

A Comparative Study Of Smartphone Addiction Drivers' Effect On Work Performance In The U.S. And Korea

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ABSTRACT

Smartphone addiction is a new phenomenon when a smartphone becomes a necessity in our daily life. This study explores smartphone addiction drivers and their results. Four factors such as ease of use, emotional lift, preference of social interaction, and flow, are used for drivers and neglect of work is used as a proxy of addiction result. In the result of structured equation modeling analysis, preference of social interaction is not related with smartphone usage behaviors such as usage frequency and usage hours. In the analysis of U.S. users, emotional lift is a driver and in the analysis of Korean users, ease of use and flow are drivers for smartphone addiction. There is a significant relationship between smartphone use and neglect of work in both countries. Even if there is a trend of converging user behavior because of globalization, drivers for smartphone addiction are different in the U.S. and Korea.

Keywords: Smartphone Addiction; Structured Equation Model; Work Performance

1. INTRODUCTION

Smartphone is not just a calling device, but it is a multi-purpose device such as social networking, e-mailing, web browsing, texting, taking pictures, media playing, organizing schedules, and GPS navigating. In addition, with an introduction of near field communication technology, smartphones become a mobile wallet. In the 1990s, internet was commercialized and the number of internet users has increased exponentially with an advent of graphical web browsers. In 1998, internet addiction was coined by Dr. Kimberly Young, who developed the Internet Addiction Diagnostic Questionnaire. After the introduction of Apple's iPhone in 2007, mobile phones have been gradually replaced by smartphones. Smartphones change people's daily life and smartphone become a necessity of life. As the smartphone penetration rate increases, the dependency of smartphone increases (Shin, 2014) and negative effects by compulsive use of smartphones come in (Lee, Chang, Lin, and Cheng, 2014).

According to a report about the U.S. smartphone market by comScore, a leading digital media analytic company, 182 million people in the U.S. owned a smartphone, which is 74.9% market penetration in 2014. According to a report of the Cellular Telephone Industry Association, wireless penetration is 110% in 2014 and the U.S. is a world leader of 4G mobile service. Korea has been a pioneer for broadband mobile service in the early 2000s (Yoo, Lyytinen, & Yang, 2005) and Korea is the first country to widely introduce mobile TV services to its mobile phone users (Shim, Shin, and Weiss, 2006). According to the statistics by the Korea Communications Commission (KCC), in 2014, the wireless penetration was over 114% and 70% of Korean wireless subscribers were smartphone users.

Several international projects about smartphone user behaviors include samples from Korea and the U.S. Google conducted a project, "Our Mobile Planet", which surveyed 48 countries to understand smartphone adoption and users' behaviors. In 2013, smartphone penetration rates of Korea and the U.S. are 73% and 56% respectively. According to the 2012 Time Mobility Poll, which surveyed smartphone user behaviors of eight countries, including the U.S. and Korea, Koreans were more dependent on smartphones than smartphone users of the other seven countries. As a by-product, Korea has historically suffered from internet addiction (Block, 2008) and recently it has suffered from smartphone addiction (Lee, 2013). As the Korean Government considers internet addiction as one of the public health

issues (Block 2008), current studies about smartphone addiction on Korean high school and college students show the potential risk for smartphone addiction (Lee, 2013; Seo et al., 2013; Park & Lee, 2014; Mok et al., 2014). It is a phenomenon in Korea but it could also be a phenomenon of any country with a high penetration of smartphones.

Due to the relative early stage of smartphone service, there are only a few empirical studies on smartphone service addiction. The comparative study of intent is to develop an initial relationship model between smartphone addiction itself and its drivers and compare the results of two countries, U.S. and Korea. This paper is organized in the following order: In the next section, the authors explore literature review of smartphone addiction. In the third section, the authors explain the research plan which includes hypothesis and questionnaire development. In the fourth section, analysis and results are presented. The discussion and conclusion sections are added at the end.

2. LITERATURE REVIEW

Internet Use Disorder (IUD), is a preoccupation with internet activity and online gaming. For the IUD, excessive use with a loss of sense of time is known as a big factor for internet addiction (Block, 2008). Block (2008) also pointed out that South Korea had a serious internet addiction problem compared to the U.S. As more and more people use smartphones for their online activity, it is a general trend that the internet addiction focuses on smartphone addiction.

