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THE IMPACT OF ELECTRONIC WORD-OF-MOUTH AND FLOW EXPERIENCE ON CONTINUANCE INTENTION

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Abstract

Online gaming is a burgeoning market with growth potential and is developing rapidly. The entertainment-oriented features of such online games play experience motives for users. The global market of games will reach approximately US\$ 1.3 billion annually. The technology acceptance model (TAM), including perceived ease of use (PE) and perceived usefulness (PU) and intention in accepting new technologies, is one of the most widely examined models used to test consumer acceptance of new information technology. Electronic word of mouth (EWOM) and flow experience (FE) also influence continuance intention of online games. However, the introduction of these factors was not utilized accurately. Therefore, the challenges for service providers are to identify key obstacles affecting the continuance intention of online games. In this study, we examined the role of TAM, FE and assess the influence of TRI on these factors toward continuance intention of online games. This model was tested with data from 686 current online game players who answered an online questionnaire. The structural equation model analysis confirmed that EWOM, FE and PU have a positive effect on continuance intention with statistical significance. The implications of this study are also discussed.

Keyword: Technology acceptance, Electronic word of mouth, Flow experience, Continuance intention, Online games.

Introduction

In recent years, online games have flourished and become one of the most popular forms of leisure and entertainment. The online game industry is linked with the basic entertainment needs. Although the average user spending is limited, online game industry is still able to maintain growth.

With the rise of the online games, the related businesses increasingly compete with each other. Low cost network marketing has become the best marketing tool. As the online game has a considerable cohesion with the communities, the

players need a specific and free community forum to express some kind of online games for evaluation or questions asked, therefore, some game player's community websites have become very important channels of communication. If they made the forums, message boards or chat rooms useful and established a good reputation among the players, the site can become a major tool of foreign propaganda to increase online games.

"Word of mouth" has always been an important customer decision-making factor in whether to buy. With the development of Internet media, "word of mouth" becomes not only exist in the spread between people, but also are the customers' views and experiences. The chat room, message board and other cyberspace communication has formed new types of word of mouth, commonly called "Internet word of mouth" in addition to retain the original "word of mouth" feature, by means of the network characteristics ([11] and [12]), its modes of transmission and dissemination of results should be different.

Past research (e.g. [29] and [31]) found that consumer's age, gender, experience, etc, were all key factors for receiving new information, while technology readiness measured the future of new technologies or services for individuals. Amongst differences in personal characteristics, including intelligence, knowledge, thinking styles, motivation and other factors, the individual and interactive game environment generated by emotional experiences come from the human-machine interaction and is generated by flow experience [22]. Other than personal characteristics, the "flow experience" is the interaction of individual motivation and the environment condition, generated by experience, when the individual in the activities of all focused, balance between challenges and skills, and satisfaction with the master, they always come into an addicted state. Addicted individuals represent the experience of their feeling with the character, motives and qualifications process in a kind of work [5]. Therefore, we suggest that personal characteristics or technological readiness are the related factors on flow experience.

Many word of mouth and reputation studies have focused on the quality of product and the impact on consumer behavior. Agarwal and Prasad (1999) referred to personal differences (individual differences) has been important factors in consumer acceptance for new information technology products or services [1]. As technology readiness is used to measure individual services for new technologies or psychological tendencies, this study also suggests that individual's high and low technology readiness level would affect the level of flow experience. This study mainly explores the technology acceptance model, flow experience, online word of mouth influence on intention to continue the game.

Hypotheses Development

Internet word of mouth and perceived usefulness

The research result of Igbaria, Guimaraes & Davis (1995) showed that subjective norm through perceived usefulness and indirectly affect the use of IT users' intention, word of mouth means a considerable impact on the existence of perceived usefulness [16]. Therefore, we hypothesize:

H1a: Positive online word of mouth (PWOM) has a positive relationship with the perceived usefulness (PU).

H1b: Negative online word of mouth (NWOM) has a negative relationship with the perceived usefulness (PU).

Perceived ease of use and perceived usefulness

Easy operation will increase work performance, as perceived ease of use will obviously help to enhance the perceived usefulness ([24] and [29]). In addition, most research on the expansion pattern of TAM, ([1], [8], [27], [28], [30], and [33]) pointed out that perceived ease of use will positively affect the user's perceived usefulness. The following hypothesis was proposed

H2: Perceived ease of use (PE) has a positive relationship with perceived usefulness (PU).

