Korean Students' Intentions to Use Mobile-Assisted Language Learning: Applying the Technology Acceptance Model

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ABSTRACT

The purpose of this study was to examine how Korean students accept and use mobile-assisted language learning (MALL) and investigate related factors that potentially affect MALL usage. The participants were 244 undergraduate students who were surveyed with a questionnaire. The research model, which included students' self-efficacy, content reliability, interactivity, perceived enjoyment, perceived usefulness, perceived ease of use, attitude, and behavioral intention to use MALL, was developed based on the technology acceptance model (TAM). The structural equation modeling (SEM) technique was employed in order to analyze the overall results of modified TAM and the research model. The results indicated that TAM was a good theoretical tool to understand students' acceptance of MALL. In addition, all constructs, with the exception of self-efficacy and interactivity, had significant effects on students' acceptance possibilities of MALL. Limitations and suggestions for the further study are also presented.

Key words: Mobile-Assisted Language Learning, English Education, Technology Acceptance Model, Structural Equation Modeling.

1. INTRODUCTION

With a widespread use of mobile phones and other portable and wireless devices, mobile-learning (M-learning) has been changing the landscape of technology-enhanced learning environment. Students are now provided with a variety of learning contents through various mobile devices and engaged in learning activities that fit their personal needs. Furthermore, with a wireless Internet connection, the students are enable to have opportunities to access learning resources in 'anytime', and 'anywhere' [1].

M-learning is now considered one of the important alternatives for traditional classroom-based learning, and likewise, the number of M-learning opportunities and materials continues to grow in the context of language learning. A variety of learning materials and activities has recently developed to deliver language learning contents, and various attempts have done to adapt M-learning in formal or informal learning contexts.

Consequently, language teachers and educators attempt to follow these recent trends of education and consider setting up

M-learning systems in actual language classrooms. In addition, Korea has well-developed WiFi-network systems and takes full advantages of information technology (IT) to support all levels of language education.

The concept of mobile-assisted language learning (MALL) first appeared in 1994 [2], and since then, MALL has focused on the exploitation of various mobile technologies. A number of studies have been done to explore an adequate perspective of MALL implementation over the past two decades. The topics covered are varied such as mobile device ownership [3], pedagogical design and development [4], effectiveness of M-learning activities [5], [6], learner perceptions and attitudes [7], [8], institutional infrastructure, teacher training, and so forth.

Many researchers have focused on the possibilities and implementations of MALL in previous research, and more recently, the research trends have moved to student-centered learning activities and interactions through social network service (SNS) [4]. However, there has not many studies done to understand how language learners perceive and react to elements of MALL along with how to most effectively apply a MALL environment.

In fact, it is important for language teachers and educators to know students' intentions and factors that affect their beliefs about MALL in order to attract more students to adopt this new learning environment [9]. However, as [10] pointed out, research that empirically determined the relationship of

university students' use of technology-enhanced learning with personal factors, social factors, and organizational factors has relatively little done in Korea.

For this reason, the present study aimed to empirically investigate how Korean university students perceive the factors of MALL and their intention to use MALL. It also tried to develop a structural model of MALL acceptance that provided a language teachers and educators with implications for better implementing MALL. To do so, the current study proposed an integrated research model of MALL usage mainly based on the technology acceptance model (TAM) and prior MALL research. The constructs selected for the current research model were students' M-learning self-efficacy, interactivity, content reliability, perceived enjoyment, perceived usefulness, perceived ease of use, attitude toward MALL, and behavioral intention to use MALL.

2. LITERARUE REVIEW

2.1 Mobile-Assisted Language Learning

Ever since the concept of M-learning was adopted in the field of language learning research in the mid-1990s, many researchers have paid attention to the use of mobile technologies in language learning settings and suggested the definition of MALL [2]. There is no clear definition that all agreed, but MALL is generally defined as the use of mobile technologies to support language learning.

