

USING TECHNOLOGY ACCEPTANCE MODEL TO EVALUATE USERS' ATTITUDE AND INTENTION OF USES

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Abstract: Many empirical studies have pointed out that the technology acceptance model (TAM) can be used to explain whether users can accept a new information technology. Therefore, this study has adopted TAM to investigate external factors that affect gamers' acceptance of online games. In this study, system quality, information quality, and service provider's characteristics were taken as external variables. It was discovered that in the aspect of perceptions, system quality had positive effects on perceived ease of use and perceived usefulness. Service provider's characteristics had positive effects on perceived usefulness and perceived trust. Besides, in the relationship between user's perception and attitude and intention, the research finding was consistent with TAM as suggested; i.e. perceived ease of use had positive effects on perceived usefulness and user's attitude, and perceived usefulness had positive effect on user's attitude. Finally, user's perceived trust and attitude would be positively correlated with user's intention of use.

1 INTRODUCTION

With the advancement of information technology, popularity of the Internet, and the gradual prevalence of broadband networks, the output value of online games has been increasing in a fast speed. In fact, Internet websites are accessible by consumers from around the globe, and this has contributed to the globalization of markets over the past three decades (Yip, 2000), it is very common for researchers studying the international environment to select one country and use it as a basis for empirical inquiry. Clearly, managers need to better understand the growing use of Internet shopping sites and those consumer characteristics that encourage repeat visits to these sites. One key consumer characteristic is their willingness to use and accept the new technologies. Since researchers need a framework to effectively evaluate new online phenomena, the technology acceptance model (TAM) is applicable in this context (Savitskie, K, Marla B Royne

M.B., Persinger, E.S., Grunhagen., M., Witte, C.L., 2007). The TAM model was derived from Fishbein and Ajzen's (1975) Theory of Reasoned Action and has received considerable support by many researchers (e.g. Jackson, Chow, & Leitch 1997; Venkatesh & Davis 1996). Further, a number of researchers have examined Internet usage via the Tam framework (Gefen & Staub 2000; Venkatesh, & Massey 2003), and the current research use the TAM to better understand individual attitudes toward technology within the international Internet shopping environment.

Moreover, the identified human factors are mainly user perceptions about the utility of this type of technology: perceived ease of use and perceived usefulness (Davis, 1989). Some related studies have also revealed that when one enters the fully immersed state, he will feel totally involved in the activity, his consciousness will be very narrow, his attention is only focused on the activity, and his awareness is partially lost (Webster et al., 1993;

Koufaris, 2002). However, the gaming market is very competitive, and several new games are released every month. Thus, when players have a certain degree of 'flow' experiences from a new game, they may quit playing it due to awful external quality of the game. As discussed above, the purpose of this study is to investigate the effects of external factors, such as system quality, information quality, service provider's characteristics on the perceptions of online gamers, and find out whether gamers' perceptions have positive effects on their attitude for the game and intention of use, in hope of providing the research result as a reference for online game companies to enhance service quality for customers.

2 LITERATURE REVIEW

2.1 System Quality (SQ)

Website quality, system quality, and game quality are significantly influential to gamer satisfaction. In the I/S success model proposed by DeLone(1992), 12 empirical studies about system quality were investigated, and 18 indicators of system quality were proposed. These indicators include ease of use, usefulness, system accuracy, system flexibility, system reliability, response time, and etc. However, Mckinney, Yoon, and Zahedi (2002) measured system quality of Internet shops with the following indicators, including access, usability, navigation, and interactivity. In Negash (2003) which focused on online customer service systems, it was argued that some of DeLone's system quality indicators are already outdated. Thus, interactivity and access were proposed as system quality indicators.

2.2 Information Quality (IQ)

As online games will be constantly updated and expanded, game information is very important for online gamers. In the evaluation of information quality, Lee, Strong, Kahn, and Wang (2002) developed 15 indicators to assess the information quality of an organization. These indicators are accessibility, appropriate amount, believability, completeness, concise representation, consistent representation, ease of operation, free of error, interpretability, objectivity, relevancy, reputation, security, timeliness, and understandability. In Mckinney et al. (2002), only 5 indicators, including relevance, timeliness, reliability, and scope, were adopted. Negash et al. (2003) proposed to use informativeness and entertainment as system quality

indicators.

