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Review Article

Gender and Age Matter: Acceptance of Smart Phones for Learning in Higher Education in South Korea

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Abstract

The purpose of this study is to examine how students in higher education are using smart phones for learning and to investigate gender and age difference in student's acceptance level towards smart phones. Data were collected from 164 undergraduate and graduate students in South Korea. The findings show that students in higher education are using smart phones mostly in order to search the Internet, chat/use mobile messenger, and use Social Networking Sites (SNS). There is no gender difference regarding the purpose for using smart phones. The results also reveal that the younger the students are, the more they use SNS and mobile messenger. However, there are gender differences in facilitating conditions and anxiety. The findings show that female students have lower facilitating conditions and higher anxiety when they use mobile technology. Finally, these results suggest that educators should develop curriculum that can help female students to be more exposed to using mobile technology.

Keywords: Smart phones; Acceptance; Gender; Age; Higher Education; South Korea

Introduction

It is not hard to spot people staring at their mobile phones inside a subway or a public bus in South Korea. According to the Korea Internet and Security Agency (KISA), during the last 12 years 95.5% of Korean people owned mobile phones and 90% of the owners had smart phones [1]. KISA also reported which age group use smart phones: people in twenties used it the most (99.2%), those in thirties (98.6%) came in second, ages 12 to 19 (97.8%) the next, and then those in forties (95.6%). Concerning the purpose for using smart phones, 95.9% of the participants responded that they use it for searching and acquiring information and 94.6% replied that they use it for communication purposes [1].

As mobile technology is widely disseminating, many researchers and educators have addressed the possibility of using mobile technology as a learning tool. Some researchers have investigated the effectiveness of mobile learning and the level of acceptance towards mobile technology that promotes teaching and learning [2-5]. Examining the users' level of technology acceptance towards mobile phones helps to explain the reason why users utilize and obtain mobile technology [2].Conducted a survey that studies undergraduate students 'attitude and perception toward mobile learning and found that mobile learning advances learners' retention. While many have conducted studies on learners' acceptance of mobile technologies [6-8] little is known about how much of mobile technology is being used for learning both in and out of classrooms. Therefore, the research team for this current study examined students' actual usage of smart phones in higher education. This research poses the following questions:

(1) How do students in higher education use smart phones for learning?

(2) Do purposes for using smart phones differ by gender and age?

(3) Do the acceptance level towards smart phones differ according to the amount of daily usage of smart phones?

(4) Do students' acceptance level towards smart phones differ by gender and age?

Literature Review

Mobile Learning

Due to ubiquitous, portable, spontaneous, and personalized characteristic of mobile technology [9,10] and already established infrastructures such as Wi-Fi network and high-speed Internet connection in Korea [11], usage of mobile technology for learning has rapidly drawn both researchers and educators' attentions.

However, mobile learning is still at its infancy both in research and in practice.

Many researchers define mobile learning as an activity of learning where users access information and communicate with others by utilizing mobile technology, wherever they are. [12-14] According to mobile learning "combines individualized learning with anytime and anywhere learning". Other researchers [15,16] define mobile learning as learning facilitated by mobile devices. [17] analyzed mobile learning in three specific ways: mobile learning as "learning that is delivered and supported by mobile technology; [2] that is both formal and informal; and [3] that is context aware and authentic for the learner" (p.19).

Mobile technology can provide many benefits to its users. First, it enables students to access information and knowledge anywhere, anytime [18]. That is, students can access course content, as well as interact with instructors and their peers no matter where they are [19-21]. Mobile technology enable learners to engage in constant connectivity [22, 23] foster collaborative learning [24,25] and allow students to create personalized and authentic learning experience [26,27,22]. According to Gikas and Grant's qualitative research based on focus group interviews of seven undergraduate or graduate college students, they found that students benefit from mobile technology in that [1] students can access information quickly, [2] constant connectivity available to students enable them to communicate with fellow classmates and instructor immediately and continually, and [3] students can learn by interacting with course contents in variety of ways, and [4] mobile technology allows for students' situated learning.