According to [11], MALL is perceived as a part of computer-assisted language learning (CALL), but there are important differences between existing CALL and MALL. Unlike CALL, MALL uses personal, portable devices that enable new ways of M-learning and emphasizes continuity or spontaneity of access. In other words, MALL pays its special attention to the mobility of learners and contents, not only the general notion of learner's spatial movement but also the ways of shifting one's time and crossing boundaries [11], [12]. Therefore, a mobile device in MALL environment acts as a bridge between different contexts of learning, some of which as 'formal' whilst other are more 'informal' [6], [11]. In addition, the use of various mobile technologies takes learning out of the language classrooms and plays a key role to accomplish learning objectives that fit individual learners' preferences and needs.

For this reason, MALL emphasizes on the individual learner's personal factors, and some research has focused on students' perceptions and attitudes towards MALL [7], [8], [13]. Wang [8], for example, examined university students' learning experiences through collaborative learning tasks. She used mobile-based SNS applications and found that students had positive feelings about mobile networking learning. She also found that perceived individual accountability and quality of feedback were two predictors of perceived learning quality. From these findings, she concluded that wireless and mobile technologies could integrate into classroom-based environment.

On the other hand, MALL is extended to provide multimedia contents and allows interactions across different contexts of use [14]. Language learners are able to use the mobile devices for downloading and listening more authentic

audio-video clips, recording and creating their own voices, uploading and sharing feedbacks whenever and wherever they want. Therefore, these context-free interactive services on handheld devices support collaborative speaking and listening activities [1], [6].

Overall speaking, a key principle of MALL is identified as the possibilities or feasibilities for personalized, situated, authentic, spontaneous, and informal learning [15]. However, the majority of previous studies have employed mobile devices as a means of delivering learning contents to learners at specific, pre-set times within formal settings [2], [5], [6]. Most researchers hardly applied MALL in more informal language learning contexts because of cost-issues, lack of willingness toward cutting-aged technologies, accessibilities to technologies or preference for low technology solutions. For this reason, [3] argued that MALL might not really take advantage of this principle if some barriers were not carefully considered when using mobile devices. This is why it is important to figure out potential factors that may or may not influence students' acceptance of MALL.

2.2 Technology Acceptance Model

TAM is one of the well-known models related to technology acceptance and use. It was originally proposed by [16], and has been considered a theoretical model to explain and predict user behavior towards new IT systems. According to TAM, user's actual use of an IT system is influenced directly or indirectly by the one's behavioral intentions, attitude, perceived usefulness of the system, and perceived ease of the system. TAM also proposed that external variables affect one's intention and actual use through mediated effects on perceived usefulness and perceived ease of use. Fig. 1 displays the original TAM proposed by [16].
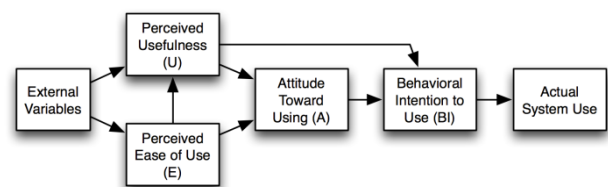

Fig. 1. The Original TAM proposed by Davis (1989)

Ever since proposed originally, TAM has evolved over time, and some researchers extended the original model to explain how people accept and reject new technologies [17]-[20]. Based on these studies, extended TAM was used to demonstrate which variables influenced intention to adopt and use new learning technologies, provide information about predictive factors beyond TAM, and make a prediction of their acceptance and use of e-learning medium.

Lee, Cheung, and Chen [17], for example, investigated university students' adoption behavior towards an Internet-based learning medium (ILM). By integrating a motivational perspective into TAM, they included perceived usefulness and ease of use as extrinsic motivators and used perceived enjoyment as an intrinsic motivator. The results collected from 544 undergraduate students showed that both perceived

usefulness and perceived enjoyment had significant effects on their intention to use ILM. Interestingly, students' perceived ease of use did not show a significant impact on their attitude or intention to use ILM.