Perceived ease of use and flow experience

Csikszentmihalyi (1975) pointed out that a person aware of an activity will affect the feasibility of the effects of their flow experience [5]. Trevino & Webster (1992) also studied the use of e-mail on addiction [26]. Ease of use will affect the experience of their addiction. The above theory shows that easier systems in the cognitive use of a higher feasibility and the more affect the use of

flow experience. Therefore, easy to use interface is very important for online game. Hsu & Lu (2003) also showed that the flow experience and perceived ease of use had a positive relationship [14], therefore we hypothesize:

H3: Perceived ease of use (PU) has positive correlation with flow experience (FE).

Internet word of mouth and continuance intention

Word of mouth in consumer behavior plays an important role, and influence customers to buy products for short-term and long-term decisions. ([3], [11], and [13]) also pointed out that word of mouth on the Internet more and more active dissemination and influence consumer buying decisions. Therefore we hypothesize:

H4a: Positive word of mouth (PWOM) network will strengthen the continuance intention (CI).

H4b: Negative online word of mouth (NWOM) will ease the continuance intention (CI).

Technology acceptance model and continuance intention

Hu et al. (1999) pointed out that the technology acceptance model, with a strong theoretical basis and empirical support has a large number of advantages [15]. However, Teo, Lim & Lai (1999) stated that "perceived usefulness" and "perceived ease of use" will positively affect intention to use the Internet, while empirical results support the "perceived ease of use" and use the Internet to conduct direct and indirect effect [25]. Therefore we hypothesize:

H5: Perceived usefulness (PU) has a positive relationship with continuance intention (CI).

H6: Perceived ease of use (PE) has a positive relationship with continuance intention (CI).

Flow experience and continuance intention

Hsu & Lu (2003) mentioned that flow experience can be used to predict whether the user will play certain online games [14]. When the user generated flow experience that will have a positive impact on the intention of use. Rettie (2001) also suggested that flow experience seems to be obsessed with the Internet users to extend the stay in the use of games [21]. Therefore we hypothesize:

H7: Flow experience (FE) has a positive effect on continuance intention (CI).

Figure 1 summarizes the hypothesis framework of this research.

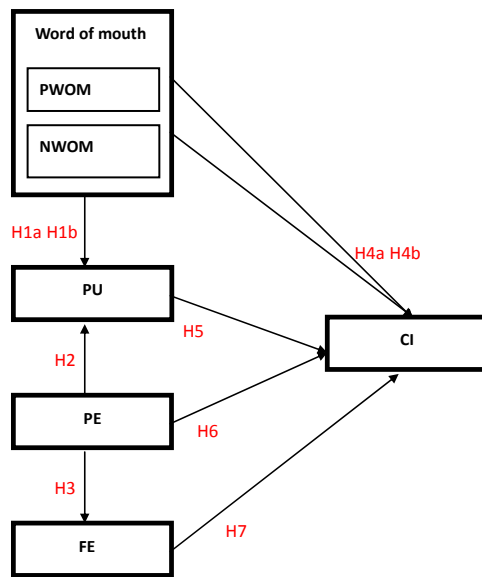


Figure 1- hypothesis framework

Research Method

In this study, convenience sampling and an online questionnaire were adopted on www.my3q.com. It also published in the domestic larger information survey website and the game base (Bahamut). To make the sample representative, the questionnaire had qualifications: 1. Have participated or are participating in online games. 2. Have browsed through the online game-related community site. A total of 917 samples were collected within two months. A total of 686 valid questionnaires were obtained, and the valid rate was 74.80%.

Statistics

This study used SPSS 12.0 with AMOS 6.0 structural equation model version (structural equation models, SEM) as a statistical analysis tool. The process used in the analysis methods included descriptive statistics analysis, factor analysis, reliability analysis, the path analysis, etc.

Questionnaire design

The first part of questionnaire is personal information of online gamers: this part is to understand basic information on the online gaming experience of subjects; these data include the “has been” or “is” for online game play-off information including (1)Sex, (2)Age, (3)Education, (4)Professional, (5)The average time spent on each online game, (6)How long they have had access to online game, (7)The average duration until leaving the current online game, (8)The duration for you to give up a major online game, (9)The

average amount of online games in duration, (10)The average time for each online game.

The second part of questionnaire consists primarily of (1) flow experience including 4 items ([14] and [19]), (2) intention to continue the game including 3 items [17], (3) Internet word of mouth including 6 items [12], (4) perceived ease of use, perceived usefulness including 8 items ([14]).