United Theory of Acceptance and Use of Technology (UTAUT) towards Mobile Learning

The Unified Theory of Acceptance and Use of Technology (UTAUT) was created by Venkatesh and his colleagues (2003) and their model is now being widely accepted in the field of information and communication technology. UTAUT applies four concepts to explain why people use and accept technology: performance expectancy, effort expectancy, social influence, and facilitating condition that directly influence the behavioral intentions to use smart phones [28]. Performance expectancy is defined as "the degree to which an individual believes that using the system will help him or her to attain gains in job performance". Perceived usefulness can be interpreted to be the same as performance expectancy. Effort expectancy is defined as "the degree of ease associated with the use of the system". Perceived ease of use is interchangeable with effort expectancy. Social influence is defined as "the degree to which an individual perceived that important others believe he or she should use the new system". Facilitating conditions is defined as "the degree to which an individual believes that an organizational and technical infrastructure exists to support the use of the system". Behavioral intentions to use are defined as "the person's subjective probability that he or she will perform the behavior in question". In this UTAUT model, gender, age, experience and voluntariness of use are moderating variables.

Many researchers are starting to focus more on mobile technology as it penetrates into people's lives and is being distributed to everyone. In particular, user's acceptance of mobile learning is one of the interesting topics in this field [29,30] examined mobile learning readiness in American higher education. A total of 177 students participated in this research and the results showed that attitudes, subjective norm and behavioral control affected the intentions to use mobile learning. Hwang and Chang (2011) also found that in Taiwan, enhancing learner's satisfaction, encouraging learners' autonomy, empowering system functions, and enriching interaction and communication activities improved acceptance levels towards mobile phones. According to performance expectancy and effort expectancy influence the intentions to use mobile technology. Also social influence and facilitating conditions affect attitude towards mobile technology. Finally, in Saudi Arabia, researchers found that attitude towards mobile technology affects intention to use mobile technology. Interestingly, according to a meta-analysis study conducted by [31] most studies of mobile learning dealt with the motivation, perceptions, and attitudes of students toward mobile and ubiquitous learning. However, most of these available studies were conducted by US-based researchers, followed by researchers in the UK and Taiwan.

South Korea is one of the more developed countries in terms of Internet and mobile technology. Most Koreans are using mobile technology regardless of gender and age. According to [32], performance expectancy, social influence, perceived playfulness, and self-management of learning are determinants of mobile learning behavioral intention. They examined a total of 172 students at two universities in South Korea. [33] explored users' acceptance towards mobile technology and a total of 215 staff, students, and faculty members from 10 universities in Korea participated in this study. They found that perceived usability and perceived quality affected behavioral intention for mobile learning. Another study by [34] examined how students accept technology at Kunkuk University in South Korea. A total of 288 students responded and this study results confirmed that attitude, followed by students' major and subjective norm, is the most important construct in explaining the causal process in the model. In the context of mobile learning, social influence (e.g., teachers, parents, peers, etc.) strongly affected younger students' intention to accept and use mobile devices for learning purposes. That is consistent with the findings of [35] that social influence has a significant effect on usage intention of mobile learning.

Age and Gender Differences and Technology

Generally acceptance level towards a specific technology may differ by gender or age [36]. Conducted a longitudinal study of what the Dutch do online. They revealed that gender and age influence the purpose for using the Internet. Male and young people use the Internet the most. For example, males show more competence and less anxiety compared to females when it comes to using technologies [5]. According to Huang et al., (2013), males and females have different perception towards Web 2.0 applications including blogs, messengers, and online games. Overall, females feel more anxiety towards using Web 2.0 applications than males do. However, interestingly, recent study [37, 38] shows that there are no significant differences between genders regarding their perception towards mobile learning.

