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Factors Affecting User's Behavior of Smartphone: Integrated Model of Service Distribution, Addiction and Consequence

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Abstract

Purpose: The wide distribution of smartphones has changed life and user behavior. This phenomenon has both advantages and disadvantages for users. As smartphones become a part of our daily lives, smartphone addiction has recently become a social issue in many countries. This study explores factors that affect smartphone addiction and the consequences of addictive behaviors. **Research design, data and methodology**: Our model hypothesizes that four key factors determine addictive behavior: flow, enjoyment, preference for online social life, and escape reality. Commitment and compulsive use are mediating variables that connect key drivers and addictive results. Based on the SEM (structural equation model) analysis of 497 survey responses, these four driving factors each have a significant effect on the compulsive use of smartphones directly or indirectly; the compulsive use of smartphones directly influences the three results **Results:** We conducted a reliability and validity analysis, and the results were successful. In the hypothesis test, every path is accepted as expected at the significance level of 0.05. **Conclusions**: Among the four driving factors, escape reality is the vital factor influencing smartphone addiction and its consequences. And anxiety is the number one consequence influenced by the compulsive use of smartphones.

Keywords: Smartphone addiction, Addictive Behavior, Commitment, Compulsive Use, User Behavior

JEL Classification Code: M15, M21, M50

1. Introduction

The distribution of smartphone and its applications have revolutionized the way people live today. These devices from various makers are used for multiple purposes: communication, web browsing, social networking, navigation, stock trading, mobile banking, and augmented reality (Amez & Baert, 2020). Recent researchers have started to pay attention to the excessive use of smartphones with the rapid growth of smartphone distribution. Even though there are many benefits of using a smartphone, it also can be a negative influence on users.

Researchers have argued that the attractiveness of smartphones could lead to problematic use or compulsive use (Harris et al., 2020; Busch & McCarthy, 2021,). The negative effects of smartphone use have been brought up in terms of smartphone addiction, which is considered a new form of technological addiction (Lin et al., 2016; Harris et al., 2020; Busch & McCarthy, 2021). Smartphone addiction has been recognized as a new type of addictive problem that is similar to other problematic addictions. Heavy and addictive use of the smartphone could result in problematic use that has similar indicators to other technology addictive behaviors, such as internet addiction or game addiction (Chia & Chang, 2020).

However, despite a growing volume of academic work on smartphone addiction, there has been little consensus on the impacts of smartphone addiction and the basic structure

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of the addictive motivations; the relationship between the addictive motivations and problematic behavior remains unclear. In this empirical study, we attempt to conceptualize an integrated model to explain the addiction factors, behaviors, and consequences of smartphone addiction.

To achieve the research goal, this study attempted to address the following research questions.

Firstly, after reviewing previous studies, we tried to identify the key antecedent factors affecting smartphone addiction.

Secondly, we tried to present an integrated model that can synthesize the results of various existing studies on smartphone addiction.

Thirdly, we tried to present the various results that can be caused by smartphone addiction in an integrated way. Through this, we tried to confirm the integrated relationship between addiction and consumer behavior.

2. Theoretical Background

2.1. Smartphone Addiction

Since the introduction of Apple's iPhone in 2007, the distribution of smartphone has increased dramatically and has become an essential part of everyday life. A smartphone is a popular device because of its powerful processing ability, abundant memory, and open operating systems that can generate a thriving eco-system for makers and users. With ubiquitous and robust internet connectivity, users have access to various services and data in their daily lives at any time, which can increase job performance significantly (Kalkbrenner & McCampbell, 2011).

It is known that there are many different forms of IT technology addiction. These technology addiction phenomena include users' addictive behaviors for internet, gaming, online auction, online shopping, online social networking, and so on. Addiction studies in terms of technology are of recent interest to many academics. Efforts to explain why people are deeply involved in the technology have been urgent research topics. However, the scope of the technology addiction concept is not well defined, and many terms are used differently to describe the same phenomenon. Technology disorder, compulsive use, problematic use, and pathological use are used interchangeably.

Despite this inconsistency, in general, technology addiction is believed to be a negative type of behavioral addiction (Hodis & Bruner, 2009). Turel et al. (2011) defined technology addiction as a "psychological state of maladaptive dependency on the use of technology." They argued that technology addiction is different from the concept of habit in regard to psychological dependency and behavioral addiction symptoms. The origination of technology addiction is not apparent, but the internet has had an influence on technology addiction. Academic papers on technology addictions select an example of technology addiction: e-mail, online gaming, online shopping, online auction, mobile phone, and online social networking.

While smartphones are highly attractive new mediums for diverse situations, there have been increasing concerns about the problematic use of smartphones or smartphone addiction. Before smartphones were popular, studies were focused mainly on mobile phone addiction. Previous studies on mobile phone addiction show that mobile phone users tend to become addicted to the technologies in much the same way that others became addicted to drugs and alcohol (Takao et al., 2009). Younger generations, such as teens and college students, have a higher percentage of addicted respondents than older generations (Leung, 2008; Takao et al., 2009).