2.3 Service Provider's Characteristics (SPC)

Saeed et al. (2003) conceived that service provider's characteristics are important because the Internet is a virtual channel which creates more sense of uncertainty to Internet users. Stronger service provider's characteristics will enhance users' trust and consumers' perceptions will not be affected. Saeed et al. further proposed the following indicators to measure service provider's characteristics, including size, reputation, and participation costs. In Jarvenpaa, Tractinsky, and Vitale (2000), it was proposed that perceived reputation and perceived size of service providers will affect users' trust for service providers. Among domestic studies, Chen Chuen-Liang (2002) pointed out that online game's brand image will positively affect users' intention of use, and brand image can be evaluated by corporate image, word of mouth, popularity, and reputation.

2.4 Technology Acceptance Model

Over the past 10 years, Technology Acceptance Model (TAM) has been empirically proven to be an important explanatory model for personal acceptance or use of new information technology. TAM is a behavior intention model developed based on the Theory of Reasoned Action (TRA) by Davis in 1989. It was intended to simplify TRA and find out an effective behavior model that could be widely applied to explain or predict the factors affecting the use of information technology. In TAM, two definite cognitive beliefs were proposed, namely perceived usefulness and perceived ease of use. The two beliefs determine an individual's behavior intention for using technology through attitude. It has been clearly pointed out that external variables will directly influence perceived usefulness and perceived ease of use and indirectly affect user's attitude, intention, and practical use. Based on the behaviors of information system users, Seddon et al. (1997) developed a successful information system model which definitely pointed out that system quality and information quality would respectively affect user's perceived usefulness and perceived ease of use. Lin and Lu (2000) probed into the behavior intentions of World Wide Web (WWW) users, using information system quality to measure user's behavior intention for using WWW. It was discovered that system and information quality were positively correlated with user's cognition, attitude,

and willingness. In a review of studies related to online consumer behaviors, Saeed, Hwang, and Yi (2003) proposed a set of integrative structure, in which system quality, information quality, service quality, and service provider's characteristics are influential to user's perceived ease of use, perceived usefulness, and perceived trust.

In recent years, many empirical studies (David, 1989; Szajna, 1996, Lederer et al., 2000; Lin and Lu, 2000; Moon and Kim, 2001; Hsu and Lu, 2003) have verified that perceived ease of use would affect perceived usefulness, perceived usefulness and perceived ease of use would affect user's attitude, and user's attitude would further affect user's intention of use.

3 RESEARCH METHODS

In this study, the questionnaires were mainly distributed to players of a new online game available for public test. The game was selected according to the observation of popular forum topics on a well-known game website "Bahamut" (www.gamer.com.tw) during one week (Apr 27~May 3 2005). The statistic result revealed that the "RF Online" forum was almost always on the top 3. During that time, "RF Online" was available for public test, so it was selected as the research focus. Later, a web-based questionnaire was formed and published on a professional web-based survey website "MY3Q". The survey link was also posted on the online game forum of BBS at Dong Hwa University, famous game forums "Bahamut" and "Game Base", and some game-related communities on Yahoo for players to connect to the survey system. The survey period started from May 5 till May 31 2005. A total of 319 valid samples were collected.

3.1 Measurement of Variable

According to Mckinny et al. (2002), system quality was divided into three dimensions, including "access", "usability", and "navigation". Access was defined as the connection response and access speed of the game and the website. Usability refers to the operations of the user interface in the game, and navigation is defined as the operation of the user interface on the website. Aladwani and Palvia (2002) pointed out that security mechanism is also an important element when users evaluate the quality of a website. Thus, this study also incorporated "security" as dimension of system quality and defined it as the level of security of gamers' personal

data and the gaming process.