On the other hand, [18] proposed an integrated theoretical framework by introducing TAM and flow theory, which emphasized concentration on the structural model. They included constructs from TAM and flow theory and tested their integrated theoretical framework of online e-learning users' acceptance behavior.

In Korea, [19] adopted TAM and analyzed structural relationships of university students' intention to use M-learning with related affective factors. They proposed a theoretical framework that included attitude towards M-learning, M-learning usefulness, ease of use, and intention to use M-learning as internal variables, and self-efficacy, learning relevance, system accessibility, and subjective norm as external variables. Data collected from 648 undergraduate students were analyzed through the structural equation modeling

The results showed that constructs such as attitude towards M-learning, learning relevance, and subjective norm had a significant and direct impact on students' intention to use M-learning. Attitude towards M-learning was directly affected by perceived usefulness, self-efficacy, learning relevance, subjective norm, and both self-efficacy and system accessibility significantly affected perceived ease of use. Additionally, by analyzing structural paths for direct and indirect effects, they concluded that both learning relevance and subjective norm were analyzed as key constructs that predicted students' intention to use M-learning.

A similar study done by [20] also examined the students' intention to use e-learning materials in a formal classroom setting, especially for elementary school students' acceptance of English digital textbooks. 313 students who had no previous experiences of digital textbooks responded to the survey. As results, the study found that the factors influencing the students' acceptance of digital textbook were usefulness and playfulness. In addition, the study also revealed that the possibilities of students' acceptance were high. From these results, he insisted that these two factors should be considered when adapting digital textbooks in elementary English classrooms.

From the previous research reviewed above, constructs related to the students' behavioral intention of new IT usage in learning environment could be categorized into several groups: individual or personal factors (perception, self-efficacy, attitude, motivation, enjoyment, etc.), social factors (subjective norm, voluntariness, personalities, interactivity), cognitive factors (output quality, usefulness, easiness, confidence, concentration), and organizational factors (relevance, system accessibility, system visibility).

3. METHODOLOGY

3.1 Research Model Design

Based on the previous research, a theoretical research model was developed for the current study [10], [17], [19], [20]. Four external variables related to the behavioral intention of MALL usage were selected to be tested: M-learning self-

efficacy (SE), M-learning interactivity (IN), content reliability (RE), and perceived enjoyment (EJ). Four constructs (latent variables) were also included in the model: perceived ease of use (PE) and perceived usefulness (PU) were considered cognitive constructs, and attitude towards MALL (AT) was considered an affective construct. Meanwhile, the behavioral intention to use MALL (BI) could be regarded as a behavioral construct. Fig. 2 demonstrates the research model to be tested and analyzed in this study.
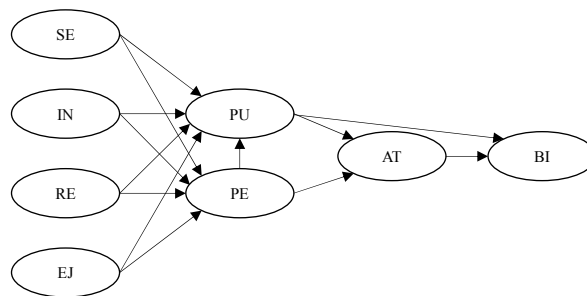

Fig. 2. The Research Model of the Study

3.2 Instrument

The instrument was developed by two researchers based on the aims of the study and previous research mentioned earlier [10], [17], [19], [20]. The complete instrument was a self-response questionnaire and divided into two parts. Part I was designed to collect demographic information of the participants. It consisted of question items inquiring gender, academic years, age, major, and M-learning experience. The measurement model was stated in Part II. The question items were not only modified based on Davis's original TAM but also mainly adapted from four previous studies to fit the specific context of the MALL. The questions in Part II consisted of eight sub-sections, including SE, IN, RE, EJ, PE, PU, AT, and BI, and each variable (construct) was measured by three question items. The measurements were phrased on a five-point Likert-scale, from 1 (strongly disagree) to 5 (strongly agree).