When the focus of addiction study moves from mobile phone to smartphone, the same pattern remains. Lee (2013) developed Smartphone Addictive Use Scale (SAUS), in which there were six categories of smartphone addiction symptoms (neglect work, neglect of social life, lack of control, salience behavior, escape reality, excessive use).

Block (2008) said that the Korean government considers internet addiction as a public health issue. In recent years, the Korean government considers smartphone addiction as a growing social issue. The previous studies for smartphone addiction scale development that are mentioned above (Kwon et al., 2013; Lee, 2013; Lin et al., 2016) note that a smartphone is a source of potential addiction; thus, the needs for understanding of addictive usage pattern is essential to prevent problems. However, it is not clear yet that smartphone addiction can be recognized as a diagnostic category of mental disorder (Park & Lee, 2014). In addition, it is also not clear if smartphone addiction is more than just a combined addiction to online gaming, social networking sites, and mobile internet. The increasing concerns about the addictive use of smartphones raise the need for empirical research that identifies key driving factors for addictive behaviors and attitudes which lead to problematic consequences.

2.2. Need for Model Integration

As a pioneer of internet addiction study, Young developed an eight-item measure to diagnose internet addiction, which was based on the Diagnostic and Statistical Manual of Mental Disorder IV (DSM-IV) tool (Young, 1998). DSM-IV had been developed originally to diagnose criteria of pathological gambling; it was used for different forms of addiction later. Since then, the research topic has expanded to new types of technological products and services such as online games, online auctions, online

shopping, and mobile phones. As a result, in terms of addiction factors associated with addictive behavior, there are still unanswered questions. From a psychological point of view, users' personality traits are the main factors to be considered; however, from a technology point of view, users' perceptions of technology such as perceived usefulness and perceived ease of use are the main factors regarding addiction.

Therefore, the findings revealed in previous studies are different according to the researchers' academic backgrounds and the technological product or service studied. Some smartphone addiction studies identified key precedents, but they did not provide causal relationships between precedents and smartphone addiction. Despite a growing volume of work on smartphone addiction, the basic understanding of the disorder caused by smartphones remains unclear compared to other technology addictions.

In the recent studies of smartphone addiction, there are three approaches to explain the factors for smartphone addiction. One approach is to use personality traits and needs as smartphone addiction factors; another is to apply the Technology Acceptance Model (TAM) to smartphone addiction. The final approach is to find factors for addiction to smartphone content, such as SNS or games. Some studies use a combination of the personality trait approach and one of the other two approaches.

Lee et al. (2013) examined both the relationships between psychological traits (locus of control, social interaction anxiety, need for touch, materialism) and compulsive usage of smartphones and the resulting technostress caused by compulsive usage of smartphones. They found that those four psychological traits significantly influenced the compulsive use of smartphones, and higher levels of smartphone use led to higher levels of technostress. Chiu (2014) examined the relationship between various kinds of stresses to smartphone addiction with a mediating variable of self-efficacy. Chiu found that while academic stress and interpersonal stress had a negative predictive power to smartphone addiction, family stress and emotional stress had a positive predictive power to smartphone addiction.

Van Deursen et al. (2015) examined the relationship among five factors (two types of smartphone use and three personality traits) and two types of smartphone usage behavior, habitual smartphone behavior and addictive smartphone behavior. They found that the type of smartphone use (process usage and social usage) had an impact on habitual smartphone behavior; the two personality traits (social stress and self-regulation) and habitual smartphone behavior directly impacted addictive smartphone behavior. However, emotional intelligence did not influence either habitual or addictive smartphone behavior. While van Deursen et al. (2015) argued that habitual behavior was a factor for addictive behavior, Wang et al. (2015) explored the relationship between each of the two factors (entertainment and escapism) and problematic smartphone use, and they tested whether perceived stress could moderate the relationship. They found that for the users of high problematic scores, the perceived stress moderated the relationship between each of the two motivation factors and smartphone addiction.

TAM model is used more than any other framework for the purpose of explaining users' behavior toward technology (Thomas, 2011; Jahan et al., 2020). The antecedents such as perceived ease of use (PEOU) and perceived usefulness (PU), can explain general use behavior. Even if some researchers try to apply TAM to smartphone addiction behavior, TAM cannot explain the unique and differentiated reasons for addiction. TAM needs to be modified with additional variables to provide a stronger model.

For instance, Venkatesh and Davis (1996) proposed the TAM2 model and Heijden (2004) proposed an extension by using perceived enjoyment (PE) as a new predictor. Turel et al. (2011) proposed addiction as a factor to influence on inflated usage intentions for online auction through inflated perceptions of utility and enjoyment. The study explained how addiction can stimulate the use of technology; however, neither mentioned what driving factors lead to addiction. Park et al. (2013) borrowed PEOU and PU from the TAM model as mediating variables. They listed psychological factors (innovativeness, behavioral activation system, locus of control) and two motivation needs (social inclusion and instrumental use) that influence PEOU and PU, which led to smartphone dependency. Even if PEOU and PU were found to increase smartphone dependency, it would not have been enough to explain the smartphone addiction phenomenon with only two the variables PEOU and PU.