Lee et al. (2014) analyzed college students' smartphone usage patterns related to smartphone overuse. They divided the subjects into two groups: risk group and non-risk group. They found that the risk group spent longer time in smartphone usage and the Mobile Instant Message (MIM) app is the most frequently used app. The risk group spent more time on MIM which was triggered by MIM notification. Park and Lee (2011) investigated that three factors for compulsive smartphone usage are satisfaction, loneliness, and personal innovativeness. Seo et al. (2013) studied the relationship between smartphone addiction and PC internet addiction. They found there is a positive relationship between the smartphone addiction rate scales and Young's internet addiction scales. Park and Lee (2013) investigated the difference of smartphone usage patterns between two smartphone addiction tendency groups, high and low, which is grouped by self-evaluation. They found that more females belonged to the high addiction tendency group and the high addiction tendency group has a higher shyness, loneliness, and depression score and a lower self-esteem score.

Bernroider, Krumay and Margiol (2014) studied the negative effect of smartphone addiction with technology acceptance. They integrated the technology acceptance model in their proposed smartphone addiction model. They found that perceived security, perceived usefulness, and perceived enjoyment are positively related with smartphone usage behavior and these relations are positively inflated by smartphone addiction. Among the above three factors, perceived enjoyment is the most important factor to influence the smartphone addiction.

There are several studies about comparative analysis of mobile services and user behaviors between the U.S. and Korea. While the U.S. is one of the largest mobile service market, Korea is one of the top countries in OECD member countries in the wireless broadband subscription rate (Shin, Lee, and Odom, 2014). Cho (2009) found that when purchasing a mobile service, convenience is more sensitive to mobile users in Korea than those in the U.S. Kang and Jung (2014) compared basic needs for smartphone use in Korea and U.S. They found that in contrast to U.S. smartphone users, those in Korea believed that self-esteem did not positively affect smartphone use because 70% of mobile users have smartphones and they consider the smartphone as a necessity. L. Shin (2014) studied comparison of smartphone usage pattern between the U.S. and Korea. He found Korean users had a higher usage dependency level than U.S. users.

3. HYPOTHESIS DEVELOPMENT

Measures of the variables were developed in several stages. All the measures were borrowed from the previous studies and modified to be suitable for the smartphone addiction research context. The hypotheses in this research are the four factors such as ease of use, preference for online social interaction (POSI), flow, and emotional lift would influence smartphone use, which also influences the neglect of work as a result of compulsive usage.

Chen (2007) insisted that individual belief of ease of use could predict the extent to which users will use a mobile service. Cho (2008) revealed that ease of use is one of factors to influence satisfaction of mobile users. Shin and Lee

(2014) also argued that ease of use was a construct to predict intention to use a smartphone payment. The authors assume that ease of use will affect smartphone usage pattern.

H1: Ease of Use has a positive effect on smartphone use.

Faber and O’Guinn (1992) stated that emotional lift was one of the main factors to influence behavior of compulsive buying. LaRose (2001) said that there were many surveyed evidences of compulsive buying on the internet, which could lead to behavioral addiction. Moore (2009) ascertained that emotional lift was a critical factor of compulsive buying disorder. According to the survey about mobile payment (Shin, et al., 2014), 56% of U.S. smartphone users had an experience of mobile shopping and 48% of smartphone users in Korea had an experience of mobile banking. The authors assume that emotional lift is also a factor for use of smartphone because mobile shopping and mobile banking are parts of buying activities through smartphones.

H2: Emotional lift has a positive effect on smartphone use.

Caplan (2010) stated that POSI has a positive predictor of compulsive use of internet through deficient self-regulation. Casey and Leung (2015) found that psychological attributes such as loneliness and shyness had negative relationship with face-to-face communications, which lead to smartphone addiction significantly. Kwon et al. (2013) argued that smartphone users with cyberspace-oriented relationship, “a feeling of relationship obtained through a smartphone”, had more intimate feelings with online friends than with real life friends and they are susceptible to compulsive use of smartphones. The authors assume that POSI is a factor for use of smartphone.

H3: Preference of online social interaction has a positive effect on smartphone use.

