Exploring Korean Collegians' Smartphone Game Behavior: Focusing on Conciseness, Perceived Ease of Use, Perceived Enjoyment, Flow, and Intent to Use

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한국대학생의 스마트폰 게임 행위의 탐색: 간명성, 인지적 용이성, 인지적 즐거움, 플로우 및 이용의도를 중심으로

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Abstract This study explored Korean college students' smartphone game behavior for the pastime. Smartphone games have weakness that is not appropriate for playing the game because of small screen and non-sophisticated interface for operation. To defeat the disadvantage, the games employed minimalism like conciseness or simplicity. The study explored how conciseness influences perceived ease of use, perceived enjoyment, flow, and intent to use the game through PLS path modeling. We found that every hypothesis except a path, perceived ease of use to flow, proved significant. This result means that smartphone game design should consider the interface of users' convenience and user experience practically. Finally, based on the findings, suggestions for future studies were discussed

Key Words : Smartphone game, conciseness, perceived ease of use, perceived enjoyment, flow, intent to use

요 약 본 연구는 현대인의 주요한 시간보내기 수단으로 자리 매김하고 있는 스마트폰 게임행위를 우리나라 대학생을 대상으로 경험적으로 탐색하였다. 스마트폰 게임은 작은 스크린 크기와 정교하지 않은 조작 인터페이스로 인해 컴퓨터 게임에 비해 이용자에게 불편한 게임이다. 이러한 불리한 상황을 극복하기 위하여 스마트폰 게임은 게임 인터페이스 설계에 있어서 간명성으로 대표되는 미니멀리즘적 요소를 도입하고 있다. 본 연구는 스마트폰 게임의 간명성이 인지적 용이성, 즐거움, 플로우 및 이용의도에 어떠한 영향을 미치는지를 PLS(partial least square) 경로모형분석을 통해 탐색한다. 연구결과를 요약하면, 인지적 용이성-플로우 경로를 제외한 제안된 모든 가설들이 유의한 것으로 나타났다. 이러한 결과는 게임 개발에 있어서 이용자 편의 중심의 인터페이스와 이용자의 경험을 고려할 필요가 있음을 말해준다. 마지막으로 미래 연구를 위한 함의와 제언을 제시하였다.

주제어 : 스마트폰 게임, 간명성, 인지적 용이성, 인지적 즐거움, 플로우, 이용의도

1. Introduction

Media have played an important role in the pastime. Today smartphone is the representative of media for pastime due to personalization, customization, and portability. People use many kinds of content on a smartphone for pastime. Especially, a game is a favorite content of smartphone user. Smartphone users most frequently download and exert game applications in Korea[1].

Although smartphone game applications have a disadvantage, e.g. relative small screen, another element in the games enables the user to play them. This research explores what enables smartphone users to play the game. Thus, this research analyzes the structural relationships influencing smartphone games usage, specifically, concerning conciseness, perceived ease of use, perceived enjoyment, flow, and use intent.

This research would identify that users' cognition plays a critical role in new technology acceptance. In turn, practically the analyses would give significances to game developers or programmers for developing applications.

2. Literature Review and Hypothesis

2.1 Minimalism in Smartphone Game: Conciseness

The advent of 'digital era' has caused to diversify device display and has made the Graphic User Interface (GUI) design an important issue. Moreover, the trend of digital design emphasizes User Experience-based design (UX-based design) [2]. The contemporary UX-based design partakes of minimalism which is the trend of the contemporary art and pursues simplicity or conciseness[3].

Kim [3] classifies the minimalism in digital game GUI into three aspects: (1) information reduction through the system simplification, (2) navigator system for substituting mini-map, and (3) indirect GUI through features in the game. The information reduction through the system simplification divides into three-way, GUI deletion, intensive informational GUI, and intermittent pop-up GUI which show up if necessary. They contribute convenience and participation to users, and the affordable space through them presents the user to maximum visual transmission. The navigator system comprises runner vision, scale on a bar coordinate, and circle or fan-shaped direction indicator to replace mini-map. The runner vision informs the user where to go through objects with garish color on user direction. The bar coordinate informs direction rather than accurate position, and present simple GUI due to occupying smaller space than mini-map. The indirect GUI through features in the game refers to present indirect mission communication with the user instead of direct order, for example, projecting the mission text on the wall which the character watches and featuring the player on a special suit that synchronizes operational interfaces and menu. The equipment enables the user to commit to the game.