3.3 Participants

The participants of the study were 244 undergraduate students at a university located in Chungbuk area, South Korea. The students were enrolled in seven different English classes in the spring semester of 2016 and voluntarily participated in this study. Among all participants, 146 students were male and 98 students were female. Since the English class was a required course for all freshman of the university, most of the participants were in their first year of school. The ages of most students were ranged from 20 to 24. In addition, about 60 percent of 244 students had previous experiences of M-learning. Table 1 displays the demographic information of the participants.

Table 1. Demographic Information of the Participants

Variables		N	%
Gender	Male	146	59.8
	Female	98	40.2

	Freshman	181	74.2
School year	Sophomore	36	14.8
	Junior	8	3.3
	Senior	19	7.8
	Under 19	14	5.3
Age	20~24	231	89.4
	Over 25	13	5.2
Previous experience of M-learning	Yes	147	60.2
	no	97	39.8

3.4 Research Procedure

Data collected from the questionnaire were coded by one of the researchers. The data were recorded first in an MS Excel program and later transferred to SPSS 22.0. Descriptive analyses were conducted using SPSS. In order to test the research model presented in Fig2, a confirmatory factor analysis and a structural equation modeling (SEM) analysis were carried out, and AMOS 22.0 was employed for it.

4. RESULTS

4.1 Reliability and Validity of Measures

In the measurement model, the reliability and validity were checked through a confirmatory factor analysis (CFA). Table 2 describes the results of the CFA and the relationships between constructs (variables) and observed indicators (question items).

Table 2. The Results of the CFA

Constructs	Items	Estimate	S.E.	t	AVE	C.R.
SE	A1	0.87	-	-	0.72	0.89
	A2	0.90	0.06	16.56		
	A3	0.76	0.06	13.84		
IN	B1	0.77	-	-	0.62	0.85
	B2	0.86	0.09	12.26		
	B3	0.72	0.08	10.77		
RE	C1	0.75	-	-	0.56	0.85
	C2	0.77	0.11	10.32		
	C3	0.72	0.11	9.92		
EJ	D1	0.78	-	-	0.72	0.88
	D2	0.85	0.07	14.11		
	D3	0.91	0.08	15.01		
PE	E1	0.80	-	-	0.64	0.86
	E2	0.83	0.07	13.51		
	E3	0.77	0.07	12.34		
PU	F1	0.84	-	-	0.67	0.88
	F2	0.84	0.07	15.25		
	F3	0.78	0.07	13.68		
AT	G1	0.86	-	-	0.73	0.90
	G2	0.88	0.06	17.70		
	G3	0.83	0.06	15.95		
BI	H1	0.90	-	-	0.70	0.87
	H2	0.84	0.05	17.07		
	H3	0.77	0.06	14.75		

Above all, the overall model fit measures of the measurement model were checked. In general, the model fit measures were examined by checking the root mean squared residual (RMR), the goodness-of-fit index (GFI), adjusted goodness-of-fit index (AGFI) and the comparative fit index (CFI), normed fit index (NFI), and the root mean squared error of approximation (RMSEA). GFI and CFI with values exceeding 0.9 and AGFI with values exceeding 0.8, indicate a good fit. Also, RMSEA with values under 0.08 is commonly regarded as a good fit to the data [21].

The overall model fit measures of the current measurements were: χ^2 =387.23(df=224), GFI=0.889, CFI=0.957, AGFI=0.851, RMSEA=0.055, which was statistically significant and considered acceptable. Therefore, all constructs and observed indicators were accepted and judged to be good enough to explain the research model of the present study.

The validity of constructs is related to the degree of correspondence between the constructs and usually checked by three validity tests: convergent validity, discriminant validity, and nomological validity [22].

