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Why People Continue to Play Online Games: In Search of Critical Design Factors to Increase Customer Loyalty to Online Contents

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ABSTRACT

As people increasingly play online games, numerous new features have been proposed to increase players' log-on time at online gaming sites. However, few studies have investigated why people continue to play certain online games or which design features are most closely related to the amount of time spent by players at particular online gaming sites. This study proposes a theoretical model using the concepts of customer loyalty, flow, personal interaction, and social interaction to explain why people continue to play online network games. The study then conducts a large-scale survey to validate the model. Finally, it analyzes current online games to identify design features that are closely related to the theoretical concepts. The results indicate that people continue to play online games if they have optimal experiences while playing the games. This optimal experience can be attained if the player has effective personal interaction with the system or pleasant social interactions with other people connected to the Internet. Personal interaction can be facilitated by providing appropriate goals, operators and feedback; social interaction can be facilitated through appropriate communication places and tools. This paper ends with the implications of applying the study results to other domains such as e-commerce and cyber communities.

INTRODUCTION

As the Internet has spread into our society on a broad scale, it has been used to trade various kinds of contents.[1] One of the most popular online contents is the game, in which a person can play not only with the computer, but also with other people connected via the Internet.[2,3] For example, a recent study on the use of the Internet showed that PC owners spent an average of 20 h per week on the internet for personal use, 48% of which was to play online games.[4] Accordingly, the market for online gaming has rapidly expanded from $770 million in 1988 to $2.06 billion in 2001.[5]

Because the online game market goes up and people usually pay fees to play online games according to game playing time, developers try to increase the duration of online game playing time by making a new online game using new techniques. Numerous techniques and features have been suggested to make gamers want to return to the online games repeatedly.[5] For example, several studies are being conducted to determine the effect of improving the graphics used in the games on game play-

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ing time;[6,7] other studies are proposing new audio techniques for better sound quality in online games.[8–10] Choosing the most appropriate technical features among the myriad of newly suggested techniques for an online game being developed becomes a challenging if not impossible task.

Research on game playing time may have significant implications for increasing customer loyalty of online contents businesses in general. It is important for online contents businesses to ensure that customers visit their sites repeatedly because the number of loyal customers who frequently visit their site determines their value.[11] If none of the customers are willing to visit the site again, its business value becomes worthless despite its technical or managerial assets. Online game has been quite successful in maintaining an extremely high level of customer loyalty to the degree of addiction.[12] Therefore, the reasons why people keep playing the same online game repeatedly and the design features that lead them to have such a high loyalty may be used to increase the customer loyalty for other online contents businesses such as distance learning.

Despite the high potential of online games and the numerous features of suggested techniques, only a few studies have been conducted to explore the important techniques that influence the usage of online games.[12–14] The limitations of prior studies of online games can be categorized into three groups. First, most studies fail to provide a conceptual framework based on a theoretical foundation. Therefore, we are not sure whether they are covering important game design factors comprehensively and whether they are including unnecessary design factors. Second, most prior studies of games fail to provide empirical validation of their argument. Therefore, we are not sure whether the proposed design factors are really important in increasing log-on time for game play. Finally, prior studies did not establish a relation between the conceptual factors and concrete design features. Therefore, even if we know which concepts are important in increasing game playtime, we do not know how to implement the concepts into practical design features for online games. Consequently, numerous online games have been developed using a variety of highly expensive techniques, but only a few of them have succeeded in obtaining customer acceptance.[5]

The main goal of this research is to search for key factors that are important in increasing the customer loyalty of online games. In order to achieve this goal, we have conducted two consecutive studies. In the first study, we constructed a conceptual model of customer loyalty in online games and verified it with a large-scale survey, the results of which explained why people continued to play certain online games. In the second study, we analyzed all the online games that were mentioned by respondents in the first study, and then identified those design features that were closely related to the conceptual factors verified in the first study. The results provided preliminary answers to the question of how we can increase the customer loyalty of online contents in general.

The next section explains the conceptual model of repeated usage of online games, followed by a section explaining the large-scale survey and its results. The third section provides a technical analysis of existing online games and its results. Finally, this paper ends with the implications and limits of the study results.