Salehan and Negaban (2013) argued that the source of smartphone addiction was SNS and that a user's SNS intensity was influenced by SNS size. Jeong et al. (2015) explored the sources of smartphone addiction, including personality characteristics (loneliness, sensation-seeking, stress, self-control) and content types (game, SNS, music, and video). They found that SNS was the top source of smartphone addiction and online gaming was the next.

Given the limitations of previous research, an integrated model to explain addictive behavior for smartphones is needed. It is believed to be desirable to link addiction driving factors to both addictive behavior and to consequences continuously. Considering factors previously suggested, this study proposes a model with four explanatory variables, (1) flow and (2) enjoyment, which come from a user's experiences, (3) escape reality and (4) preference for online social life, which stem from personality traits.

3. Hypothesis and Model

3.1. Integrated Model of Smartphone Addiction

The following graph presents an integrated model proposed in this study. There are (1) four factors for smartphone addiction, (2) three consequences of smartphone addiction, and (3) two mediating factors between the factors and the consequences. Detailed explanations of each hypothesis follow in the next subsection (Figure 1).

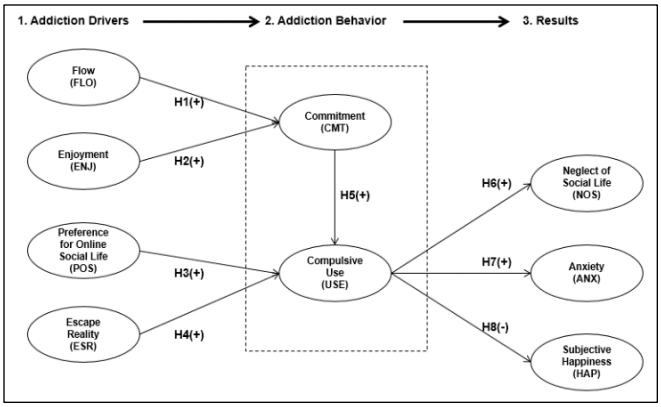

Figure 1: Research Model

3.2. Key Factors and Behavior

The theoretical background of the relationship between commitment and the first two factors (flow and enjoyment) is based on the Theory of Reasoned Action (TRA). According to Fishbein and Ajzen (1975)'s theory, individuals who have a positive attitude toward a product are more likely to display positive behavior. According to psychologist Csikszentmihalyi (1990), flow is known as "a state of complete immersion in an activity." Webster and Martocchio (1992) insisted that flow can increase exploratory behavior and positive personal experience. Young (1998) explained that the virtual experience is very strong to some users and once these experiences are brought to the mind, it becomes very difficult to suppress them again.

Flow experience occurs strongly in online gaming (Chen, 2007) and flows on the internet is closely related with heavily internet use (Thatcher et al., 2008). As a result, authors assume that flow is a positive attitude toward smartphone use, commitment to using a smartphone is resulting in positive behavior, and online flow experience will happen when using smartphones as it would occur when using a desktop computer.

H1: Flow (FLO) will positively affect smartphone commitment (CMT).

Enjoyment is understood as a reason for doing an activity for no apparent reason other than to perform the activity. Thomas (2011) believes that there is a strong and positive relationship between enjoyment and a user's attitude. Dai et al. (2011) found that consumers' internet service enjoyment affected their commitment to that service. More directly, Anton et al. (2013) found that enjoyment in using e-book devices affected users' attitudes favorably. Therefore, authors assume that enjoyment is a positive attitude toward smartphone use, commitment to using a smartphone is a resulting positive behavior, and enjoyment will influence a user's commitment positively.

H2: Enjoyment (ENJ) will positively affect smartphone commitment (CMT).

Beard (2005) found that internet users often feel safe to take positive and negative feedback and to express opinions online that they were unable to express to others in the real world. Wei and Lo (2006) and Leung (2008) also found that a significant use of a mobile phone was to increase social interaction and connectedness.

Skues et al. (2012) found that college students with a higher level of loneliness had more activity on social networking through their smartphones. As a result, the amount of online social activities affected use behavior positively. Therefore, authors assume that preference for online social life affects the compulsive use of a smartphone.

H3: Preference for online social life (POS) will positively affect compulsive use of smartphone (USE).

Psychological aspects of technology are important precedents for explaining addictive behaviors. Wallace (1999) suggested that psychological spaces of the internet might lead people to overuse of the internet. For instance, the experience of a stressful event was a potential risk of internet addiction (Lawrence et al., 2009) Wang et al. (2015) found that there was a positive relationship between escapism and problematic use of smartphones.

The above results imply that people might heavily use technologies such as the internet and smartphones when they are stressed to escape reality or to seek a fantasy. Therefore, authors assume that escape reality affects compulsive use of smartphone.

H4: Escape reality (ESR) will positively affeact compulsive use of smartphone (USE).

According to the commitment–trust theory (Morgan & Hunt, 1994), commitment and trust are two key mediating variables, which are critical to the management of relationship marketing. Commitment has a strongly positive

relationship with cooperation and maintaining relationships with business partners of buyers and suppliers, as well as employees and competitors. Based on the commitment-trust theory, many marketing papers argue that commitment leads to customer satisfaction, which also leads to continued usage of goods and services. Fullerton (2005) studied the impact of brand commitment on loyalty, and he found that commitment to the brand was strongly related to repurchasing and advocating the brand.