Study [39] found that age is an important factor related to the usage of social networking sites. Their findings show that, compared to older students, younger students more frequently utilize social networking sites. [40] explored teachers' perception towards using mobile technology in classrooms. Their study shows that teachers, depending on their age, have different sentiments towards using mobile technology in classrooms. Those over 50 years old are less likely to be supportive of using mobile phones in classrooms and they also perceive barriers in using them in classrooms. On the other hand, the study shows that teachers who are less than 32 years old have positive perception toward adopting mobile phones in classrooms. Therefore, the findings prove that age does matter in adopting mobile technology in classrooms. Furthermore, [41,42] found that regardless of age, students in higher education spend a lot of time using digital technologies. Also in their study, there are differences in age when it comes to using technologies.

Methodology

Participants and Data Collection

Participants were recruited from four classes of four universities in South Korea. In-class announcements were made by lecturers two weeks before the data collection and a research team visited the classes to distribute and collect the survey questionnaires. Data were collected for four weeks from December 2012 to January 2013. A total of 177 Participants voluntarily took part in the survey.

Instruments

To measure the technology acceptance level towards smart phones, UTAUT was modified and applied for this current study. The modified UTAUT is measured by seven constructs, which include performance expectancy (4 items), effort expectancy (4 items), attitudes (3 items), social influence (4 items), facilitating conditions (2 items), anxiety (2 items) and behavioral intention to use (4 items). The reliabilities of all the constructs included in this current study exceed .60, ranging from .64 to .91, which are considered acceptable to excellent (Thompson, Barclay, & Higgins, 1995). See (Table 1).

Construct	Definitions	Item #	Cronbach's Alpha
Performance Expectancy	The degree to which an individual believes that using the system will help him or her to attain gains in job performance	3, 11, 17, 22	0.91
Effort Expectancy	The degree of ease associated with the use of the system	1, 8, 16, 20	0.69
Attitudes	An individual's positive or negative feelings about performing the target behavior	6, 14, 19	0.77
Social Influence	The degree to which an individual perceives that important others believe he or she should use the system	2, 9, 10, 21	0.82
Facilitating Conditions	The degree to which an individual believes that an organizational and technical infrastructure exists to support use of the system	7, 15	0.64
Anxiety	Evoking anxious or emotional reactions when it comes to performing behavior	5, 13	0.7
Behavioral Intention to Use	The degree to which an individual wants to use technology and will use what is learned in the work context	4, 12, 18, 23	0.83
Overall			0.89

Note: *p<.05, **p<.01, ***p<.001

Table 1: Constructs and reliabilities

Data Analysis

The survey was distributed to 177 students. Thirteen incomplete data sets were discarded, so a total of 164 data sets were analyzed. Descriptive analyses and correlation analyses were conducted to examine the relationships among age, gender, daily use, and students' acceptance level toward smart phones. Pearson's Chi Square tests were performed to compare gender and age differences in students' purposes for using smart phones. Welch's t-tests were conducted to compare the acceptance level towards using smart phones in different gender and age group of students.

Results

Demographic Information

Of the 164 completed surveys, 55 of them were completed by males (33.5%) and 109 (66.5%) by female students. The ages

of most of the participants range from 18 to 30 years: 60 (36.6%) are 18-21 years old and 68 (41.5%) are 22-26 years old. Most of them are undergraduate students (116, 70.7%), and 48 (29.3%) are graduate students. Eighty students (48.8%) are using smart phones daily from 1 to 5 hours, 41 (25%) for 5 to 10 hours, and 27 (16.5%) for 10 to 20 hours. See (Table 2).

Variables		Number (N)	Percent (%)
Gender	Male	55	33.5
	Female	109	66.5
Age	18-21	60	36.6
	22-26	68	41.5
	27-46	35	15.8
	No response	1	0.01
Educational level	Undergraduate	116	70.7
	Graduate	48	29.3
Grade	Freshman	5	3
	Sophomore	38	23.2
	Junior	29	17.7
	Senior	29	17.7
	Graduate	48	29.3
	No response	15	9.1
Daily Use	Less than 1 hour	9	48.8
	1 to 5 hours	80	25
	5 to 10 hours	41	16.5
	10 to 20 hours	27	4.3
	Over 20 hours	7	5.5

Table 2: Demographic Information (n=164)