Based on Mckinny et al. (2002) and Lee et al. (2002), this study proposed 4 dimensions of information quality, namely "relevance", "timeliness", "reliability", and "scope". Relevance refers to the applicability of the game information provided by the website. Timeliness indicates whether the website can provide latest game information. Reliability is defined as the correctness of the game information, and scope refers to the coverage of the provided game information.

As suggested in Jarvenpaa et al. (2000), service provider's characteristics included two dimensions, reputation and perceived size. Reputation is defined as the prestige of the firm, and perceived size refers to the scale of the company in this industry. According to TAM and the study of online guys by Hsu and Lu (2003), perceived ease of use was defined as the level of easiness that users feel about the functions of an online game. Based on TAM and Hsu and Lu (2003), perceived usefulness was defined as the level to which users feel that the online game can achieve the gaming objective. In Hsu and Lu (2003), gaming objectives included fun, recreation, messaging, information exchange, making friends, chatting, team work, fantasy, hobby, work, and transaction. This study employed TAM and Hsu and Lu (2003) to define attitude as the level of user's preference for an online game. Based on TAM and Hsu and Lu (2003), this study defined the intention of use as the intensity of user's intention to use an online game. After all the questionnaires were collected, we analyze the data and verify the hypotheses with structured equation model (SEM). The analysis procedure included two parts, basic analysis and overall model analysis. In the basic analysis, descriptive analysis and reliability analysis would be processed on SPSS 10. In the overall model analysis, confirmatory factor analysis and structural equation model analysis would be performed on Amos 4.0.

4 RESULTS

In the gender distribution among collected samples, male players accounted for 84.9% and female ones only 15%. Players aged between 19-23 took the largest proportion by 37.9%. 45.4% of them had a university or college education background, and 38.8% had a high school or vocational school education background. In terms of occupation, 66.7% of them were students. This sample structure was similar to those observed in other studies of

online games but not in the studies of behaviors on the Internet. As to gender distribution, the ratio of male and female online gamers was 7:3. In the aspect of online shopping, female shoppers outnumbered male ones, by a ratio of 6:4. Other activities, such as the use of portal sites and Internet phone, had a relatively even ratio of male to female users. In the age distribution, if age 24 was viewed as a barrier, the ratio of those above 24 to those under 24 was 7:3.

Table 1: Path coefficients of the proposed model and verification of hypotheses.

Variables	Beta	Ha	Result
SQ → perceived ease of use	1.375**	H1	○
IQ → perceived ease of use	0.303*	H2	○
SQ → perceived usefulness	NA	H3	×
IQ → perceived usefulness	NA	H4	×
SPC → perceived ease of use	0.859**	H5	○
Perceived ease of use → perceived usefulness	0.424**	H6	○
Perceived ease of use → user's attitude	0.363**	H7	○
Perceived usefulness → user's attitude	0.314**	H8	○
Perceived usefulness → intention of use	0.833**	H9	○
User's attitude → intention of use	0.168**	H10	○

**p<0.001

However, the ratio was reversed in the aspect of online shopping, where those above 24 took the largest proportion (6:4). In other activities on the Internet, both groups had an even distribution. In terms of occupation, most of the online gamers were students. The ratio of student gamers to non-student gamers was 6:4. But in the aspect of online shopping, those of other occupations took a larger proportion, and students only accounted for 30%. Besides, no significant difference between the two groups was observed in other activities. Finally, in terms of education background, the majority of online gamers received college education. It can be discovered that

every dimension had a mean larger than 3, and attitude and intention of use even had 4.26 and 4.28, respectively, indicating that players had a high level of preference for the online game.

In this study, AMOS 4.0 was used to process the structural equation model analysis and verify the proposed causal path model. After the path was established and the samples were applied into the model, it was discovered that many relationships among latent variables were not significant. Thus, the structure was modified to remove the insignificant path between exogenous and endogenous variables.

