary purpose of this study was to explore the key factors that could affect MLCI, and further examine the moderating effect of perceived flexibility advantages on the relationship between key mobile learning elements and continuance intention. First, it has been found that hypothesis 1, 2, and 3 are supported by study findings. The study results are congruent with previous research which indicates that the perceived usefulness of mobile technology (PUMT), subjective norm (SN), and self-management of learning (SML) could be closely linked to mobile learning continuance intention (Lee, 2010; Roca & Gagné, 2008; Wang et al., 2009). It is implied that more attention should be paid to whether the functions and services of mobile devices are suitable for mobile learning, mainly because perceived usefulness of mobile technology could play the most important part in determining learners' mobile learning continuance intention. Moreover, in order to minimize the possible interruption to mobile learning, it is important that more efforts should be made not only to facilitate learners to have better self-management of learning, but also to properly give them recommendations for future mobile learning.

Third, it has been demonstrated that hypothesis 4 and 5 are supported by study results. The findings are in line with early reviews (Evans, 2008; López-Nicolás et al., 2008), which suggest that perceived flexibility advantages could moderate the relationship between perceived usefulness of mobile technology and mobile learning continuance intention, as well as the association between subjective norm and mobile learning continuance intention. That is, learners with higher perceived flexibility advantages are more likely to have stronger relationship between perceived usefulness of mobile technology and mobile learning continuance intention than those with lower perceived flexibility advantages, whereas learners with higher perceived flexibility advantages are more likely to have weaker relationship between subjective norm and mobile learning continuance intention than those with lower perceived flexibility advantages. It is hinted that with respect to learners with lower perceived flexibility advantages, subjective norm should deserve more attention, mainly because critical insights from key people could be more important to them in affecting their mobile learning continuance intention. On the contrary, with specific regard to learners with higher perceived flexibility advantages, perceived usefulness of mobile technology should merit first consideration, mainly because it could play a relatively more important role in facilitating their mobile learning continuance intention.

Last but not least, it has been shown that hypothesis 6 is not supported by study findings. The study result is not consistent with previous research (Gardner & Miller, 2011), which reveals that perceived flexibility advantages did not moderate the relationship between self-management of learning and mobile learning continuance intention. In other words, learners with different levels of perceived flexibility advantages could still have a similar relationship between self-management of learning and mobile learning continuance intention. Nevertheless, it is suggested that more

studies are needed in order to verify the role of perceived flexibility advantages in self-management of learning and mobile learning studies.

Limitations and Conclusions

There are some limitations and restrictions in this study that should be further addressed. First, findings and implications drawn from this study should be applied with caution, mainly due to the limited data available. Moreover, it is necessary that suppliers of mobile technology, one of the important stakeholders, should be further incorporated into future mobile learning studies in order to gain insights from different stakeholders. Third, due to age differences, it is possible that mobile learning effectiveness and efficiency could be subject to change. Accordingly, more studies should be conducted to investigate the role of the age variable in subsequent mobile learning studies.

In conclusion, this report has further added to the body of knowledge in the field of mobile learning through empirical examination. As mobile learning has gradually become a key learning channel in our lives, it is critical that the researchers and practitioners should concentrate not only on the use of mobile technology, but also on the continued use of mobile technology in learning.

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