Baca-Motes et al. (2013) studied the relationship between commitment and behavioral changes of hotel guests in green environment campaigns, such as towel reuse. They found that guests' commitment had a significant impact on practicing environmentally friendly behavior. They concluded that commitment to a certain cause could indicate that she/he would care about the cause and the person would behave consistently. These two studies showed that commitment was positively related to the intended behaviors. Therefore, the authors assume that commitment to smartphones will affect the change of behaviors toward more frequent and longer usage of smartphones.

H5: Smartphone commitment (CMT) will positively affect compulsive use of smartphone (USE)

3.3. Result of Addictive Behavior

Problematic users of technology tend to spend most of their time using the technology. As a result, they are going to have less time for real social life. According to Young's (1998) survey results, addicted internet users use an average of 38 hours per week. According to the report for mobile behavior, average hours spent on a smartphone by age 18-24 were 36.4 hours per week, which was close to the internet usage hours of internet-addicted users in Young's survey. Scherer (1997) found that internet addicted students were more likely to select to use the internet for leisure than general students were. Jeong and Kim (2011) insisted that the level of real social activities with parents and friends was negatively associated with the degree of game addiction. As a result, authors assume that compulsive use of a smartphone will result in neglect of real social life.

H6: Compulsive use of smartphone (USE) will positively affect neglect of social life (NOS).

In the study for internet addiction, many internet heavy users reported being lonely, depressed, and having anxiety (Correll, 1995). Lee et al. (2014) identified that compulsive usage of smartphones and its technostress were positively related to anxiety. Cheever et al. (2014) examined anxiety in college students when wireless mobile devices were not available, and they found that the anxiety level went up as time without wireless mobile devices increased. Yu and Choi (2015) and Demirci et al. (2105) found that there was a serious relationship between smartphone use and anxiety in college students of both Korea and Turkey. Therefore, we assume that compulsive use of a smartphone will affect anxiety.

H7: Compulsive use of smartphone (USE) will positively affect anxiety (ANX).

Hodis and Bruner (2009) insisted that technology addiction posed a real threat to people's welfare. They suggested that technology addiction was giving negative impacts to one's welfare just like another addiction, such as alcohol and drugs. Akin (2012) examined whether internet addiction could influence the subjective happiness of users.

The result was that subjective happiness was negatively predicted by internet addiction. Cardak (2013) examined the relationship between internet addiction and psychological well-being. David et al. (2017) measured actual smartphone usage data, evaluated its relationship with individual well-being, and concluded that excessive smartphone usage was generally negatively related to well-being. The result was that psychological well-being is negatively affected by internet addiction. Therefore, we assume that compulsive use will negatively affect users' happiness.

H8: Compulsive use of smartphone (USE) will negatively affect subjective happiness (HAP).

4. Empirical Research

4.1. Measurement Item

This study intends to identify the structural relations among the addiction drivers of smartphone use, addictive behavior, and its consequences. To analyze the proposed model, we adopt structural equation modeling (SEM). In the initial stage, measures of the constructs need to be developed. Every measure was borrowed from previous studies and modified to fit the research context. For example, Huizingh and Hoekstra (2003)'s four items of flow were referred from the concept, which were used for online customers' experiences. The four items to evaluate the flow of Huizingh and Hoekstra (2003) were developed to measure Web-site user experience; these items were modified into three items to fit smartphone user experience. An initial process to check the face validity is held with the help of consumer behavior experts and academics. There are four constructs in addiction driving factors, two constructs in addictive behavior, and three constructs in the

consequences. A total of 9 constructs and 25 items are adopted (Table 1).

Table 1: Construct and Item

Construct	Item	Source
FLO	1. I feel I am totally absorbed by a smartphone. 2. While using the smartphone, I forget about my immediate surroundings. 3. While using the smartphone, I am not aware of how long I have been here.	Huizingh & Hoekstra (2003)
ENJ	1. I use a smartphone because using it makes me happy 2. Using a smartphone is fun 3. I get a real 'high' from using a smartphone	Lee (2013)
POS	1. I am treated better in my online relationships than in my face-to-face relationships. 2. I am more confident socializing online than I am offline. 3. I feel safer relating to people online rather than face-to-face.	Caplan (2010)
ESR	1. I think life without a smartphone would be boring. 2. I feel preoccupied with a smartphone.	Lee et al. (2014)
CMT	1. I am very committed to the smartphone. 2. I intend to continue using a smartphone. 3. I feel much loyalty to the smartphone.	Bettencourt (1997)
USE	1. I have made unsuccessful efforts to cut down my use of a smartphone. 2. I feel guilty about the amount of time I spend on a smartphone	Caplan (2003, 2010),
NOS	1. I choose to spend more time with a smartphone over going out 2. I form new relationships with fellow smartphone users 3. I prefer a smartphone to intimacy with your partner	Lee (2013)
ANX	1. When out of range for some time, I become preoccupied with the thought of not using a smartphone. 2. I feel anxious if I have not checked for a smartphone. 3. I feel isolated from my groups when I cannot check my smartphone	Casey (2012)
HAP	1. I evaluate myself a very happy person in general. 2. Compared to most of my peers, I consider myself happier. 3. Compared to most of my acquaintances, I consider myself happier.	Lyibomirsky & Lepper (1999)