Huizingh and Hoekstra (2003) argued that the flow which online buyers experienced during visiting online store sites, was the most important factor for describing the attitudinal changes of online buyers from viewing a product advertisement to product purchase. Chou and Ting (2003) found that flow experience showed much stronger impact on cyber gaming addiction than any other factor. Voiskounsky, Mitina, and Avetisova (2004) ascertain that flow experience was the most important factor in the online gaming addiction. Kamssu and Siekpe (2012) examined the relationship between online flow experience and internet addiction. They found that internet flow seemed to extend the duration of internet usage which lead to internet addiction. Hsu, Chang, and Chen (2012) investigated the relationship between flow experience and internet shopping behavior. They found that flow experience was positively related to internet shopping behaviors such as continuance intention, purchase intention and impulsive buying. The authors assume that flow is a factor for use of smartphone.

H4: Flow has a positive effect on smartphone use.

A level of smartphone use in this study is determined by usage frequency and usage length. Derks and Bakker (2012) investigated smartphone users’ behavior for work-home interference, which is defined as “a process of negative interaction between work and home domains.” They found that intensive smartphone users had a positive relationship with work-home interference, which were also a positive relationship with state levels of burn out. The findings in their study show that a level of smartphone usage influences work performance. Lee (2013) found that among various factors for smartphone addiction, neglect of work, escape reality, and lack of control are strong effective factors. Kim et al. (2013) found disturbance of adaptive functions and virtual life orientation are important factors for smartphone addiction, which are similar as neglect of work and escape reality. Kibona and Mgaya (2015) investigated impact of smartphone addiction on academic performance of college students. They revealed that smartphone addiction has a negative relationship with academic performance. The authors assume there is a strong relationship of neglect of work from smartphone usage hours and usage frequency.

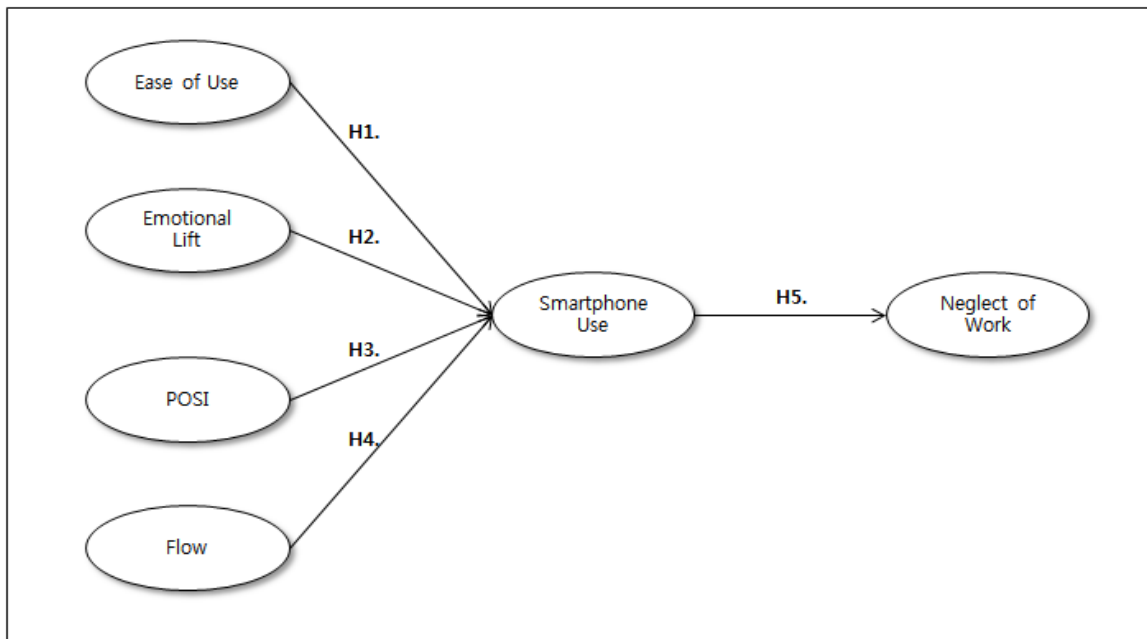
H5: Smartphone use has a positive effect on neglect of work.

Figure 1 represents the research model and its hypotheses used in this study. Table 1 provides a list of all measurement items.