Results

Descriptive statistics

Among a total of 686 valid samples, 543 are male (79.2%), 143 are female (as shown in Table 1). The male to female ratio is about 8:2. In age distribution, 255 people were under 20 years 348 were between 21-30 years of age, a total of 87.9% under 30 years old showing a major player in online game. However, over 30 years of age and almost 12% of users in the ratio have the market potential for development that should not be overlooked.

Education degree distribution, the majority had universities accounted for 45.8%, while the high school level and a total of 270 (39.03%), which shows the university education level of online game players are mainly groups, followed by the high school educated users.

Occupational distribution, the total of 396 students is the largest group, accounting for 57.7%, followed by the 207 staffs including services, finance, manufacturing, military and government, health care, high-tech industry, accounting for 30.17%. Among this staff group, the in-service workers of online gamers is the main ethnic group, it has 11.7%, followed by manufacturing, and the finance staff is a minimum, only 0.60%.

54.7% of people gave up a game in a year, while nearly 34.5% of people gave up in 1 to 3 years. About 92.6% of people spent less than 10,000 NTD on each online game. The players had more than 2 years accounted for about 90.2% of players who has been played online games. The every day game players ranked up to 59.5%, while the playing time for each is 1 ~ 5 hours, accounting for 64% of the all sampling subjects almost play online games as part of everyday life.

Skewness and kurtosis

To check the distributional characteristics of the data, Table 2 and Table 3 summarize a variety of descriptive statistics. The distributional shape of the data, as reflected by its skewness and kurtosis, determined to a large extent, the conditions under which the use of various estimation techniques

Table 1- The subject of basic statistical information and online gaming experience

Characteristics of the subjects	Number	%	Online game account	Number	%
1. Gender			5. The average expenditure of each online game(NT)		
Male	543	79.2%	<10,000	635	92.6%
Female	143	20.8%	10000-30000	42	6.1%
2. Age			30000-50000	6	0.9%
20 years of age	255	37.2%	70000-90000	2	0.3%
21-30 years old	348	50.7%	More than 90000	1	0.1%
31-40 years	77	11.2%			
41-50 years	6	0.9%	6. Age of participate in an online game		
50 years old	0	0%	<3 months	7	1.0%
3. Education			3-6 months	6	0.9%
Senior High School	270	39.3%	6-12 months	16	2.3%
University College	395	57.6%	1-2 years	38	5.5%
Graduated School	21	3.1%	2 years	619	90.3%
4. Occupation			7. The average frequency of online game		
(1) Student	396	57.7%	Several times per day	408	59.5%
(2) office workers			Several times a week	236	34.4%
1. High-tech	26	3.8%	Once per week	7	1.0%
2. Manufacturing	66	9.6%	Several times a month	12	1.7%
3. Financial industry	4	0.6%	Once per month	4	0.6%
4. Medical industry	6	0.9%	Occasionally (1 months)	19	2.8%
5. Military	25	3.6%	8. Average hours per time on game		
6. Services	80	11.7%	<1 hour	34	5.2%
Other	38	5.5%	1-5 hours	440	64.1%
			5-10 hours	159	23.2%
			10-20 hours	41	6.0%
			More than 20 hours	12	1.7%

were appropriate. For most structural equation modeling (SEM) techniques, the presence of multivariate normality is needed.

Inspection of the significance of the skewness and kurtosis of each individual variable provided us with information about the choice of the appropriate statistical technique. Based on the information in Table 2, we concluded that most variables deviated significantly from normality, thereby limiting the validity of maximum likelihood estimation techniques.

Reliability and validity

Reliability estimates were computed using composite reliability (CR) value. That is the measurement for total reliability of each composition variables. As Table 3 shows, the values for the constructs and subscales are above the desirable minimum of 0.70, and hence these results surpass the acceptable level of .70 recommended by Nunnally (1978) [20]. These measurements, therefore, indicate high internal consistency.

To assess convergent validity, the t-tests for each indicator loading are shown in Table 3, and they show that the construct demonstrated a high convergent validity since all factor loadings surpass the recommended level of twice their standard error, providing strong evidence of convergent validity. Most of the load factors were between 0.60 and 0.82 and the reliability of its composition are more than 0.7 in Table 3, consistent with Fornell & Larcker (1981) [9]. On the composite reliability of the recommended value (0.60), indicating scale used in this study (the constructs of the questionnaire) has to meet its internal consistency. This study average variance extracted. (AVE) values in six dimensions, five more than up to 0.50 (standard value must be greater than 0.5), so convergent validity of this study is acceptable.