Firstly, convergent validity refers to the extent to which more than two indicators of a potential factor that theoretically should be related to each other are in fact correlated. All standardized factor loadings (estimates) on the constructs should exceed 0.5 and statistically significant (t>1.96) [23]. As shown in table 2, the values of estimates were all higher than 0.72 and statistically significant, and therefore, the indicators of each variable correlated highly enough. In addition, average variance extracted measure (AVE) with values exceeding 0.5 [24] and composite reliability (C.R.) with values exceeding 0.7 [25] are generally an acceptable level of convergent validity. As displayed in table 2, the scores of AVE and C.R. were all satisfied with those levels, which meant that the convergent validity of the constructs was checked.

Secondly, discriminant validity implies the degree to which measures of constructs that theoretically should not be related to one another are observed to be not related. The discriminant validity is usually checked by examining correlations among the constructs. The AVE on each potential factor should be larger than the squared correlations between the two constructs [24]. Table 3 presents cross-construct correlations.

Table 3. Correlation Matrix between Constructs

	SE	IN	RE	EJ	PE	PU	AT	BI
SE	**0.72**							
IN	0.19	**0.62**						
RE	0.07	0.22	**0.56**					
EJ	0.02	0.21	0.23	**0.72**				
PE	0.13	0.29	0.34	0.29	**0.64**			
PU	0.10	0.30	0.40	0.32	0.61	**0.67**		
AT	0.17	0.31	0.36	0.32	0.60	0.67	**0.73**	
BI	0.07	0.26	0.36	0.47	0.47	0.55	0.62	**0.70**

As indicated on the diagonal of the table 3, each value of AVE was all higher than the squared correlations, and therefore, the measurements of this study were found to have adequate discriminant validity.

Lastly, nomological validity refers to the degree to which a construct behaves as it should be within correspondence rules of related constructs. It requires a comparison of at least two constructs, and those constructs or variables have possible linkages and directions between constructs. The nomological validity is actually measured by operating correlations and the degree of significance level [22]. In comparison with the previous study, the measurements of this study were positively correlated with one another and statistically significant. Therefore, the nomological validity of the measurements was also good enough to fit.

4.2 Analysis of the Research Model

After checking the reliability and validity of the measurement model, the SEM was conducted with the question items of the measurements. The overall model fit measures of the research model were appeared to be acceptable: χ^2 =429.830(df=233, p=0.000), GFI=0.877, CFI=0.948, AGFI=0.842, RMSEA=0.059, which was consistent with recommended levels [21].

The general SEM was used to test simple bivariate relationships between the constructs included in the research model. The structural paths were tested by confirming the presence of statistically significant relationships in a predicted direction. The results of SEM, including path coefficients (estimates), their t-values, and p-values, are summarized in table 4.

Table 4. Results of the SEM

Path			Estimate	S.E.	t
SE	→	PE	0.18	0.06	2.65**
IN	→	PE	0.19	0.08	2.28*
RE	→	PE	0.33	0.11	3.97***
EJ	→	PE	0.28	0.07	3.77***
SE	→	PU	0.02	0.05	0.38
IN	→	PU	0.11	0.07	1.58
RE	→	PU	0.22	0.10	3.00**
EJ	→	PU	0.19	0.06	2.86**
PE	→	PU	0.49	0.08	5.72***
PE	→	AT	0.35	0.10	3.58***
PU	→	AT	0.56	0.11	5.62***
AT	→	BI	0.44	0.13	3.94***
PU	→	BI	0.41	0.15	3.64***

* p<0.05, ** p<0.01, *** p<0.001

According to table 4, all of the path coefficients to PE were found statistically significant. For example, the estimate between SE and PE was 0.18(t=2.65), which meant that SE significantly affected PE. Likewise, IN also had a positive impact on PE since the estimate between IN and PE was 0.19 (t=2.28). In addition, both RE and EJ were identified as the significant determinants to PE, and path coefficients were 0.33 (t=3.97) and 0.28(t=3.77) respectively.