4.2. Data Collection and Sample

Previous studies indicated that people suffering from technology addiction were mostly young people (Scherer, 1997; Wu & Zhu, 2004). The respondents of this study were smartphone users between 18 and 26 years old who live in a major city in Korea. In general, these young users are known as the generation with the most serious smartphone addiction problem (Lee, 2013). A total of 500 respondents participated in the online survey, and 497 samples were valid, excluding missing values and smartphone non-users (Table 2). Considering the complexity of the model, the sample size of 497 people was determined to be sufficient for SEM analysis.

Every item indicates multiple levels of agreement or disagreement with a 5-point Likert scale (1=strongly disagree, 5=strongly agree). Among the respondents, 48.1% are male and 51.9% are female. The average age is 22.5. The respondents spend about 4.24 hours a day on their smartphones; their favorite applications are mobile chatting, internet browsing, and social media. The data were analyzed using software such as SPSS and AMOS statistical software programs

Table 2: Sample Characteristics

Category		Frequency	%
1. Gender	Male	239	48.1%
	Female	258	51.9%
2. Age	18-20	79	15.9%
	21-22	173	34.8%
	23-24	167	33.6%
	25-26	78	15.7%
3. Mobile service experiences		Average service experience = 42.58 months Day use hours = 4.24 hours Daily use frequency = 5.25 times	

5. Analysis Result

5.1. Reliability and Validity

The reliability and validity of measures were tested in two-step stages, which are Cronbach's alpha test and factor analysis (Bagozzi & Yi, 1988). The internal consistency of measures was evaluated by calculating Cronbach's alpha scores (Table 3). The scores were found to be from .677 to .926 and the reliability was accepted. Factor analysis of endogenous (Table 4) and exogenous variables (Table 5) were performed to test the validity of the variables. This study adopted the Principal Component Analysis (PCA) extraction method with a VARIMAX rotation. Four factors

in exogenous variables, and five factors from endogenous variables were extracted successfully.

Table 3: Reliability Test

Construct		Mean (Std. Dev.)	Cronbach's Alpha	Number of Items
Addiction Drivers	FLO	2.52 (.89)	.824	3
	ENJ	3.28(.74)	.860	3
	POS	1.97(.90)	.840	3
	ESR	3.18 (1.00)	.755	2
Addiction Behavior	CMT	3.36 (.73)	.677	3
	USE	2.31(.95)	.926	2
Results of Smartphone Addiction	NOS	1.60 (.77)	.846	3
	ANX	1.89 (.89)	.891	3
	HAP	3.63 (.85)	.925	3

Table 4: Factor Analysis (Exogenous Variables)

Construct	Item	Factor 1	Factor 2	Factor 3	Factor 4
ENJ	a2	0.908	-0.034	0.121	0.165
	a1	0.896	-0.03	0.113	0.202
	a3	0.765	0.105	0.218	0.128
POS	a6	0.039	0.889	0.12	0.01
	a5	0.018	0.875	0.078	0.096
	a4	-0.013	0.821	0.116	0.111
FLO	a8	0.095	0.078	0.899	0.066
	a9	0.163	0.097	0.838	0.196
	a7	0.217	0.182	0.709	0.247
ESR	a10	0.294	0.058	0.138	0.863
	a11	0.189	0.187	0.389	0.753
Igen value		2.419	2.33	2.293	1.526
% of variance		21.99	21.18	20.84	13.87
Total % of variance		77.89%			

Table 5: Factor Analysis (Endogenous Variables)

Construct	Item	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
HAP	a12	0.949	-0.063	-0.031	-0.057	0.047
	a14	0.942	-0.082	-0.069	-0.039	0.042
	a13	0.879	-0.041	-0.174	-0.057	0.024
ANX	a15	-0.036	0.9	0.154	0.129	0
	a16	-0.071	0.893	0.116	0.172	0.024
	a17	-0.09	0.825	0.249	0.182	0.03
NOS	a20	-0.05	0.161	0.905	0.092	-0.074
	a19	-0.078	0.21	0.876	0.129	-0.071
	a18	-0.166	0.137	0.752	0.196	0.162
USE	a21	-0.062	0.216	0.177	0.896	0.088
	a22	-0.069	0.211	0.189	0.893	0.075
CMT	a25	0.165	-0.101	-0.137	-0.154	0.821
	a24	-0.024	0.096	0.104	0.32	0.798
	a23	-0.057	0.126	0.085	0.538	0.585
Igen Value		2.651	2.514	2.393	2.167	1.708
% of variance		18.93	17.96	17.09	15.48	12.00
Total % of variance		81.66%				