The smartphones, furthermore, are so-called 'computer in the palm,' and have the functions beyond mere voice calling and texting service: SNS, web browsing, game, etc. The game is a powerful killer content which leads the users into using smartphone more frequently, despite the criticism of addiction to a smartphone.

However, the smartphone has some weakness for playing a game, whereas it has some strength, e.g., portability, high definition display, and online. The weakness is relative smaller display, less operative interface, and less availability for mass storage game due to less hardware than a computer. Thus, smartphone game needs minimalism design for playing the game smoothly. Especially, conciseness or parsimony, the sub-concept of minimalism, for game design indicates minimizing the introduction of

interface elements and inappropriate metaphors that could lead to clutter[4]. The conciseness contributes to improved learnability and user acceptance of novel interface[5]. Thus, the conciseness in game design would stimulate the users' perception that playing the game would be free of effort. Regarding conciseness, Oh and Kim[6] identified the conciseness influences perceived enjoyment and flow on playing a digital game. Accordingly, this study hypothesizes:

H1. Conciseness in the game will positively affect perceived ease of use (PEOU).

H2. Conciseness in the game will positively affect perceived enjoyment (PE).

H3. Conciseness in the game will positively affect Flow

2.2 Relationship between PEOU, PE, flow and Intention to use

PEOU from technology acceptance model[7] refers to "the degree to which a person believes that using a particular system would be free of effort(p 320)." According to previous studies[7, 8, 9], the information system user trends to use more convenient system than an inconvenient system. Rogers[10] also reports the faster the user learns how to use, the faster a new product is accepted in a market.

Some devices in smartphone game would enable players to perceive ease of playing a game. Especially, smartphone games employ so-called auto play mode which make users ease to play and to level up. That is, though simple setting about the way to play, the system implements the task automatically. With regard to PEOU, Oh and Kim[6] verifies PEOU augments PE and flow in playing a digital game. Accordingly, present study sets forth the following hypotheses:

H4. PEOU will positively affect PE.

H5. PEOU will positively affect Flow.

Playing a game is a hedonic activity to pursue enjoyment. PE is an appropriate concept to understand the hedonic activity. PE is defined as "the extent to which enticing users' enjoyment is perceived through the activity of using a specific product or services, rather than derives from any of its own performance consequences"[11, p. 31, 12]. The previous study verified the experience of enjoyment, playfulness, or fun on playing game augments the commitment to the game and the intention to play a digital game[6, 13]. Accordingly, the following hypotheses were proposed:

H6. PE will positively affect flow

H7. PE will positively affect intent to use (INT).

Flow is defined as the holistic experience that people feel when they act with total involvement[14]. When users are in the flow state, they get absorbed in their activity, such as sports, shopping, rock climbing, dancing, gaming and others; their awareness is concentrated to the activity itself; they lose self-consciousness, and they feel in control of their environment[15]. Previous studies[6, 13, 15] identified flow was positively associated with intent to play a game. Accordingly, we hypothesize:

H8. Flow will positively affect INT.

Based on the above hypotheses, the following [Fig. 1] illustrates hypothetical relationships.
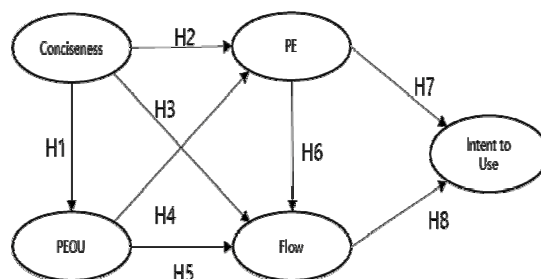
[Fig. 1] Proposed Research Model

3. Method

3.1 Data Collection

The data for empirical analysis were collected by

implementing a field survey of smartphone game users. The subjects chosen for this study were 417 Korean college students who had experienced smartphone games. To examine the proposed hypotheses, the study employed a self-reported survey. Questionnaires were administered by 20 trained interviewers who major in communication. The survey was administered for 10 days from May 19 to May 29, 2014, in Seoul metropolitan area. This study employed the convenience sampling for the economy of time and cost. <Table 1> summarizes the demographic profiles of the respondent. As shown in <Table 1>, 50.60% of the respondent were male with 49.40% female. As for academy year, 27.34% of the respondents were junior; 25.18% were freshman; 24.46% were sophomore, and 23.02% were senior. The mean of age was 23.04 with standard deviation of 3.53.