Content validity and discriminant validity

In this study, construct of this study was derived from relevant literature as a theoretical basis, and vast literature has been cited by the scale and measure, so that measures used in this study is consistent with content validity of guidelines. Therefore, this study has content validity.

Table 2- Descriptive statistics and empirical results of measurement model

Variables	Skewness	Critical value	Kurtosis	Critical value
CI1	-0.272	-2.913	-0.432	-2.312
CI2	0.071	0.76	-0.535	-2.86
CI3	-0.197	-2.108	-0.685	-3.661
CI4	-0.574	-6.133	0.117	0.624
FE1	-0.778	-8.323	0.407	2.176
FE2	-0.588	-6.284	-0.182	-0.974
FE3	-0.219	-2.344	-0.632	-3.376
FE4	-0.378	-4.042	-0.868	-4.643
WM6	-0.138	-1.48	-0.71	-3.797
WM5	-0.163	-1.745	-0.706	-3.776
WM4	-0.281	-3.01	-0.653	-3.493
WM3	-0.894	-9.565	1.02	5.454
WM2	-0.436	-4.659	-0.317	-1.693
WM1	-0.489	-5.23	-0.387	-2.067
PU1	-0.531	-5.674	0.313	1.671
PU2	-0.667	-7.136	0.772	4.128
PU3	-0.067	-0.721	-0.125	-0.667
PU4	-0.47	-5.031	-0.324	-1.733
PU5	-0.396	-4.236	-0.014	-0.076
PE1	-0.899	-9.614	0.933	4.989
PE2	-0.747	-7.987	0.178	0.949
PE3	-0.864	-9.237	0.727	3.888
INS4	0.355	3.795	0.311	1.66
INS3	0.533	5.697	0.45	2.406
INS2	0.317	3.388	0.192	1.027
INS1	0.258	2.762	-0.177	-0.944
DIS4	0.506	5.416	1.203	6.429
DIS2	0.051	0.541	0.437	2.335
DIS1	0.483	5.17	1.121	5.992
INNO5	-0.242	-2.588	0.166	0.887
INNO4	-0.39	-4.171	0.071	0.378
INNO3	-0.425	-4.549	0.139	0.745
INNO2	0.036	0.38	-0.12	-0.643
INNO1	-0.377	-4.03	0.136	0.726
OPT5	-0.785	-8.392	0.713	3.81
OPT4	-0.567	-6.068	0.233	1.246
OPT3	-0.442	-4.729	0.023	0.12
OPT2	-0.603	-6.449	0.583	3.115
OPT1	-0.444	-4.752	-0.172	-0.919

Discriminant validity is achieved if the correlations between different constructs are relatively insignificant. The χ^2 difference test can be used to assess the discriminant validity of every two constructs by calculating the difference of the χ^2 statistics for the constrained and unconstrained measurement models. In this study, all of the χ^2

Table 3- composite reliability and convergent validity

Factors/indicators	Loading	AVE	Composite reliability
(PE)			
PE1	0.838	0.589	0.810
PE2	0.799		
PE3	0.655		
(PU)			
PU1	0.815	0.444	0.758
PU2	0.623		
PU3	0.576		
PU4	0.626		
(PWOM)			
WM1	0.723	0.502	0.750
WM2	0.781		
WM3	0.613		
(NWOM)			
WM4	0.759	0.518	0.761
WM5	0.780		
WM6	0.608		
(FE)			
FE1	0.810	0.544	0.822
FE2	0.821		
FE3	0.770		
FE4	0.506		
(CI)			
CI1	0.822	0.551	0.785
CI2	0.728		
CI3	0.669		

Table 4- χ^2 difference tests for examining discriminant validity

Unconstrained model $\chi^2=848.1$ (d.f.=194)	constrained model χ^2 (d.f.= 195)	χ^2 difference
(PE,PWOM)	1101.2	253.1***
(PE,NWOM)	1109.9	261.8***
(PE,FE)	1123.3	275.2***
(PE,PU)	1197.7	349.6***
(PE,CI)	1202.3	354.2***
(PU,PWOM)	1020.8	172.7***
(PU,NWOM)	1088.5	240.4***
(PU,FE)	1088.7	240.6***
(PU,CI)	1077.9	229.8***
(FE,PWOM)	1110.9	262.8***
(FE,NWOM)	1102.3	254.2***
(FE,CI)	1111.3	263.2***
(PWOM,CI)	1105.4	257.3***
(NWOM,CI)	1185.5	337.4***
(PWOM,NWOM)	1146.1	314.7***

*p-value<0.1, **p-value<0.05, ***p-value<0.01

differences tests were significant at $p=0.01$ level (as shown in Table 4). Accordingly, the results demonstrated discriminant validity successfully achieved for the measurement model.