Students' Purposes for Using Smart Phones in Higher Education and Gender and Age Differences in Purposes

Most students (93.3%) are using smart phones to search the Internet. 78% use smart phones to chat/use mobile messenger, 73.2% to use Social Networking Sites (SNS), and 51.2% to check/send emails (Table 3). Frequency analysis show that 93.3% of those aged 18-21, 95.6% of those aged 22-26, and 96.9% of those aged 27 or more are using smart phones to search the Internet. There are no gender differences in students' purpose for using mobile technology (Table 3).

purpose (total n= 164)	18-21 (# and % of group)	22-26 (# and % of group)	27+ (# and % of group)	Overall (# and % of total)	χ^2
Searching the Internet	56 (93.3%)	65 (95.6%)	31 (96.9%)	152(95%)	1.81(p=.41)
Using SNS	52 (86.7%)	49 (72.1%)	18 (56.3%)	119(74.4%)	13.98(p=.001)
Chatting/Using mobile messenger	46 (76.7%)	62 (91.2%)	20 (62.5%)	128(80.0%)	16.07(p=.000)
Reading e-books	8(13.3%)	8 (11.8%)	1 (3.1%)	17(10.6%)	2.82(p=.24)
Checking or sending emails	31 (51.7%)	37 (54.4%)	15 (46.9%)	83(51.9%)	.79(p=.38)
Using educational contents such as e-lecture	8 (13.3%)	11 (16.2%)	6 (18.8%)	25(15.6%)	.310(p =.86)
For work/business	6 (10.0%)	11 (16.2%)	4 (12.5%)	21(13.1%)	1.167(p=.56)
Listening to podcasts	5(8.3%)	9 (13.2%)	5 (15.6%)	19(11.9%)	1.043(p =.59)

Table 3: Frequencies, percentages, and Chi square comparisons on various purposes for using smart phones by gender

86.7% of group 1 (age 18-21), 72.1% of group 2 (age 22-26), and 56.3% of group 3 (age 27 or more) are using smart phones to go on SNS. Pearson's Chi Square tests indicated that there are age differences in purposes for usage such as using SNS (χ^2=13.98, ** p=.001) and in chatting/using mobile messenger (χ^2=16.07, ** p=.000). The age group 18-21 more frequently uses smart phones for SNS than the other two groups. In terms of chatting/using messenger, the age group 22-26 uses smart phones more frequently than the other two groups. See Table 4 for detailed frequency analysis.

purpose (total n= 164)	**18-21 (# and % of group)**	**22-26 (# and % of group)**	**27+ (# and % of group)**	**Overall (# and % of total)**	**χ^2**
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Table 4: Frequencies, percentages, and Chi square comparisons on various purposes for using smart phones by age

Correlation analysis (Table 5)

	M	SD	1	2	3	4	5	6	7	8	9	10
1. Gender	1.66	0.47	-									
2. Age	24	4.66	-.17*	-								
3. Daily Use	2.65	0.96	.20*	-.36**	-							
4. PE	3	0.96	0.05	-0.01	0.12	-						
5. EE	3.9	0.59	-0.07	-.27**	.34***	.39***	-					
6. AT	3.03	0.89	0.01	-0.04	.16*	.80***	.47***	-				
7. SI	3.66	0.74	0.03	-0.1	.24**	.47***	.62***	.47***	-			
8. FC	3.72	0.73	-.18*	-.23**	.24**	.28***	.76***	.40***	.52***	-		
9. AX	2.45	0.97	.25**	-0.14	0.06	-0.08	-0.04	-0.11	-0.03	-0.04	-	
10. BI	4.02	0.69	-0.079	-.25**	.36***	.31***	.63***	.39***	.59***	.52***	-.31**	-

Note: M=Mean, SD=Standard Deviation, PE=Performance Expectancy, EE=Effort Expectancy, AT=Attitudes, SI=Social Influence, FC=Facilitating Conditions, AX=Anxiety, BI=Behavioral Intention to Use

*p<.05, **p<.01, ***p<.001

Table 5: Correlations among variables (n=164)

show that gender is significantly negatively associated with facilitating conditions (r=-.18, p<.05), positively associated with anxiety (r=.25, p<.01). Age is significantly negatively associated with effort expectancy (r=-.27, p<.01), facilitating conditions (r=-.23, p<.01), and behavioral intentions to use (r=-.25, p<.01). Students' hours of daily use are positively associated with effort expectancy (r=.34, p<.001), social influence (r=.24, p<.01), facilitating conditions (r=.24, p<.01), and behavioral intentions to use (r=.36, p<.001).