Regarding PU, both RE (0.22, t=3.00) and EJ (0.19, t=2.86) had significant effects on PU. However, SE (0.02,

t=0.38) as well as IN (0.11, t=3.00) were found non-significant to PU. Additionally, the path coefficient between PE and PU (0.49, t=0.08) was also statistically significant, and therefore, PE influenced PU in a positive way.

In terms of AT, both PE (0.35, t=3.58) and PU (0.56, t=5.62) turned out to be important factors, and the relationships were statistically significant each other. As far as BI was concerned, both AT (0.44, t=3.94) and PU (0.41, t=3.64) were identified to be significant.

5. CONCLUSION AND IMPLICATION

Based on rational behavior theory, TAM is a theory to explain user's acceptance and use of IT [20], and the current study confirmed that TAM was a useful theoretical model to predict students' behavioral intention to use MALL. According to the results of SEM analyses, the key constructs of this study showed significant relationships with one another and had direct and indirect impacts on students' behavioral intention to use MALL. In fact, in the field of language education research, there has not many tries done to empirically examine students' acceptance and use of MALL and related factors. This study was one of the few attempts to investigate students' acceptance of MALL employing TAM and suggested a holistic model explaining how students adopt MALL or demonstrate potential factors that affect MALL usage.

The results of the current study indicated that most path coefficients between constructs were found statistically significant, which meant that the current research model well represented the collected data. However, the paths from students' M-learning self-efficacy and interactivity of MALL to perceived usefulness were found non-significant, which meant that both self-efficacy and interactivity would not directly influence perceived usefulness of MALL. This could be interpreted that although the students felt confident dealing with M-learning devices and socially interacted with one another through mobile devices, they were suspicious of its usefulness as language learning tools.

Based on the findings of the study, it suggests some pedagogical implications for language teachers and system designers to implement MALL environment.

First, language teachers and system designers should make MALL contents to be reliable so that the students could perceive MALL to be easy and useful. To do so, MALL materials are designed to provide immediate feedback that the students are dependable on, and therefore, they could correct misunderstood parts and build upon a progress [5].

Second, teachers should create enjoy-and-learn environment. In MALL, the good use of games, quizzes, and other creative approaches can install more fun and interest in the learning process, so the students could be encouraged to use MALL [18], [20].

Third, teachers should consider students' self-efficacy as an intrinsic motivator and guide them to feel easy on MALL. The students' beliefs about their capability to use mobile devices make them feel easy on MALL, and the feeling of easiness improves students' attitude to MALL usage.

Last, teachers should encourage students to interact with MALL systems and other users. Wireless online social networking through a hand-held device fosters student collaboration and a sense of community [8], and it makes the students feel easy on MALL and intrinsically motivated to adopt MALL. In addition, rich multimedia capability of MALL can be used to create various types of learning contents and activities, so the students could interact with various MALL contents, such as images, sounds, or texts, in a coordinated manner, and it facilitates their understanding and memory.

Although the present study was a meaningful try to present structural framework for students' MALL acceptance, there are several limitations and suggestions for the further study. First, the study aimed to investigate students' behavioral intention to use MALL, but the participants of this study included both experienced and unexperienced students of M-learning. However, since the students who did not have prior experiences might respond to the survey based on their deliberate intentions related to the future use, the results could be differently interpreted depending on the experience of MALL. Thus, further study needs to be done by classifying students into groups based on the presence or absence of MALL experience and analyze the differences and relationships between groups of students.

Second, the definition of MALL employed for the current study did not exactly reflect the recent trends of smartphone-based language learning circumstances. Therefore, similar studies need to be conducted to handle more recent smart-learning circumstances or infrastructures. Since little research has been done to deal with behavioral intention to smartphone-based MALL and relationships among related factors, it is highly recommended to carry out further research employing TAM.

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