5.2. Hypothesis Test

This study adopted the SEM technique to prove the hypotheses. The fit test resulted in chi-square statistics of 899.356 (p=.000, d.f=261) and the chi-square value was satisfactory in general. Other fit statistics such as GFI, AG, CFI, NFI, SRMR could be more proper for assessing the model fit than a single chi-square value (Bagozzi & Yi, 1988). The testing of all these fit statistics also showed satisfactory outcomes (Table 6). Therefore, further analysis of a causal relationship between the variables was conducted. According to the results, all hypotheses were significantly supported (Table 6). Except for H3, all other hypotheses were supported by 0.01 α value

Table 6: Hypothesis Test

Hypothesis	Estimate (Std. Estimate)	SE	CR	P (* < 0.01, **< 0.05)
H1. FLO → CMT	.730(.663)	0.061	12.014	.000*
H2. ENJ → CMT	.302(.345)	0.039	7.829	.000*
H3. POS → USE	.146(.113)	0.058	2.51	.012**
H4. ESR → USE	.434(.327)	0.095	4.57	000*
H5. CMT → USE	.361(.314)	0.079	4.547	000*
H6. USE → NOS	.285(.401)	0.036	7.881	000*
H7. USE → ANX	.444(.469)	0.044	10.067	000*
H8. USE → HAP	-.140(-.161)	0.041	-3.383	000*

* Model fit: Chi square=899.356(df=261, p=.000), GFI(AGFI)=.867(.834), CFI=.918, NFI=.889, RMR=.087, RMSEA=.070

6. Conclusions

6.1. Research Result and Implication

The distribution of smartphones is constantly increasing, and as a result, addiction to smartphones will not stop. After the introduction of internet addiction by Young (1998), there have been numerous studies about internet addiction, which was followed by online game addiction, social networking addiction, mobile phone addiction, and smartphone addiction. The previous studies tried to find factors to affect those addictions and to develop methods of diagnoses of those addictions, but there was no clear division between the driving factors of addiction and their consequences.

In this study, the authors reorganize constructs used in the previous studies to present the overall process of smartphone addiction: dividing factors into addictive driving factors and addictive consequences and making a bridge of addictive behaviour between them. The integrated model with separating driving factors and consequences

provides a dual-path model of smartphone addiction. The dual-path model allows researchers to better understand the processes of smartphone addiction: (1) FLO and ENJ indirectly influence compulsive use addiction behaviour through CMT, (2) POS and ESR directly influence addiction behaviour of compulsive use, and (3) compulsive use has a direct effect on three addictive consequences. Thus, this study proves that addictive behaviours, such as compulsive use, can be done with or without attitudinal changes, such as commitment. This finding suggests the possibility that a user cannot stop using the smartphone even though he/she does not have the intention to use the smartphone.

The compulsive use of smartphone results in negative outcomes, such as neglect of social life, increasing anxiety, and decreasing subjective happiness. Among the three consequences, ANX is the strongest influenced by the four factors, which is the same result of Robinson and Berridge (2003) explained the addictive behaviour process: addictive behaviours start to seek pleasant feelings and once addicted, addictive behaviours are continued to escape unpleasant feelings. This explanation supports the subjective unhappiness of smartphone addiction. Using a smartphone could give happiness in a short period of time at the time of access, but smartphone addiction in this study eventually turns into a negatively affects happiness.

Pies (2009) argued that the Internet is merely a communication medium for existing addictive behaviours of gambling, gaming, or viewing pornography. Jeong et al. (2015) argued that SNS was the first reason to be addicted to smartphone use. Smartphone could just be a means to use social networking, internet gaming, or another internet activity, which could provide the main sources of the addictive behaviours, instead of the smartphone itself. Even if we accept the premisea smartphone is merely the main medium to access sources of addictive behaviours, we cannot separate addiction to smartphone usage from addiction to online behaviours via smartphone. Block (2008) said that the Korean government considered internet addiction a serious public health issue. After the smartphone was introduced, Korea has been plagued by smartphone addiction (Shin et al., 2014).

6.2. Research Limitation

Despite the significance of the results, the present study has some limitations that should be addressed in future research. In the study of internet addiction, psychological traits such as loneliness, shyness, self-esteem, or lack of self-control, are used for factors to influence users' addiction behaviours. In order to understand the nature of smartphone addiction, future research needs to consider more psychological traits. For potential consequences of smartphone addiction, depression and aggression are candidates suggested by a recent study (Yu & Choi, 2015). To develop an enhanced version of integrated model, additional driving factors and consequences of smartphone addiction need to be examined.

References

Akin, A. (2012). The relationship between internet addiction, subjective vitality, and subjective happiness. *Cyberpsychology, Behavior, and Social Networking*, *15*(8), 404-410.

Amez, S., & Baert, S. (2020). Smartphone use and academic performance: A literature review, *International Journal of Educational Research*, *103*, 1-8.

Anton, C., Camarero, C., & Rodriguez, J. (2013). Usefulness, enjoyment, and self-Image congruence: The adoption of e-book readers. *Psychology & Marketing*, *30*(4), 372-384.

Baca-Motes, K., Brown, A., Greenzy, A., Keenan, E. A., & Nelson, L. D. (2013). Commitment and behavior change: Evidence from the field. *Journal of Consumer Research*, *39*(5), 1070-1084.