Students' Acceptance Level towards Smart Phones by Daily Use

Students show positive acceptance towards smart phones and their intention to use smart phones is high (Intention to use mobile phones = 4.02). Regarding technology acceptance level towards mobile phones, students in higher education think that mobile phone is easy to use because they do not need to put particular efforts into learning how to use it (Effort Expectancy = 3.90). Also, when students face technical problems while using smart phones, they feel that they have many resources that they can use for help when necessary (Facilitating Conditions = 3.72). See (Table 6).

Technology Acceptance	Daily use	N	M	SD	t	Sig. (2-tailed)
Performance Expectancy		163	3	0.96		
	1	89	2.88	0.89	-1.62	0.11
	2	74	3.13	1.02		
Effort Expectancy		163	3.9	0.59		
	1	88	3.75	0.56	-3.64	.000***
	2	75	4.08	0.57		
Attitude		164	3.03	0.89		
	1	89	2.88	0.84	-2.4	.02**
	2	75	3.21	0.91		

Social Influence		163	3.66	0.74		
	1	88	3.53	0.72	-2.5	.01**
	2	75	3.81	0.74		
Facilitating Conditions		163	3.72	0.73		
	1	89	3.59	0.77	-2.54	.01**
	2	74	3.88	0.66		
Anxiety		162	2.45	0.98		
	1	88	2.36	0.94		
	2	74	2.54	1.01	-1.15	0.25
Behavioral Intentions to Use		163	4.02	0.69		
	1	88	3.83	0.72	-3.83	.000***
	2	75	4.23	0.59		

Note: M=Mean, SD=Standard Deviation, 1: up to 5 hours, 2:5 to 20 hours or above, *p<.05, **p<.01, ***p<.001

Table 6: Students' acceptance level toward smart phones by daily use (Welch's t-test, p=.05).

The researchers divided students into two groups and analyzed the students' acceptance level towards smart phones by looking at their hours of daily use. Students from age group 1 use smart phones for up to 5 hours every day and those from age group 2 use them for 5 hours to 20 hours or more every day. Table 6 shows that age group 2 uses smart phones with more ease, has more positive attitudes, has more social influence in using smart phones, and has higher facilitating conditions and behavioral intentions to use than age group 1.

Gender and Age Differences in Students' Acceptance Level towards Smart Phones

(Table 7) shows that female students have lower facilitating conditions and higher anxiety than male students. Other than that, there is no gender difference in performance expectancy, effort expectancy, attitudes, social influence, and behavioral intentions to use.

Technology Acceptance	gender	N	M	SD	t	Sig. (2-tailed)
Performance Expectancy	M	55	2.92	0.94	0.45	0.51
	F	108	3.03	0.97		
Effort Expectancy	M	55	3.96	0.53	0.87	0.35
	F	108	3.87	0.62		
Attitude	M	55	3.02	0.93	0.004	0.95
	F	109	3.03	0.87		
Social Influence	M	55	3.63	0.74	0.14	0.72
	F	108	3.67	0.74		
Facilitating Conditions	M	55	3.9	0.77	4.8	.03*
	F	108	3.63	0.7		
Anxiety	M	55	2.11	0.83	11.81	.001**
	F	107	2.62	1		
Behavioral Intentions to Use	M	54	4.09	0.71	0.98	0.33
	F	109	3.97	0.68		

Note: M=Mean, SD=Standard Deviation, M=male, F=female, *p<.05, **p<.01

Table 7: Students' acceptance level toward smart phones by gender (Welch's t-test, p=.05)

(Table 8) reveals that there is age difference in effort expectancy, facilitating conditions, and behavioral intention to use, but not in performance expectancy, attitudes, social influence, and anxiety. Specifically, students' acceptance level towards smart phones differ between age group 18-21 and age group 27+, but the level does not show much difference between age group 18-21 and 22-26, and between age groups 22-26 and 27+. Age group 18-21 has higher effort expectancy, facilitating conditions, and behavioral intentions to use.