A CONCEPTUAL MODEL OF ONLINE GAME USAGE

Customer loyalty and optimal experience

We believe that people want to play specific online games repeatedly because they have a high level of customer loyalty to the games. Customer loyalty is defined in marketing as a customer's repeated use of a specific company, store, or product.[15] The concept of customer loyalty is used in marketing research to measure the customers' tendency to use the same products or services.[16] It has been verified that customers want to continue to use specific services, despite the introduction of new services or products, if they have strong loyalty toward their current service or product.[15] The more loyalty a customer has toward a specific online game, the more he/she keeps playing the game. Although there are various factors that influence customer loyalty, this study focuses on the quality of customer experience, because digital contents, including online games, are primarily "experience" goods.[17] This is because people play online games primarily to have a good experience, and the value of an online game can only be determined after they actually play it.[18] For example, people sometimes experience a life of heroes or become storytellers who experience a new history of a kingdom in online games and tell their experience to others.

The optimal level of experience during work or play is defined as flow.[19–21] If somebody enters the flow state while playing an online game, this means that he/she is interested in playing the game, is curious about the game, has full control

FIG. 1. The first hypothesis.

over the game, and is focused on playing the game with no other distraction. According to the flow theory, when somebody is in the state of flow, he/she wants to maintain the state.[20] Therefore, as shown in Figure 1, we believe that if somebody experiences the flow state more often while playing an online game, he/she will have higher customer loyalty to the game.

Hypothesis 1: If a player experiences the flow state during the playing of an online game, then he/she will have customer loyalty toward this online game.

Interaction in online games

Interaction is considered one of the most important aspects related to optimal experience with computer games.[12,22,23] Interaction is defined as the behavior of communicating with two or more objects and affecting each other.[24] For instance, a monster may interact with a player for killing him/her, and the player interact with a counterattack using his/her arms for saving his/her life in online games. Sometimes, when a player want to get powerful items or a higher skill, the player may interact with a monster, and then the monsters responds with a counterattack or run away. Such interaction has been found to have substantial impact on the popularity of games because a set of several sequences of interaction is a narrative or storytelling used to construct a player experience in online games.[12,25–27] Therefore, several computer game developers have researched various ways to provide novel features of interaction to players.[12,28,29] In this research, interactions while playing online games can be classified into two types: the first is the interaction that exists between the user and the system, while the second is the user-to-user interaction.[26] At this time, the interaction between the user and system will be referred to as personal interaction, and the term social interaction will be used in reference to the interaction between two or more users. We hypothesize that people will feel flow, the optimal experience, if they can interact with the system or with other people effectively (as seen in Fig. 2).

Hypothesis 2: If personal interaction is effectively supported for players by an online game, then they can have an optimal experience while playing it.

Hypothesis 3: If Social interaction is effectively supported for players by an online game, then they can have an optimal experience while playing it.

Personal interaction. Game-playing has been regarded as a problem solving process, in which a problem solver (i.e., Ultima online gamer) tries to achieve goals (i.e., defeating monsters, growing up players' skill, or questing dungeons) using available operators with feedback (i.e., swords and noises) from the game system.[30,31] Based on problem-solving theory, the numerous features of personal interaction can be classified into three categories: goals, operators, and feedback.[32]

First, a goal can be defined as the specific target that each game participant wants to achieve during the game.[25,30] For example, in a certain game a player's goal may be to make his character become the greatest warrior, whereas in another case, the goal may be to find the treasures hidden within the game. When provided with goals such as these, players interact with the system in order to accomplish the goal.[31] We hypothesize that providing appropriate goals is an important factor of the personal interaction.

Hypothesis 2–1: A goal is an important factor of the personal interaction in an online game.

Second, an operator, which is defined as an instrument for problem solving, is given to players to accomplish their goals.[32] For example, when a player destroys his opponents, monsters or other players, by using a sword or magic in an online game, the sword or the magic is considered an operator. An operator's sole purpose is to assist the user to achieve the goal; people are able to interact with the system while utilizing the operator to achieve their goals.[30] Therefore, we hypothesize

FIG. 2. Hypothesis 2 and hypothesis 3.

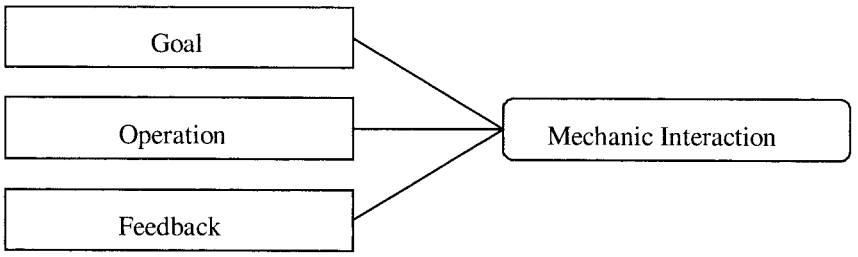

FIG. 3. The important design features for personal interaction in online games.

that providing appropriate operators is an important factor of the personal interaction.