Bagozzi, R., & Yi, Y. (1988). On the evaluation of structural equation models. *Journal of the Academy of Marketing Science*, *16*(1), 74-94.

Beard, K. W. (2005). Internet addiction: A review of current assessment techniques and potential assessment questions. *CyberPsychology & Behavior*, *8*(1), 7-14.

Bettencourt, L. A. (1997). Customer voluntary performance: Customers as partners in service delivery. *Journal of Retailing*, *73*(3), 383-406.

Block, J. (2008). Issues for DSM-V: Internet addiction. *American Journal of Psychiatry*, *65*(3), 306-307.

Busch, P. A., & McCarthy, S. (2021). Antecedents and consequences of problematic smartphone use: A systematic literature review of an emerging research area. *Computers in Human Behavior*, *114*, 1-47.

Caplan, S. E. (2003). Preference for online social interaction: A theory of problematic internet use and psychosocial well-being. *Communication Research*, *30*(6), 625-648.

Caplan. S. E. (2010). Theory and measurement of generalized problematic internet use: A two-step approach. *Computers in Human Behavior*, *26*(5), 1089-1097.

Casey. B. M. (2012). *Linking psychological attributes to smart phone addiction, face-to-face communication: Present absence and social capital.* Graduate School of the Chinese University of Hong Kong.

Cardak, M. (2013). Psychological well-being and internet addiction among university students. *The Turkish Online Journal of Educational Technology*, *12*(3), 134-141.

Cheever, N. A., Rosen, L. D., Carrier, L. M., & Chavez, M. (2014). Out of sight is not out of mind: The impact of restricting wireless mobile device use on anxiety levels among low, moderate and high users. *Computers in Human Behavior*, *37*, 290–297.

Chen, J. (2007). Flow in games. *Communications of the ACM*, *50*(4), 31-34.

Chia, D. X., & Zhang, M. W. (2020). A scoping review of cognitive bias in Internet addiction and Internet gaming disorders. *International Journal of Environmental Research*