As to basic goodness of fit, the factor loading of each indicator ranged between 0.5 and 0.95 and reached the level of significance. Besides, there was no negative deviation. Thus, overall, this model was compliant with the standard of goodness of fit. As to the fitness of overall model, the absolute fit measures of the overall theoretic model: $\chi^2/d.f=1.90$, GFI=0.87, RMR=0.04, and RMSEA=0.05, where $\chi^2/d.f$, RMSEA, and RMR reached the ideal level, and GFI also approached the acceptable level of 0.9. In the aspect of incremental fit measures, AGFI=0.84, NFI=0.90, CFI=0.95, NFI and CFI exceeded the ideal level of 0.9., and AGFI was also close to the acceptable level of 0.9. Among parsimonious fit measures, PNFI=0.80 and PGFI=0.72, all of which were compliant with the standard.

The path coefficients in the path model and the results of hypotheses verification were organized in Table 1. In the aspect of the impact of external factors on user's perceptions, user's perceived ease of use was affected by system quality and information quality. Thus H1 and H2 were supported. In the aspect of perceived usefulness, the research findings revealed that system quality and information quality had no effect on perceived usefulness, so H3 and H4 were not supported. However, service provider's characteristics and perceived ease of use had positive effect on perceived usefulness. Thus, H5 and H6 were supported. Perceived ease of use and perceived usefulness had positive influence on user's attitude. Thus, H7 and H8 were supported. Finally, perceived usefulness and user's attitude (H9, H10) would have positive influence on intention of use at the same time.

5 CONCLUSIONS

System quality and information quality were

positively related to player's perceived ease of use. This indicates that when better and more stable systems and correct and rich information are provided to game players, game players will feel perceive more ease of use and the entry obstacle of the game can be reduced.

No significant effect of system quality and information quality on gamer's perceived usefulness was discovered. Unlike task-oriented information systems, online games are entertainment-oriented information systems. Thus, when players are engaged in online games, they do not necessarily play the game to enhance their game performance or seek higher efficiency but simply kill some time, make friends, get rid of the social bindings. This explains why system quality and information quality were not significantly related to perceived usefulness.

Service provider's characteristics had positive effects on Perceived usefulness. In online games, it would be time-consuming to accumulate achievements or cultivate relationships, so if the service provider is in a small scale or it does not proper manage with players, the service provider may shut down the game due to improper management.

In this study, TAM was adopted to investigate the factors affecting online game players' acceptance of games. The research results were consistent with those suggested in previous studies. This shows that if gamers feel that a game is easy to be familiar with and get involved in, they will have more preferences for the game and further increase their intention to carry on using it.

6 MANAGERIAL IMPLICATIONS

Most of the previous studies of TAM focused on the second half of the model, i.e. the effect of user's perceptions on their attitude and intention. The main contribution of this study is that it probed into the first half of the TAM model to understand the impact of external factors on user's perceptions.

In the previous studies about evaluation of information systems, external factors were mainly touched upon in the discussion of the impact of information quality and system quality on information systems. However, with the fast development of the Internet, many related online information systems have been derived. Thus, the past evaluation models are no longer applicable to the evaluation of online information systems. In this study, the importance of service provider's

characteristics was empirically proven. Online users cannot directly interact with service distributors or providers, so trust becomes an important element in the evaluation of online information systems, and well-known and large-scale firms can usually lower the level of uncertainty.

The research of online games is seldom across to foreign nations, and no measurement scale for online games is available. This study try to use the scales designed for other information systems, and incorporated the opinions of online gamers to develop an integrated scale for online game systems. The proposed model had compliant validity and reliability. Thus, it can be a reference for further studies

Besides, in the aspect of brand image, a good management mechanism is helpful for the establishment of a brand. If game service providers can make use of brand advantage, they can attract more users to participate in their games and enhance customer loyalty. Besides, a good brand image can also help promote other games, create popularity, and establish a good reputation. Finally, according to the survey of this research, 54% of the gamers reported to play other games in addition to the selected game. This reveals that there are numerous choices for online games in Taiwan, and the market competition is very fierce. As a result, if game service providers are imprudent in their management, their games may be easily displaced.

7 RESEARCH LIMITATIONS

In this study, a web-based survey was adopted and the reference link was posted on some major forums and discussion boards for game players to participate in the survey at will. Thus, random sampling could not be conducted, and deviation of the samples in the representation of the population might occur and possibly lead to a slight bias of the research results.

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