Hypothesis 2–2: An operator is an important factor of the personal interaction in an online game.

Finally, feedback is an appropriate response from the game system in response to the player's handling of an operator.[30] For example, an enemy is destroyed along with the noise of a gun, or the player's character is given an increased capability after successfully achieving a task in an online game. A player is able to feel an effective interaction through such a give-and-take relationship.[33] Therefore, we hypothesize that providing appropriate feedback is an important factor of the personal interaction.

Hypothesis 2–3: Feedback is an important factor of personal interaction in an online game.

Goals, operators and feedback are hypothesized as important factors of the personal interaction within an online game, as summarized in Figure 3.

Social interaction. Along with the personal interaction, it is also important for online games to provide effective social interaction.[34] Because an online game is a game added to the network system, which allows many users to meet themselves in virtual space, the interaction among the users may be an important factor leading to an optimal experience.[35,36] Various factors of social interaction can be classified into two categories: places for communication or tools for communication.[37] Both places where gamers can meet in the virtual world and communication tools to facilitate conversations between gamers must be provided in online games.[34]

Online games first need to provide a communication place in a virtual world, where a number of people can gather together.[38] The virtual world may be any place in which characters—figures generated by computer graphics that are assigned to each player—can meet together. Through these characters, people are able to locate the place and meet other people who are playing the same game at the same time. This leads to social interaction among the people who have gathered in the place.[39] We hypothesize that a meeting place in a virtual world is an important factor for social interaction (as shown in Fig. 4).

Hypothesis 3–1: The communication place is an important feature of the social interaction in an online game.

Second, a communication tool is described as a game function that enables gamers to relay their opinions among themselves.[38] For example, by enabling players to chat while being involved in an online game, or by providing a community bulletin board throughout the game, gamers are able to give and receive opinions. Communication tools that facilitate sharing an opinion with others are essential to successful social interaction (as shown in Fig. 4).[34]

Hypothesis 3–2: Communication tools are an important feature of the social interaction in an online game.

In summary, a conceptual model of customer loyalty for online games is presented in Figure 5. In order to provide effective personal interaction, the online game should provide (1) appropriate goals to be achieved by game players, (2) appropriate operators for players to achieve the goals while playing the online game, and (3) appropriate feedback to convey information about the current states of the game to players. The characteristics of online games require effective social interaction. In order to promote effective social interaction, the online game should provide (4) appropriate communication places where gamers can gather together and (5) appropriate communication tools for game players to share their opinions. If personal (6) and social (7) in-

FIG. 4. The important design features for social interaction in online games.

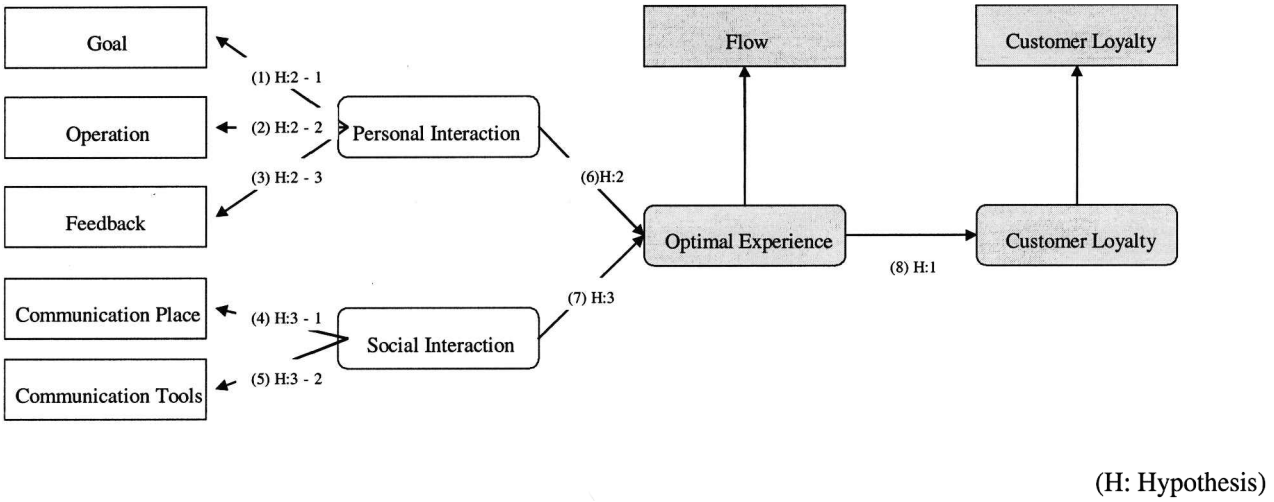

FIG. 5. Structure model for customer loyalty with flow, personal interaction, and social interaction.

teraction is effectively supported during an online game, players will have an optimal experience. Finally, (8) if players experience a positive state of flow during the playing of an online game, their loyalty to the specific game will increase.