Goodness-of-fit indices for the measurement model

The main purpose of using Structural Equation Modeling (SEM) in this study was to examine the proposed theories, concepts, and whether the evidence of the significance of architecture, theses processes are model fit evaluation.

Modification index (MI) is used to select indicator variables, through repeated filtering, a total of four indicator variables will be deleted if its MI exceeds 3.84. Each construct in the measurement model was measured, Seven common model-fit criteria were used to assess the model's overall goodness-of-fit: $\chi^2/\text{d.f.}$; adjusted goodness of fit index (AGFI); comparative fit index (CFI); non-normed fit index (NNFI), incremental fit index (IFI); root mean square residual (RMR) and root mean square error of approximation (RMSEA). As shown in Table 5, comparison all fit indices with their corresponding recommended values provided evidence of a good model fit ($\chi^2/\text{d.f.}$ smaller than 5.0, AGFI greater than 0.8, CFI, NNFI, IFI all greater than 0.9 and RMR, RMSEA smaller than 0.08), thus demonstrating that the measurement model exhibited a tolerably good fit with the data collected [2]. Reliability can reflect the internal consistency of the indicators measuring a given factor.

The results of path analysis

This study used path analysis framework to present the parameters of each variable, unstandardized regression coefficients of six dimensions were

Table 5- Goodness-of-fit indices for the research model

Fit index	Recommended value	Measurement Model	Structural Model
$\chi^2/\text{d.f.}$	≤ 5.0	4.045	4.021
GFI	≥ 0.90	0.912	0.912
AGFI	≥ 0.80	0.884	0.885
CFI	≥ 0.90	0.894	0.893
TLI	≥ 0.90	0.872	0.873
IFI	≥ 0.90	0.895	0.894
PGFI	≥ 0.50	0.687	0.695
PCFI	≥ 0.50	0.741	0.749
PNFI	≥ 0.50	0.716	0.724
RMR	≤ 0.08	0.055	0.056
RMSEA	≤ 0.08	0.067	0.066

shown in Table 6, the influence of PE on CI is not statistically significant, the others were statistically significant, but NWOM and CI had a negative relationship. After standardized path coefficient, the variables changed slightly, but to remain positive or negative relationship. Standardized coefficients of PWOM \rightarrow PU, PU \rightarrow CI, FE \rightarrow CI were high, indicating perceived usefulness and flow experience have higher influence on continuing the game with the intention, the estimated value is 0.419 and 0.358, respectively. Positive word of mouth had a greater influence on perceived usefulness, the standardized coefficient value was 0.537. Therefore, the variables of constructs were significantly effect on the continuance intention except the perceived ease of use.

Table 6- Unstandardized and standardized regression coefficients

Path	Estimate	S.E.	C.R.	P	Label	Standardized Estimate
PU \leftarrow PE	.138	.039	3.573	***	par_18	.179
PU \leftarrow PWOM	.419	.070	5.999	***	par_24	.537
PU \leftarrow NWOM	-.137	.057	-2.421	**	par_25	-.192
FE \leftarrow PE	.084	.035	2.411	**	par_16	.112
CI \leftarrow FE	.513	.073	7.003	***	par_19	.358
CI \leftarrow NWOM	-.158	.065	-2.420	**	par_20	-.160
CI \leftarrow PWOM	.188	.081	2.311	**	par_21	.173
CI \leftarrow PU	.582	.088	6.647	***	par_22	.419
CI \leftarrow PE	-.029	.044	-.651	.515	par_23	-.027

*.p-value < 0.1 ; **.p-value < 0.05 ; ***.p-value < 0.01

Mediating effects

In this study, the Sobel Test, Aroian Test and Goodman Test were used to measure the indirect effects of four variables on CI. As shown in Table 7,

the Sobel z values, Aroian z value, Goodman z value of its absolute value greater than the standard value of 2, that shows flow experience (FE) and perceived usefulness (PU) as mediators of all paths.