Table 1. List of Measurements

Variable	Measure
Ease of use	(a1) My interaction with smartphone would be clear and understandable. (a2) Integrating with smartphone would not require a lot of mental effort (a3) I find smartphone would be easy to use (a4) I find it easy to get smartphone to do what I want it to do
Emotional lift	(a5) I use smartphone because using it makes me happy (a6) Using smartphone is fun. (a7) I get a real 'high' from using smartphone
Preference for online social interaction	(a8) I am treated better in my mobile social relationships (ex: Facebook) than in my face-to-face relationships. (a9) I am more confident socializing in mobile social service rather than face-to-face. (a10) I feel safer relating to people in mobile social service rather than face-to-face.
Flow	(a11) I feel like I am totally absorbed by smartphone. (a12) While using the smartphone, time seemed to go by very quickly. (a13) While using the smartphone, I forget about my immediate surroundings. (a14) While using the smartphone, I am not aware of how long I have been there.
Neglect of Work	(a15) My work suffers because of the amount of time I spend mobile. (a16) My job performance suffers from smartphone. (a17) I use smartphone longer than intended during I work. (a18) I lose sleep due to late night use of smartphone and reach my office late.
Smartphone Use	(a19) Daily frequency for using a smartphone (a20) Daily hours for using a smartphone

Figure 1. Research Model



4. ANALYSIS AND RESULT

4.1 Data Collection Method

In order to collect data, structured questionnaires are designed to contain multiple questions. The questionnaires are submitted to college students in the U.S and Korea by using an internet survey site. The questionnaires are written in both Korean and English and both versions are identical. 570 responses were received between October and November, 2014. In the process, respondents who are not using smartphone service are excluded. As a result, 543

questionnaires out of 570 are selected for the analysis. The descriptive analysis of the data shows that 46.8% is U.S. college students and 53.2% is Korean and their average age is 24 years old. This statistic indicates that most of the respondents tend to be young college students in their twenties. Table 2 presents demographic information of the samples.

Table 2. Demographic Information

Country	Gender	Age	Occupation
U.S (46.8%)	Male (37.0%)	18~25 years (81.2%)	Student (100.0%)
Korea (53.2%)	Female (63.0%)	26 or higher (18.8%)	

4.2 Reliability and Validity

Reliability and validity of measures in the questionnaire were tested by analyzing Cronbach’s alpha score and performing factor analysis. Internal consistency was initially evaluated by computing Cronbach’s alpha score (Table 3). Cronbach’s alpha was found to be more than 0.70, suggested by Nunnally (1967), in most of the variables except emotional lift, whose Cronbach’s alpha value was 0.692.

Table 3. Cronbach’s Alpha

Variable	Mean (SD)	Alpha score	Number of item
Ease of use	3.928(.612)	.767	4
Preference for online social interaction	2.232(.885)	.786	3
Flow	3.023(.746)	.717	4
Emotional lift	3.276(.733)	.692	3
Smartphone use	3.575(.900)	.830	2
Neglect of Work	2.450(.954)	.839	4

4.3 Factor Analysis

To test the validity of variables, exploratory factor analysis is executed, selecting principal component analysis method and VARIMAX rotation option. In the test, four factors are extracted successfully (Table 4).

Table 4. Exploratory Factor Analysis

Variable	Item	EU	EL	POSI	Flow
Ease of use (EU)	a3	0.795	0.132	-0.073	-0.027
	a4	0.785	0.115	0.037	-0.064
	a1	0.747	0.050	-0.020	0.055
	a2	0.721	-0.057	-0.019	0.102
Emotional lift (EL)	a5	0.001	0.855	0.034	0.113
	a7	-0.051	0.799	0.053	0.187
	a6	0.291	0.586	-0.005	0.013
Preference for online social interaction (POSI)	a10	-0.003	0.062	0.868	0.089
	a9	-0.012	0.104	0.851	0.097
	a8	-0.048	-0.052	0.773	0.053
Flow	a14	-0.006	0.120	0.089	0.847
	a13	-0.015	0.013	0.097	0.824
	a11	0.015	0.470	0.123	0.553
	a12	0.174	0.401	0.000	0.472
Eigenvalue		3.233	2.495	1.797	1.216
% of variance		23.08%	17.82%	12.83%	8.68%
Total variance					62.43%

In addition, confirmatory factor analysis (Table 5) was performed using AMOS 20 to check convergent validity and discriminant validity. The overall model fits including GFI, AGFI, NFI, CFI, AVE and composite reliability were satisfactory in general. The analysis outcome proved that the proposed model and the sample data were good for the further analysis and unidimensionality of all constructs were satisfactory.