STUDY 1

In order to validate the conceptual model proposed in the prior section, we conducted a large-scale survey with online game players. This study was conducted to find out why people continue to play a specific online game.

Products and participants

The main survey was conducted online over a two-week period in Korea. A total of 1993 respondents participated, as shown in Table 1. Using a 7-point Likert scale, participants were asked to subjectively evaluate one of the 16 online games that they were currently playing in the Korean online game market, as shown in Table 2.

TABLE 1. DESCRIPTION OF STUDY PARTICIPANTS

	Age					
	~ 20	*21 ~ 30*	*31 ~ 40*	*41 ~ 50*	*51 ~*	*Total*
Gender						
Man	663	708	162	24	3	1560
Woman	216	184	29	3	1	433
Total	879	892	191	27	4	1993

TABLE 2. NUMBER OF PARTICIPANTS FOR EACH ONLINE GAME

Game name	*Number of participants*	*Game name*	*Number of participants*
Diablo 2	166	The Hero of Chosun	147
The Kingdom of Winds	91	The Lord of Heroes	151
Legend of Darkness	155	Majestic	62
Elancia	112	Gadius	65
Lineage	123	RedMoon	120
1000 Years	186	WarBible	55
Dragon Raja	122	The Last Kingdom	117
Darksaver	148	Legend of MIR II	172

TABLE 3. QUESTIONS FOR MEASURING CUSTOMER LOYALTY

Items	*Questions*	*Cronbach alpha*
Customer loyalty	The online game was overall satisfactory enough to reuse later. I would re-use this online game when I want to play online games later.	0.8143

Questionnaire

In order to create questions for the constructs in the conceptual model, structured interviews were conducted with professional game players and developers before the survey. The questions assembled from the interviews were pre-tested three times before the main survey in order to increase their validity. Consequently, the final questionnaire consists of twenty-one questions in total. The first question asks the name of the online network games that the respondent played most recently. The answer for this question is to be used as a reference for both the first and second study. Next, two questions are asked to measure how much customer loyalty players have to specific online games, as shown in Table 3. These questions are developed based on marketing theory related to customer loyalty.[16,40]

In order to measure the level of optimal experience during the playing of each online game, this study used six questions for measuring flow, as shown in Table 4: two questions to measure intrinsic interest, two questions to measure curiosity, one question to measure control, and one question to measure attention focus.[21,41,42]

Twelve further questions, as shown in Table 5, were selected to measure interactivity: three to measure the effectiveness of the goal, two to measure the operator, three to measure feedback, two to measure the communication place, and finally two to measure communication tools.

Data analysis

The results of the factor analysis showed that the two questions about customer loyalty successfully converged into a single factor, and its Cronbach Alphas coefficient (as shown in the right column of Table 3) is high enough to proceed with further analysis. Similarly, the six questions of the flow construct converged well into a single factor with a relatively high Cronbach Alpha coefficient, as shown in Table 4. Finally, the confirmatory factor analysis (CFA) was performed to test the convergent and discriminant validity of the 12 survey questions for Interactivity. The goodness of fit summary for the confirmatory factor analysis is shown in Table 6, which indicates that the model has enough validity to proceed to further analysis. The results of the confirmatory factor analysis as shown in Table 7 clearly indicate that the 12 questions for Interactivity were categorized into five groups. Finally, average variance extracted was calculated to test the discriminant validity of the measures. The results shown in Table 8 clearly indicate that the five independent variables are distinctive from each other. The Cronbach Alpha coefficients for the five factors turned were marginal, but high enough to proceed with further analysis.

(Diagonal cells were the values of Average Variance Extracted. The others were the correlation values between two factors.)