Technology Acceptance	Age	N	M	SD	t	Sig. (2-tailed)
Performance Expectancy	18-21	60	2.97	0.99	0.1	0.91
	22-26	68	2.97	1.01		
	27+	34	3.04	0.83		
Effort Expectancy	18-21	60	4.02	0.55	3.83	.03*
	22-26	68	3.91	0.61		
	27+	34	3.68	0.56		
Attitude	18-21	60	3.02	0.86	0.08	0.92
	22-26	68	3.05	0.93		
	27+	35	2.98	0.84		
Social Influence	18-21	60	3.72	0.72	0.4	0.67
	22-26	68	3.62	0.78		
	27+	34	3.65	0.74		
Facilitating Conditions	18-21	59	3.85	0.68	3.48	.04*
	22-26	68	3.75	0.75		
	27+	35	3.72	0.73		
Anxiety	18-21	59	2.53	1.04	1.4	0.25
	22-26	68	2.47	0.98		
	27+	34	2.22	0.84		
Behavioral Intentions to Use	18-21	60	4.17	0.66	3.97	.02*
	22-26	67	4	0.69		
	27+	35	3.76	0.69		

Note: M=Mean, SD=Standard Deviation, *p<.05, **p<.01.

Table 8: Students' acceptance level toward smart phones by age (Welch's t-test, p=.05).

Discussion & Conclusion

Students in higher education are using mobile phones for learning in many different ways. They use mobile phones to search for information, communicate with friends, read e-books, and listen to e-lectures and podcasts. Generally, there seems to be gender differences on the purpose for using technology. For example, males use the Internet for information, commerce and entertainment while females use it as a communication tool. Its findings are consistent with the results of KISA report (2013). One interesting thing to note is that the current study found no gender differences in purposes for using mobile phones. That could be due to the nature of participants in this current study, since the current study discover that students that use mobile phone for longer hours show higher effort expectancy, attitude, facilitating conditions, and behavioral intentions to use although the amount of daily use was found to be not associated with anxiety levels. The reason for this may be that students that use mobile phones for longer period of time but have no successful experience may not get a chance to lower their anxiety level. Successful experience enhances mobile phone self-efficacy [43] and lowers anxiety. According to the study by [44], males have higher self-efficacy in using web than females do.

The third finding of the study revealed that compared to male students, females have lower facilitating conditions and higher anxiety in terms of technology acceptance levels towards mobile phones. This finding is consistent with previous research by Huang. According to their study, females feel more anxiety towards using Web 2.0 applications than males do. The reason why women in higher education have lower facilitating conditions could be found on the research done by [45]. They found that women perceived themselves not to have enough resources and basic knowledge needed for using smart phones. One finding of their research states that men perceive higher computer self-efficacy than females and those females are more strongly influenced by perceptions of computer self-efficacy. This suggests that educators in higher education should find a way to enhance mobile phone self-efficacy in female students.

The other finding of the current study revealed that younger students have higher effort expectancy, facilitating conditions and behavioral intentions to use. Through a research done for Library and Information Science students, [46] found that age could be a factor that can be used to predict and show the difference in mobile adoption. According to his study, younger students show higher mobile adoption. Like many other countries, university students in South Korea are so called "digital natives" for whom digital technology has become ubiquitously accessible-they use SNS, mobile devices, and applications with ease on a daily basis [32, 47]. This presents potential benefits for learning in higher education [48] since the purpose of using web or mobile phones has been changing from primarily being a source of information and content to a new tool for creating information and knowledge [49], sharing ideas, and creating networked communities.

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