Table 5. Confirmatory Factor Analysis

Construct	Variable	Std. Estimate(p-value)	AVE	Composite Reliability
Ease of use	a1	.614(.000)	.461	.772
	a2	.601(.000)		
	a3	.765(.000)		
	a4	.722(.000)		
Emotional Lift	a5	.840(.000)	.472	.719
	a6	.471(.000)		
	a7	.701(.000)		
POSI	a8	.588(.000)	.568	.794
	a9	.811(.000)		
	a10	.837(.000)		
Flow	a11	.629(.000)	.400	.723
	a12	.503(.000)		
	a13	.641(.000)		
	a14	.735(.000)		

Fit: $\chi^2(d.f)=319.534(71)$, $p=.000$, GFI=.919, AGFI=.880, NFI=.858, CFI=.885, RMSEA=.080

4.4 SEM Analysis

The hypothesized relations are tested using SEM (structural equation modeling) technique. The variables are evaluated by a five point Likert scale (1=very little, 3=medium, 5=very much). In the test, most hypotheses are supported except H3. The results of causal relations between smartphone addiction driving variables and smartphone use indicate that H1, H2, and H4 are supported. Ease of use has a positive relationship with smartphone use. Emotional lift and flow has a positive relationship with smartphone use. However, in this model, we do not witness significant impacts of reference for POSI. The relationship between smartphone use and neglect of work showed a very strong relationship. Figure 2 and Table 6 present the outcomes of SEM analysis.