In summary, the results of confirmatory factor analysis and the application of Cronbach alpha co-

TABLE 4. QUESTIONNAIRE FOR MEASURING THE FLOW STATE

Items	*Questions*	*Cronbach alpha*
Flow	Playing the online game was interesting in itself. Playing the online game was fun. I thought of other things while exploring the online game. I felt curious while playing the online game. I was in control of the online game that I was playing. I was entirely absorbed in playing the online game.	0.8438

TABLE 5. QUESTIONNAIRE FOR MEASURING PERSONAL AND SOCIAL INTERACTION

Items	*Questions*
Goal	All information necessary to accomplish a goal was provided.
	Enough information was provided to the player to identify his objective accurately.
	The game clearly informed the user of his character's goal at present.
Operator	Various selection capabilities were provided to the player in accordance with their preferences.
	The game provided diverse facility for the player to make flexible playing strategies using characters & items
Feedback	The rewards were given in a timely manner at the end of the game, or after achieving a higher status.
	The rewards given had a positive influence towards on the continuation of the next game phase.
	The response from the system was accurate and easily understandable when the player gave an order.
Communication place	The design aspects of characters and background screen provided "real-world impressions of places"
	The characters and background graphics of the communication place provided an overall harmonious atmosphere
Communication tool	The game allowed users to form communication groups (i.e., guilds or cyber families) for sharing information
	The game provided methods for communicating with others.

TABLE 6. GOODNESS OF FIT SUMMARY OF THE CONFIRMATORY FACTOR ANALYSIS FOR THE SURVEY QUESTIONS

$\chi 2$	*Df*	*GFI*	*AGFI*	*NFI*	*NNFI*	*RMR*
638.24	44	0.95	0.91	0.93	0.90	0.082

TABLE 7. RESULTS OF CONFIRMATORY FACTOR ANALYSIS

Features	*Factor 1*	*Factor 2*	*Factor 3*	*Factor 4*	*Factor 5*	*Cronbach alpha*
Goal	0.73					0.75
	0.73					
	0.67					
Operator		0.77				0.68
		0.66				
Feedback			0.66			0.72
			0.69			
			0.70			
Communication place				0.77		0.67
				0.65		
Communication tools					0.79	0.71
					0.70	

TABLE 8. RESULTS OF DISCRIMINATE VALIDITY

Features	*Goal*	*Operator*	*Feedback*	*Communication place*	*Communication tool*
Goal	0.84				
Operator	0.75	0.85			
Feedback	0.79	0.81	0.83		
Communication place	0.67	0.70	0.71	0.85	
Communication tool	0.56	0.68	0.68	0.66	0.86

efficients indicate that the construct validity and reliability of the measures are high enough to proceed to further analysis. Factor scores were used as an input data to the LISREL analysis, results of which are shown in the next section.

Results

Using a structured equation modeling analysis, the hypothesized sequences of relationships between the personal and social interaction, flow, and customer loyalty of the model were tested as one set. The fit of the model was assessed using several indicators, including the chi-square to degrees of freedom ratio (52.89), adjusted goodness of fit test (0.98), and root mean square residuals (0.015) as shown in Table 9. These results show that the model was deemed valid enough to test the set of paths hypothesized by the model using maximum likelihood estimation. The coefficients for the eight paths representing the proposed relations among the latent constructs are summarized in Figure 6.

Figure 6 presents the LISREL results for the entire conceptual model. The coefficients for the three paths in Figure 6 represent the proposed relations among the latent constructs. Empirical support is found that goal ($\lambda = 0.75$, $p < 0.01$), operator ($\lambda = 0.72$, $p < 0.01$), and feedback ($\lambda = 0.78$, $p < 0.01$) are served for efficient personal interaction on online games, and that communication place ($\lambda = 0.73$, $p < 0.01$) and communication tools ($\lambda = 0.63$, $p < 0.01$) are also important features for an efficient social interaction in online games. Efficient personal interaction ($\gamma = 0.34$, $p < 0.01$) and social interaction ($\gamma = 0.50$, $p < 0.01$) positively influence players' experience of flow as well. Finally, the players' experience of flow has a positive influence on their formation of customer loyalty ($\beta = 0.84$, $p < 0.01$).

In addition to the above result, this study analyzes direct and indirect effects of the expected variations of customer loyalty. In the first result, the efficient personal ($p < 0.01$) and social ($p < 0.01$) interactions indirectly influence customer loyalty through players' experience of flow. And customer loyalty is directly influenced by their optimal experience ($p < 0.01$), as shown in Table 10. In summary, the LISREL results indicate that the features of efficient interaction in online games can indeed influence customer loyalty through the experience of flow.