Table7- Mediating effect analysis

Measure the construct	Construct relationship	Path Coefficient	Standard deviation	Sobel Test	Aroian Test	Goodman Test
PE→FE→CI	PE→FE	0.084	0.035	2.271	2.25	2.292
	FE→CI	0.513	0.073			
PE→PU→CI	PE→PU	0.138	0.039	3.119	3.092	3.148
	PU→CI	0.582	0.088			
NWOM→PU→CI	NWOM→PU	0.137	0.057	-2.258	-2.236	-2.282
	PU→CI	0.582	0.088			
PWOM→PU→CI	PWOM→PU	0.419	0.070	4.437	4.410	4.466
	PU→CI	0.582	0.088			

Discussion

This study may be applicable for psychological and behavioral science, may provide researchers and educators for their reference on flow experience, and provide great business opportunities for online gaming applications. Factors impacting gamers are important because competition is quite fierce. This study found that a positive online reputation (word of mouth), perceived usefulness, flow experience for continuing the game had a significant positive effect on intention, negative word of mouth network was negative impact; positive and negative word of mouth existed in the same network. The perceived usefulness and perceived ease of use on the impact of the flow experience also shows significant positive effects. This is seldom seen in previous studies.

Perceived usefulness on continuance intention

The results show that perceived usefulness directly affects the game continuance intention, or become a intermediary factors between online word of mouth and intention, As well as some scholars believe that the new technology used in predicting behavioral intention, the "perceived usefulness rather than "perceived ease of use" more important ([29], [30], and [33]). In order to enhance the player experience on the usefulness of the game, it is very important that the player needs to actively understand the game content.

Perceived ease of use on the continuance intention

The results show that perceived ease of use does not significantly affect the intention of continuing the game. Venkatesh et al. (2003) found that "perceived ease of use" in the system, although the early use is an important factor, when users become familiar with the system "perceived ease of use" turn into an insignificant relationship [31]. Therefore, over time, with improved familiarity, ease of use gradually does not directly affect the game continuance.

Perceived ease of use on perceived usefulness

Perceived ease of use will positively affect the user's perception of useful, the results of this study expand the model with the most TAM research. Van der Heijden (2004) [27], Venkatesh et. al. (2000) [30], and Wixom & Todd (2005) [33] showed ease use of online games get started more easily with the user interface, the more players want to achieve the purpose of entertainment, the more players feel the game is greatly enhanced the usefulness ,and indirectly affect whether the game players will continue.

The effect of positive and negative word of mouth on continuance intention and perceive usefulness

The results showed that positive and negative word of mouth impacted on continuance intention was very obvious, the higher the positive word of mouth, the more players would continue to play the game. Gelb & Sundaram (2002) [11] referred to the web's virtual space, providing views of the people are basically anonymous, without taking into account the interests of any feelings or situations: information disseminator will provide advice and real sharing first-hand experience to customers. Moreover, Briggs & Hollis (1997) [4] also pointed out that the message of customers for the network is based on individual needs, and active search for the received information will produce a lower sense of exclusion, it is easily be seen as credible information sources, and impact on consumer decision to products. So for businesses, how to meet the needs of many consumers with questions, maintain a good rating and reputation is extremely important issue.

Perceived ease of use on flow experience

The results showed that perceived ease of use has a positive effect for flow experience, when the players feel the interface and get started more easily in game, more easily into the flow experience. Flow experience is the period of

human-computer interaction, individual input in the games and explore in a process. If the game was easier to operate, it is possible to accelerate the player into the flow experience. Hsu & Lu (2003) also mentioned flow experience will motivate individuals have a positive mood and satisfaction, and cause individuals to further explore [14].

Flow experience on continuance intention

The results of this study found that the flow experience of online gamers addicted to the continuance intention to have a great statistical significance. Webster, Trevino & Ryan (1993) suggested that the feeling of indulgence is the experience of human-computer interaction [32]. Individuals interact with situations during the game through the manipulation of the environment to produce control sense, only the specific objectives of the reaction, and loss of other perception, that is to get an addicted state. The experience is obsessed with man-machine interaction during individual exploration into the game, and experience can feel the game fun. Therefore, the flow experience can play an important role with online game players. Hsu & Lu (2003) suggested that flow experience can be used to predict a user to play online games key projects and indicators [14].

Limitations of the study

In this study, an online questionnaire to collect samples may produce some bias. Filling out the questionnaire was voluntary and online game players who did not often visit community sites could not be included in this study. Results of this study is based on network game application, its causal relationship developed this range should be limited to as for other fields of science, and technology users can not be applied.

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