〈Table 1〉 Demographic Profile

Demographic	N	%
Male	211	50.6
Female	206	49.4
Freshman	105	25.18
Sophomore	102	24.46
Junior	114	27.34
Senior	96	23.02

3.2 Measurement and Data Analysis

To test the proposed hypotheses, this study employed five-part questionnaires which were modified from previous studies: conciseness, PEOU, PE, flow, and intent to use. Each item of questionnaires was measured with five-point Likert scales, ranging from 'strongly disagree' to 'strongly agree'. <Table 2> shows the scales of measurement.

To examine structural causalities between the proposed hypotheses, we employed PLS path modeling because PLS path modeling has more advantages than the covariance-based structural equation modeling (SEM) approach such as LISREL and AMOS[16]. Whereas SEM emphasizes sample size, PLS path modeling is free from the sample size. Accordingly,

small sample study could employ PLS path modeling [16, 17]. The sample in PLS path modeling needs 10 times than the number of the item of the most complex constructs[17, 18]. PLS path modeling, moreover, is a proper method for exploratory study[16, 17, 18]. This study is exploratory because there are a few of empirical study on smartphone game UX involved in the minimalism of smartphone game interface, while there are many conceptual and theoretical discussions. Accordingly, we employed PLS path modeling method.

〈Table 2〉 The Scale of Measurement

Conciseness[6, 13]
The smartphone game has proper capacity.
The smartphone game is organized concisely and plainly.
The menu in the smartphone game is sorted clearly and unequivocally.
The screen of the smartphone game is composed to ease the player of watching.
Perceived Ease of Use[19, 20]
Playing the smartphone game is easy for me.
It would be easy for me to become skillful at playing the smartphone game.
Learning to play the smartphone game is easy for me.
Perceived Enjoyment[21]
Playing the smartphone game gives enjoyment to me.
I have fun playing the smartphone game.
The actual process of playing the smartphone game is pleasant.
Flow[22]
I am not conscious of the passage of time while playing the smartphone game.
When playing the smartphone game, I am unaware of what is going on around me.
When playing the smartphone game, I concentrate hard.
Intent to Use[19, 20]
I intend to play the smartphone game in the near future.
I intend to keep playing the smartphone game.
I intend to play the smartphone game repeatedly.

4. Findings

4.1 Reliability and Validity of Measurement Scale

For testing the reliability and validity of measure scales, this study executed PLS algorithm on Calculate tap in SmartPLS package to get PLS quality criteria: AVE (Average Variance Extracted), composite

reliability, R square, and Cronbach's alpha (α). <Table 3> shows the overview of PLS quality criteria. As shown Table 3, each composite reliability is over minimum criterion, 0.7; consequently, each reliability of measurement scale is suitable for analysis. Every Cronbach's α of constructs is greater than 0.6, the minimum criterion, and indicates reliable values. To examine construct validity of the measurement model, we adopted convergent and discriminant validity[23]. For evaluating convergent validity, we estimate AVE; and then, convergent validity is valid when AVE is greater than 0.5[24, 25]. Every AVE value is over 0.5, and then we approved convergent validity.

〈Table 3〉 PLS Quality Criteria Overview

	AVE	Composite Reliability	R Square	Cronbach's Alpha
PE	0.689	0.869	0.270	0.774
PEOU	0.728	0.889	0.190	0.813
Flow	0.652	0.849	0.244	0.736
INT	0.760	0.904	0.375	0.840
Conciseness	0.616	0.864		0.791

To evaluate discriminant validity, we compared the inter-correlations within latent constructs with the root square of AVE of latent constructs. When the square of AVE of a latent construct is greater than its correlation with the other latent constructs, we approve that discriminant validity is significant[17]. <Table 4> shows that every square of AVE is appropriate to the criterion respectively.

〈Table 4〉 Latent Constructs Correlations

	PE	PEOU	Flow	INT	Conciseness
PE	0.830				
PEOU	0.421	0.853			
Flow	0.463	0.174	0.807		
INT	0.608	0.324	0.347	0.872	
Conciseness	0.457	0.436	0.350	0.250	0.785

Diagonals show the square root of AVE

4.2 Test of Structural Model

The following <Table 5> shows the finding of hypotheses test and path coefficients of the proposed research model. PLS path modeling method determines model validity through the R square value and the structural path coefficient[26]. We executed Bootstrapping on Calculate tap of SmartPLS package for estimating the statistical significance of the proposed path coefficient by means of the critical value of t-statistic.