STUDY 2

The results of Study 1 indicate that all five interaction factors were closely related to the flow expe-

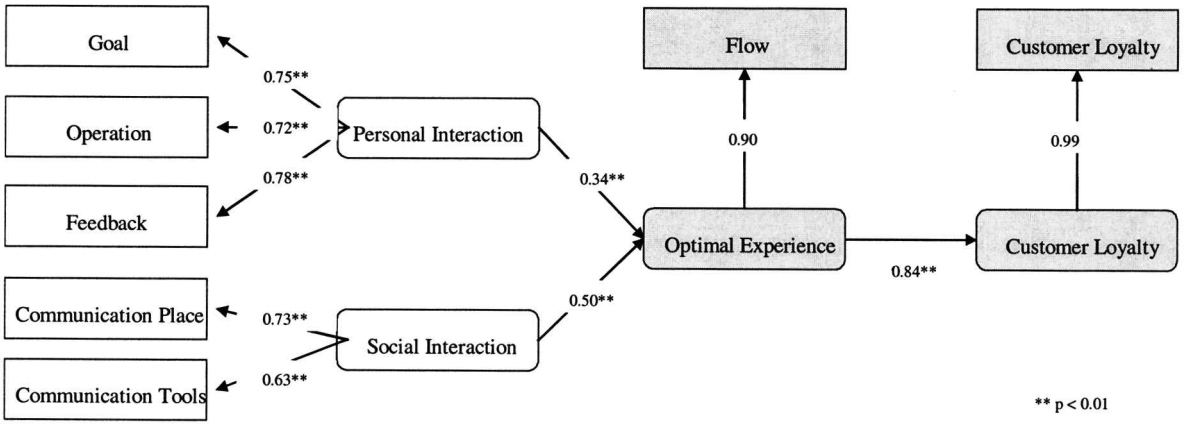

FIG. 6. Result of LISREL model.

TABLE 9. GOODNESS OF FIT SUMMARY OF THE LISREL MODEL

$\chi 2$	*df*	*GFI*	*AGFI*	*NFI*	*NNFI*	*RMR*
52.89	11	0.99	0.98	0.99	0.99	0.015

rience and in turn to customer loyalty to online games. Therefore, based on the results, we understand why people continued to play some online games while neglecting others. However, the study does not tell us how to increase the rating of the five interaction factors. In order to answer this question of increasing the rating of the factors, we conducted a second study that explores the important online game design features for each of the five interaction factors.

Data collection process

First, candidate design features were constructed for each of the five interaction factors based on prior research done on online games, books about game design and development, and suggestions of expert groups of game developer, www.gamastura.com. The initial set of candidate design features was then sent to several industry experts to test the features' relevance to online games. Based on the industry experts' opinions, three features for the goal, six features for the operator, seven features for the feedback, six features for the communication place, and seven features for the communication tools were proposed. The proposed design features are explained in detail in the next section.

According to the proposed design features, the authors then evaluated each of the sixteen online games that the respondents in our first study had mentioned in their survey answers. Next, we contacted the developers of the sixteen online games and sent the same evaluation criteria for independent assessment. We subsequently met with the developers to compare our evaluation with theirs. Any discrepancies between the two parties were resolved through face-to-face discussions while running the games in front of the two parties. A letter of agreement noting that the two parties agreed on the evaluation results was signed after all the discrepancies were resolved.

Finally, a correlation analysis was conducted between the factor scores of the five interaction factors and the evaluation results of the corresponding design features in order to identify which features were closely related to each of the five interaction factors. The unit of analysis was the individual games, and the results are shown in the next section.

Results

Goal. The four design features proposed for the Goal factor of the personal interaction, their evaluation criteria, and the Pearson correlation between the factor score and the evaluation results are shown in Table 11. All the four proposed design features turned out to be closely related to the Goal factor.

First, the explanations about the background and characters of how the game should proceed in order for the user to achieve the goal are found to be closely related to the Goal factor of the personal interaction. This is because explanations of the game background and the characters provide information about how far the gamer was located from the goal state, which makes the Goal more explicit to the gamer.[43] Second, how the final and individual goals are provided to the user throughout the game was also found to be closely related to the Goal factor. This may be because individual goals provide more detailed information about the progress of moving toward the given goals.[44] Finally, the means to describe the character's condition was found to be closely related to the goal factor. This may be because graphic description

TABLE 10. DIRECT AND INDIRECT EFFECTS FOR CUSTOMER LOYALTY IN THIS STUDY

Expected variations	*Total effects*	*Direct effects*	*Indirect effects*	*Path of indirect effects*
Personal interaction	0.29*		0.29*	Personal interaction → flow
Social interaction	0.42*		0.42*	Social interaction → flow
Flow	0.84*	0.84*		