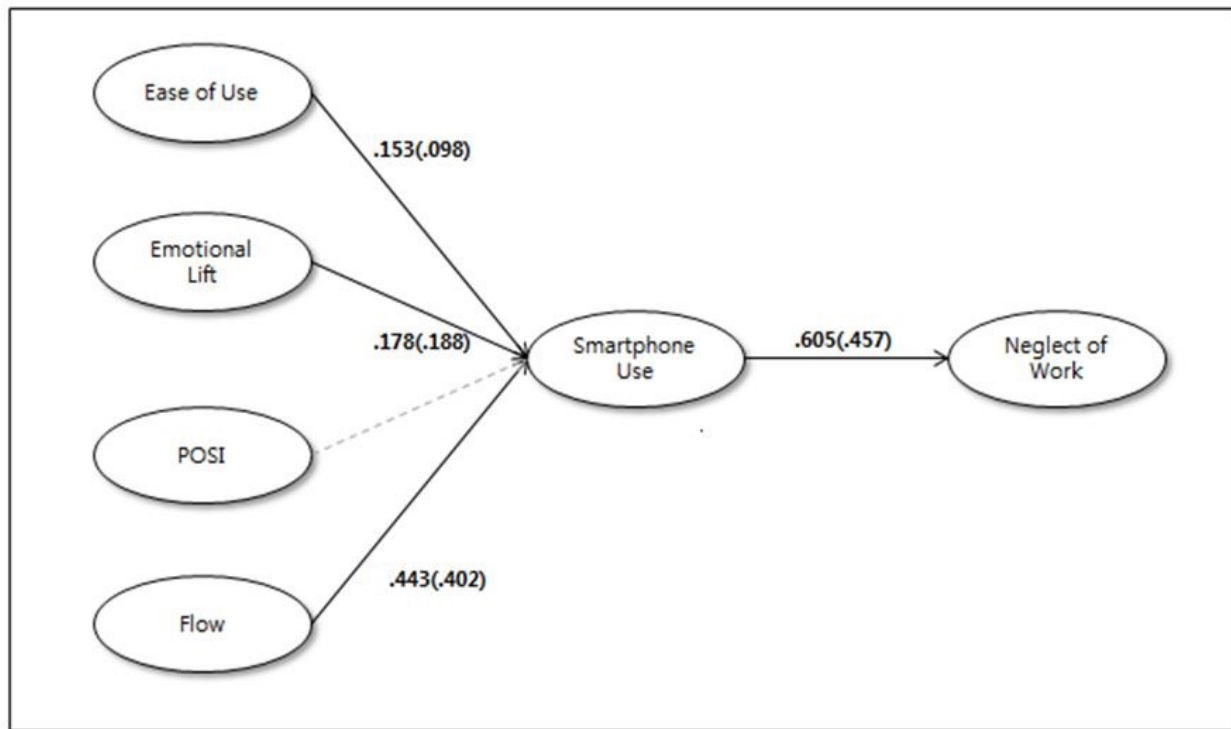
Table 6. SEM Analysis Result

Hypothesis	β (Std. β)	SE	CR	P
H1. Ease of use → Smartphone Use	.153(.098)	.076	1.999	.046**
H2. Emotional lift → Smartphone Use	.178(.188)	.063	2.831	.005*
H3. POSI → Smartphone Use	-.020(-.015)	.066	-3.07	.759
H4. Flow → Smartphone Use	.443(.402)	.081	5.448	.000*
H5. Smartphone Use → Neglect of Work	.605(.457)	.066	9.182	.000*

Fit: $\chi^2(d.f)=697.009(159)$, $p=.000$, GFI=.885, AGFI=.848, NFI=.834, CFI=.866, RMSEA=.079

* $p<0.01$, ** $p<0.05$

Figure 2. SEM Analysis of Combined Data



4.5 Comparison of Analysis for U.S. and Korea

To test the difference between the two countries, SEM analyses were performed again after separating the data into two groups according to the respondents' country (Figure 3 and Table 7). In the output of the U.S. analysis H2 and H5 are supported. Emotional lift has a positive relation with smartphone use. In the output of Korea analysis, H1, H4, and H5 are supported. Ease of use and flow have a positive relation with smartphone use. In both countries, smartphone use has a positive relation with neglect of work. The difference between the analyses of the two countries is drivers for smartphone use.

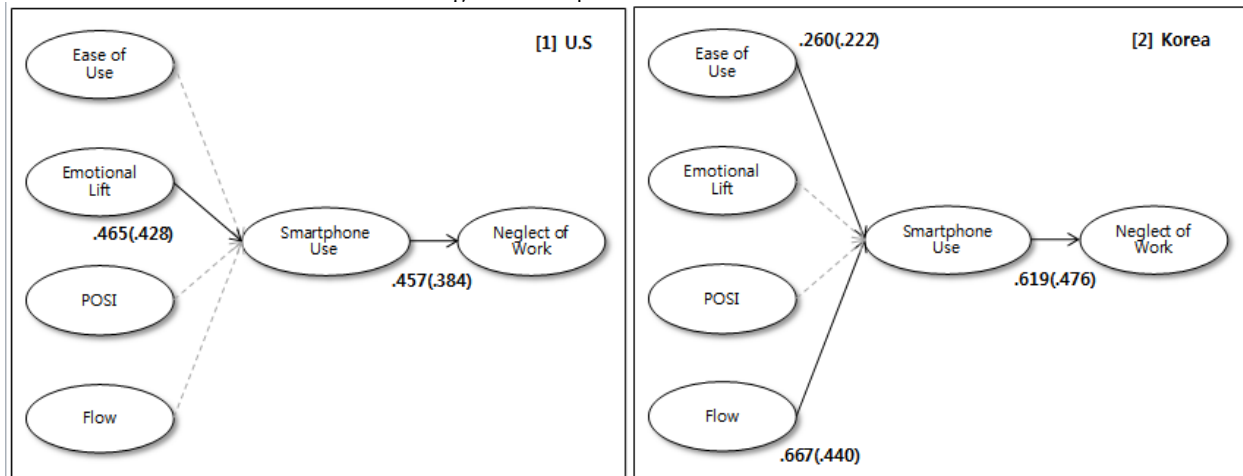
Table 7. Analysis Result for U.S. and Korea

Country	Hypothesis	β (Std. β)	S.E	C.R	P
U.S	H1. Ease of use \rightarrow Smartphone use	.050(.025)	.146	.341	.733
	H2. Emotional lift \rightarrow Smartphone use	.465(.428)	.453	3.039	.002*
	H3. POSI \rightarrow Smartphone use	-.116(-.067)	.178	-.652	.515
	H4. Flow \rightarrow Smartphone use	.215(.202)	.130	1.659	.097
	H5. Smartphone use \rightarrow Neglect of work	.457(.384)	.092	4.945	.000*
Korea	H1. Ease of use \rightarrow Smartphone use	.260(.222)	.081	3.226	.001*
	H2. Emotional lift \rightarrow Smartphone use	.093(.086)	.071	1.300	.194
	H3. POSI \rightarrow Smartphone use	.032(.030)	.069	.472	.637
	H4. Flow \rightarrow Smartphone use	.667(.440)	.126	5.299	.000*
	H5. Smartphone use \rightarrow Neglect of work	.619(.476)	.084	7.361	.000*