As shown <Table 5>, every hypothesis except H5 (PEOU-Flow path) is significant and supported. In detail, Conciseness predicted PEOU (β=0.436, t=10.277, p<0.0005, one-tailed test), PE (β=0.337, t=6.053, p<0.0005, one-tailed test), and Flow (β=0.202, t=3.816, p<0.0005, one-tailed test) respectively. These findings mean that minimalism for smartphone game interface design plays an important role in users' perception of usability, pleasure of smartphone game, and commitment to the game. All most of smartphone display is small, so that it is not good to play the game. Thus, to overcome this weakness, some strategies should be needed, one of which would be minimalism of interface design. PEOU, furthermore, influences PE (β=0.274, t=5.011, p<0.0005, one-tailed test), in turn, PE influences Flow (β=0.406, t=6.978, p<0.0005, one-tailed test) and INT (β=0.569, t=11.926, p<0.0005, one-tailed test). These findings resemble previous studies regarding the digital game[6, 13] except that PEOU does not influence Flow (H5). Finally, Flow affects INT (β=0.084, t=1.799, p<0.05, one-tailed test). The finding validates the past studies regarding intention to use a game [6, 13, 15].

5. Conclusion and Discussion

Today, people regard the mobile devices as something that means other than just communication connecting another person. An important role of mobile

〈Table 5〉 Hypotheses Test Result

	Hypotheses	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	Standard Error (STERR)	T Statistics (|O/STERR|)	P	Result
H1	Conciseness -> PEOU	0.436	0.438	0.042	0.042	10.277	p<0.0005	supported (one-tailed test)
H2	Conciseness -> PE	0.337	0.336	0.056	0.056	6.053	p<0.0005	supported (one-tailed test)
H3	Conciseness -> Flow	0.202	0.204	0.053	0.053	3.816	p<0.0005	supported (one-tailed test)
H4	PEOU -> PE	0.274	0.272	0.055	0.055	5.011	p<0.0005	supported (one-tailed test)
H5	PEOU -> Flow	-0.086	-0.090	0.060	0.060	1.435	n.s	not supported
H6	PE -> Flow	0.406	0.412	0.058	0.058	6.978	p<0.0005	supported (one-tailed test)
H7	PE -> INT	0.569	0.571	0.048	0.048	11.926	p<0.0005	supported (one-tailed test)
H8	Flow -> INT	0.084	0.085	0.047	0.047	1.799	p<0.05	supported (one-tailed test)

devices is the pastime, such as playing a game. Although the smartphone is good at playing a game due to personalization, customization, and portability, relatively small screen on the smartphone is an inhibitor for playing a game. Accordingly, to overcome the disadvantage, the game design employs the elements of the minimalism in the game interface. This study assumes that conciseness, a sub-concept of the minimalism, influences PEOU, PE, and Flow; PEOU influences PE and Flow; PE influences Flow and Intent to use, and then Flow influences Intent to use. For analyzing structural causality, the study employs the PLS path modeling method through SamrtPLS 2.0 package.

The following summarizes the findings

First, conciseness, an element of the minimalism in game interface, has a positive effect on PEOU, PE, and Flow. The finding means that conciseness enables users to play the game easily, to feel pleased and fun, and to feel themselves falling in total involvement. Accordingly, the future game designer should understand and consider the minimalism when designing the smartphone game. Second, PEOU has a positive effect on PE. That is, the easier the user has a perception of playing the game, the more fun the user

perceives. Third, PE has a positive effect on flow and intent to use. The finding implies that perception of pleasure from playing the game leads to commitment to the game and continues to use the game. Lastly, flow has a positive effect on intent to use. This indicates that the optimal experience of playing the game results in future usage of the game. These findings, theoretically, validate the previous studies on the digital game[6, 13] and, practically, suggest that smartphone game design should consider the interface of users' convenience and user experience.

The following is some suggestions for future study. This study explored that how the minimalism in smartphone game interface influences the intent to use the game within structural causality. However, the study analyzed smartphone game usage through conciseness, a sub-concept of the minimalism. Accordingly, a future study would develop and employ the multidimensional sub-concept of minimalism in the game interface. Especially, according to the game genre or typology, we would elaborate the elements of minimalism, e.g. Kim[3]'s classification of minimalism, and then would apply them to the individual genre for more significance on theory and practice.

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