*$p < 0.01$

TABLE 11. DESIGN FEATURES FOR THE GOAL FACTOR

Design features	*Evaluation criteria*	*Correlation*
Description of background	Yes/no	0.505*
Description of character	Yes/no	0.505*
Description of goals	Final goal only	−0.341*
	Final goal & Individual goal	0.597*
	No description	n/s.
Description of character's condition	Graphic & numerical value	0.578*
	Numerical value only	n/s
	Graphic only	−0.515*

about the character's current condition yields more information to the gamers about how to realize their current situation.[43]

Operator. The six design features of the Operator factor for the personal interaction, their evaluation criteria, and the Pearson Correlation between the factor score and design features are shown in Table 12. Four of the six proposed design features turned out to be closely related to the Operator factor.

First, the feature, which locates at what point the player has paused in the previous gaming session, is found to be closely related to subjective interaction. This may be important because different resuming points provide different information about the available operators.[30] Also, the facility to select characters' ability at the beginning of the game cannot be ignored. This may be useful to players because it makes them feel in control within the boundary in a way that does not ruin the entire game story.[45] The ability to transform an adversary into an ally was also found to be important, because it can be considered an important operator to overcome major obstacles. The magic operator that uses a back door provides an instantaneous change of current location from one point to another without traversing all interim locations. This ability is important because it can shorten the problem solving process significantly.[45]

Feedback. The seven design features for the Feedback factor of the personal interaction, their evaluation criteria, and the Pearson Correlation between the Feedback factor score and design features are shown in Table 13. Only three of the seven design features turned out to be closely related to the Feedback factor.

First, the ability to select appropriate types of feedback when the gamer achieves individual goals was found to be an important design feature for the feedback factor. This may be because implementing a customized feedback that rewards the user once he accomplishes a goal is important to active interaction within the system.[33] Second, a favorable response was given to the design feature that represents item loss or capability

TABLE 12. DESIGN FEATURES FOR THE OPERATOR

Design features	*Evaluation attributes*	*Correlation*
Game restarting procedures	Previous ending location/selected location	0.539
Selecting character's ability	Gamer selection	0.6044*
	Random selection	n/s
	Selection not possible	n/s
Number of items produced	Number	n/s
A manipulator that can convert an adversary into an ally	Yes/no	0.6200*
Magic operator to use a back door	Yes/no	0.5350*
Item purchasing method	One NPC provides all necessary items/ certain items are available through a particular NPC	n/s

TABLE 13. DESIGN FEATURES FOR THE FEEDBACK

Design features	*Evaluation attributes*	*Correlation*
Ability to select feedback for individual goal accomplishment	User option/computer option	0.6477*
Types of feedback for the failure in achieving individual goals	Capability reduction & consumption	0.5326*
	Equipment loss	n/s
	No change	n/s
Types of feedback for the incremental success	Money & item addition & increased character longevity	n/s
Types of feedback for the incremental damage	Decrease in life expectancy/no change	n/s
Types of feedback for the use of the operator	Capability becomes worse/no change	n/s
Feedback with sound effects	Yes/no	0.5315*
Credit allocation for collaborative operations	Evenly/according to work performed/ last worker only	n/s

reduction after demise. This may be because the issue of assigning a proper punishment after a character's demise is important for active participation in the online game.[45] Finally, the sound effects featuring mirroring alternating attacks, notifying the player of whether he is being attacked, are also closely related to the interaction. The four other design features, however, were not found to be closely related to the Feedback factor of the personal interaction.

Communication place. The five design features proposed for the Communication-place factor of the social interaction, their evaluation criteria, and the Pearson Correlation between the place factor score and design features are shown in Table 14. Only two of the five design features turned out to be closely related to the Communication-place factor.