Fit: χ^2 (d.f)=695.873(318), p=.000, GFI=.889, AGFI=.853, NFI=.845, CFI=.908, RMSEA=.047

*p<0.01

Figure 3. Comparison of U.S. and Korea



5. DISCUSSION AND CONCLUSION

There is a discussion about homogenous user’s behaviors toward a new technology because of globalization (Mooij, 2010). Sadik (2008) showed a trend in convergence of technology adoption among industrialized countries. In the study of internet addiction, it is a phenomenon of international prevalence even if there is a difference of addiction rate (Weinstein and Lejoyeux, 2010). Some studies in Korean smartphone addiction show that there is a similar pattern between internet addiction and smartphone addiction (Kwon et al., 2013; Lee, 2013; Seo et al., 2013). Most smartphone addiction studies use a modified internet addiction diagnostic test. They measured severity of smartphone addiction without considering drivers and results. In this study, the authors divided drivers and results of smartphone addiction and compared the outputs of U.S. and Korea. In the previous smartphone addiction study (Caplan, 2010), POSI is a main factor to determine smartphone addiction. In this study, among the four drivers, POSI is not related with smartphone usage behaviors in both countries. According to a paper about SNS network analysis (Jiang et al., 2013), 80% of online social network users visit a SNS site less than or equal to once a day. In their analysis, 93% of the online social network users are latent users and most of active interactions are attributed to a very small group of highly interactive users. This implicates that most smartphone users are passive users to read and consume content made by active users like power bloggers. For the passive users of online social networks, POSI is not a strong factor to determine usage behaviors of smartphone.

While flow and ease of use are drivers to influence smartphone addiction in Korea, emotional lift is a driver for U.S. users. In the mobile payment study (Shin, et al., 2014), while Korean users consider convenience as an important factor for their use of mobile payment, U.S. users consider safety as a more important factor. In addition, Korean smartphone users have a higher mobile payment frequency because Korea has developed smartphone payment systems for public transportation. Therefore, Korean smartphone users consider their smartphone as a payment tool. Cho (2009) also argued that while smartphone was a source of entertainment to users in both countries, convenience was the factor more sensitive to Korean mobile users than to U.S. users. Even if convenience is a broader concept of ease of use, ease of use is a very sensitive factor for Korean mobile users. Due to a well deployed wireless network in Korea, Korean smartphone users can access mobile internet even in public transportation. The availability of mobile internet network leads to an increase in the usage frequency and usage hours of smartphone. Because of the prevalence of mobile internet, Korean smartphone users can focus on smartphone activities, which makes flow a significant factor for smartphone use.

Smartphone users have a preference for a specific operating system. The dominant operating systems are Google’s Android and Apple’s iOS. While Korea is one of the countries with high market share of the Android operating system, Apple is the number one smartphone maker in the U.S. market. In 2012, 90% of smartphones in Korea had Google’s Android operating systems and 9% of them had Apple’s iOS (Shin and Lee, 2014). According to the comScore’ report about the U.S. digital future (2014), the U.S. market share of iPhone is 42% in 2013. While there is

only one manufacturer in iOS, many manufacturers exist in Android. The different market shares of the two operating systems in both countries causes different levels of ease to use.

Smartphone use has an influence on neglect of work in both countries. As mentioned in the previous section, there is a serious work-home interference for intense smartphone users because of losing control for smartphone use (Derks and Bakker, 2012). Among academic papers for smartphone addiction, studies with samples of Korean are dominant. Korean Government has a plan to provide a nationwide counseling program for smartphone addiction to its young generations (Nam, 2013). Even if there is a trend of converging user's behaviors because of globalization (Mooij, 2010), drivers for smartphone addiction are different in the U.S. and Korea. However, there is a possibility of prevalence of smartphone addiction in countries with a high smartphone penetration rate.

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