and Public Health, *17*(1), 1-11.
Chiu, S. (2014). The Relationship between life stress and smartphone addiction on Taiwanese university student: A mediation model of learning self-efficacy and social self-efficacy. *Computers in Human Behavior*, *34*, 49-57.
Correll, S. (1995). The ethnography of an electronic bar. *Journal of Contemporary Ethnography*, *24*(3), 270-298.
Csikszentmihalyi, M. (1990). Flow: The psychology of optimal experience. Harper & Row.
Dai, H., Haried, P., & Salam, A. F. (2011). Antecedents of online service quality, commitment and loyalty. Journal of Computer Information Systems, 52(2), 1-11.
David, M. E., Roberts, J. A., & Christenson, B. (2017). Too much of a good thing: investigating the association between actual smartphone use and individual well-being. International Journal of Human-Computer Interaction, 34(3), 265-275.
Demirci, K., Akgonul, M. & Akpinar, A. (2015). Relationship of smartphone use severity with sleep quality, depression, and anxiety in university students. *Journal of Behavioral Addictions*, *4*(2), 85-92.
Fishbein, M., & Ajzen, I. (1975). *Belief, attitude, intention, and behavior: An introduction to theory and research, Reading.* MA: Addison-Wesley.
Fullerton, G. (2005). The impact of brand commitment on loyalty to retail service brand. *Canadian Journal of Administrative Sciences*, *22*(2), 97-110.
Harris, B., Regan, T., Schueler, J., & Fields, S. A. (2020). Problematic mobile phone and smartphone use scales: A systematic review. *Frontiers in Psychology*, *11*, 1-24.
Heijden, H. (2004). User acceptance of hedonic information systems. *MIS Quarterly*, *28*(4), 695-704.
Hodis, M. A., & Bruner, G. C. (2009). Technology addiction: An exploratory study of the negative impact of technology on consumer welfare. *Advances in Consumer Research*, *36*, 840-841.
Huizingh, E., & Hoekstra, J. C. (2003). Why do consumers like websites?. *Journal of Targeting, Measurement and Analysis for Marketing*, *11*(4), 350-361.
Jahan, I., Bhuiyan, K. H., Rahman, S., Bipasha, M. S., & Zayed, N. M. (2020), Factors influencing consumers' attitude toward techno-marketing: An empirical analysis of restaurant business in Bangladesh, *International Journal of Management*, *11*(8), 114-129.
Jeong, E., & Kim, D. (2011). Social activities, self-efficacy, game attitudes, and game addiction. *Cyberpsychology, Behavior, and Social Networking*, *14*(4), 213-221.
Jeong, S., Kim, H., Yum, J., & Hwang, Y. (2015). What type of content are smartphone users addicted to? SNS vs. games. *Computers in Human Behavior*, *54*, 10-17.
Kalkbrenner, J., & McCampbell, A. (2011). The advent of smartphones: A study on the effect of handheld electronics on personal and professional productivity. *Journal of Applied Global Research*, *4*(8), 1-9.
Kwon, M., Lee,Y., Won, W., Park, J., Min, J., Hahn, C., Gu, X., Choi, J., & Kim, D. (2013). Development and validation of a smartphone addiction scale (SAS). *PloS One*, *8*(2), 1-7.
Lawrence, T. L., Peng, Z., Mai, J., & Jing, J. (2009). Factors associated with internet addiction among adolescents. *CyberPsychology & Behavior*, *12*(5), 551-555.
Lee, W. (2013). An exploratory study on addictive use of smartphone: Developing SAUS(smartphone addictive use scale). *Journal of Convergence Information Technology*, *8*(12), 403-407.
Lee, Y., Chang,, C., Lin, Y., & Cheng, Z. (2014). The dark side of smartphone usage: Psychological traits, compulsive behavior and technostress. *Computers in Human Behavior*, *31*, 373-383.
Leung, L. (2008). Linking psychological attributes to addiction and improper use of the mobile phone among adolescents in Hong Kong. *Journal of Children and Media*, *2*(2), 93-113.
Lin, Y.-H., Pan, Y.-C., Lin, S.-H., & Chen, S.-H. (2016). Development of short-form and screening cutoff point of the smartphone addiction inventory (SPAI-SF). *International Journal of Methods in Psychiatric Research*, *26*(2), 1-6.
Lyibomirsky, S., & Lepper. H. S. (1999). A measure of subjective happiness: Preliminary reliability and construct validation. *Social Indicators Research*, *46*(2), 137-155.
Morgan, R., & Hunt, S. (1994). The commitment-trust theory of relationship marketing. *Journal of Marketing*, *58*(3), 20-38.
Park, N., Kim, Y., Shon, H., & Shim, H. (2013). Factors influencing smartphone use and dependency in South Korea. *Computers in Human Behavior*, *29*(4), 1763-1770.
Park, N., & Lee, H. (2014). Nature of youth smartphone addiction in Korea. *Journal of Communication Research*, *51*(1), 100-132.
Pies, R. (2009). Should DSM-V designate "internet addiction" a mental disorder?. *Psychiatry*, *6*(2), 31-37.
Robinson, T., & Berridge, K. (2003). Pleasure of the brain. *Annual Review of Psychology*, *52*(1), 25-53.
Salehan, M., & Negahban, A. (2013). Social networking on smartphones: When mobile phones become additive. *Computers in Human Behavior*, *29*(6), 2632-2639.
Scherer, K. (1997). College-life online: Healthy and unhealthy internet use. *Journal of College Student Development*, *38*(6), 655-65.
Shin, S., Lee, W-J., & Odom, D. (2014). A comparative study of smartphone user's perception and preference towards mobile payment methods in the U.S. and Korea. *Journal of Applied Business Research*, *30*(5), 1365–1375.
Skues J. L., Williams, B., & Wise, L. (2012). The effects of personality traits, self-esteem, loneliness, and narcissism on Facebook use among university students. *Computers in Human Behavior*, *28*(6), 2414-2419.
Takao, M., Takahashi, S. & Kitamura, M. (2009). Addictive personality and problematic mobile phone use. *CyberPsychology Behavior*, *12*(5), 501-507.
Thatcher, A., Wretschko, G., & Fridjhon, P. (2008). Online flow experiences, problematic internet and internet procrastination. *Computers in Human Behavior*, *24*(5), 2236-2254.
Thomas, S. (2011). Addiction in internet chatting: An empirical study using modified technology acceptance model. *Interdisciplinary Journal of Contemporary Research in Business*, *3*(4), 287-298.
Turel, O., Serenko, A., & Giles, P. (2011). Integrating technology addiction and use: An empirical investigation of online auction users. *MIS Quarterly*, *35*(4), 1043-1061.
van Deursen, A, Bolle, C. L., Hegner, S. M., & Kommers, P. (2015). Modelling habitual and addictive smartphone behavior. *Computers in Human Behavior*, *45*, 411-420.
Venkatesh, V., & Davis, F. D. (1996). A model of the antecedents

of perceived ease of use: Development and test. *Decision Science*, *27*(3), 451-481.

Wallace, A. (1999). *The psychology of the internet.* New York: Cambridge University Press.

Wang, J., Wang, H., Gaskin, J., & Wang, L. (2015). The role of stress and motivation in problematic smartphone use among college students. *Computers in Human Behavior*, *53*, 181-188.

Webster, J., & Martocchio, J. J. (1992). Microcomputer playfulness: Development of a measure with workplace implications. *MIS Quarterly*, *16*(2), 201-226.

Wei, R., & Lo, V. (2006). Staying connected while on the move: Cell phone use and social connectedness. *New Media & Society*, *8*(1), 53-72.

Wu, H. R., & Zhu, K. J. (2004). Path analysis on related factors causing internet addiction disorder in college student. *Chinese Journal of Public Health*, *20*(11), 1363-1364.

Young, K. S. (1998). *Caught in the net.* New York: John Wiley & Sons.

Yu, S., & Choi, J. (2015). The relationship of university students' smartphone addiction with depression, anxiety and aggression: The moderating effect of self-control. *Journal of Korea Institute of Youth Facility and Environment*, *13*(1), 131-144.