In order to convey a communication place effectively, elements such as characters and background should embody 3D technology, while the visual composition must use True Color. This is because 3D true color graphics can provide a more realistic experience for gamers.[7] Another feature that should be taken into account is modeling a non-playable character (NPC) in the form of an artifact rather than real entities. This is so because artificial entities can be distinguished from the player's characters and used as accessories for the dungeon.[46] The other four design features, includ-

TABLE 14. DESIGN FEATURES FOR THE VIRTUAL WORLD

Design features	*Evaluation attributes*	*Correlation*
Graphic & no. of colors representing the communication place	2D & true color	n/s
	2D & 256 color	n/s
	3D & true color	0.8051*
	3D & 256 color	n/s
Camera angle to view the communication place	Quarter view/over view/side view	n/s
Background setting for the communication place	Fantasy/reality/future	n/s
Playable characters represented in the communication place	Child/adult	n/s
Non-playable characters (NPC) represented in the communication place	Human	n/s
	Animals	n/s
	Artifact	0.5901*

TABLE 15. DESIGN FEATURES FOR THE COMMUNICATION TOOL

Design features	*Evaluation attributes*	*Correlation*
Provision of user ID for communication	Yes/no	n/s
Ways of representing identity for communication tool	Gender	n/s
	Occupation	n/s
	Gender & occupation	0.5271*
Provision of chatting functions	Yes/no	n/s
Provision of mMail fFunctions	Yes/no	n/s
Provision of bulletin boards	Yes/no	n/s
Functions to create sub-communities	Yes/no	n/s
Presence of regulations for communities.	Personal user/company/small groups unacceptable	n/s

ing the character design model, were not found to be closely related to the communication place factor of the social interaction.

Communication tools. The seven design features proposed for the Communication-tool factor of the social interaction, their evaluation criteria, and the Pearson Correlation between the tool-factor score and design features are shown in Table 15. Only one of the seven design features turned out to be closely related to the communication-tool factor.

To provide appropriate communication interaction, categorizing online game users and producing various characters according to gender and occupation is the only design feature that is closely related to the communication feature in providing appropriate communication interaction. This is because players can differentiate their identity more specifically by using characters differently designed from others in an online game.[34] All the other six variables turned out to be unrelated to the Communication-tool factor of the social interaction.

DISCUSSION

We conducted two related studies in order to explore two issues: why some online games have higher customer loyalty than others and what key design features would increase customer loyalty. The study results indicate that customers would show a higher level of loyalty if they had an optimal experience with the games, and that an optimal experience can be fostered by providing appropriate personal and social interactions. Personal interaction can be facilitated by providing customers with appropriate goals, operators and feedback. Social interaction can be promoted by providing customers with appropriate communication places and tools. The second study identified concrete game-design features that are closely related to the interaction factors. Therefore, this study provides not only conceptual models of online games but also empirical validation of the models. The validated model was materialized through the second study to provide concrete design guidelines for developing online games.

The research contains a few limitations. First, the reliability levels of the survey concerning the operator and communication-place factors were rather low compared to the reliability levels for other factors, even though the questionnaire was pre-tested three times before the main survey. Therefore, a method needs to be developed in which the reliability levels of the two factors can be increased for a future study. Next, even though sixteen popular online games in the current market were analyzed for their design features in this research, some recent products such as Fortress were not included in the testing; more recently developed online games should be included in future research to further elucidate the correlation between design features and customer loyalty. Third, this study regards an online game in general. However, several distinctive genres are available in the online game category, and the conceptual model as well as critical design factors may vary across different genres of online games. Therefore, future studies should classify online games into more specific sub categories and empirically test the conceptual framework and design criteria in each of the sub categories. This will make those design factors that were generic and abstract in this paper to be more concrete and specific to certain kinds of online games. Finally, even though this research identifies design features that are correlated to the level of

perceived interaction, it cannot develop causal relations between design features and the level of interaction. This question can be studied further in a carefully controlled experiment in the future.

Despite its limitations, the research has both academic and practical implications. First, this research verifies that efficient interaction features positively influence customer loyalty. This finding could answer the question of why players are repeatedly playing specific online games. Moreover, the conceptual framework consists of four generic factors (customer loyalty, flow, personal interaction, and social interaction) that are rather independent from the online game domain. Therefore, the conceptual framework can be easily applied to other online contents such as online education and cyber shopping, even though further studies need to be conducted to test the external validity of the study results. For example, Cummins[26] argued that providing e-commerce customers with game-like interaction would increase the overall quality of customer experience. The author asserted that integrating e-commerce into famous online game sites such as Everquest or Majestic will increase the effectiveness of 'serious applications' such as e-commerce and spreadsheet. The results from this study provide a conceptual foundation of the critical factors that should be considered during this kind of integration.

Second, this research suggests that numerous design features for online games can be evaluated in terms of their relation to the perceived level of subjective interaction factors. The studies provide game developers with empirical data that show which design features are advantageous, rather than simply recommending that new technology be used. This research can establish an empirical foundation for measuring whether the selected design features can in fact produce the required level of perceived interaction in related domains such as online education and cyber shopping, as well as online games.

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