*Research Article*

# The Interplay between Real Money Trade and Narrative Structure in Massively Multiplayer Online Role-Playing Games

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A narrative structure is one of the main components to constitute the genre of Massively Multiplayer Online Role-Playing Games (MMORPGs). Meanwhile Real Money Trade (RMT) enables a player to adjust an ex post level of challenge by skipping the narrative structure of a game. However, RMT may concurrently disturb a player who enjoys game following the narrative structure hierarchically. In pursuance of developing the knowledge about the relationship between RMT and the usage of MMORPG, we investigate the role of the strictness of predetermined narrative structure. We present the dual structure of societies to describe a player that arbitrarily decides to reside in a virtual society. Then we adopt the social nominalism to explain how individual motif of playing a game is expanded to the nature of game. Finally, we argue that a game with weakly predetermined narrative structure is more positively associated with RMT volume, since these games arouse a player's sentiment of fun by relying more on their socially oriented motivation. With empirical evidence from the Korean MMORPGs market, we proved the hypothesis.

## 1. Introduction

The phenomenon of Real Money Trade (RMT) has appeared in Massively Multiplayer Online Role-Playing Game (MMORPG). RMT is an action where digital in-game goods (e.g., items and virtual currency) are traded with real money by player to player. It has been studied since Castronova [1] initially advocated virtual economies. Since the phenomenon of RMT itself is externally identical for many games, existing RMT research studied the relationship between playing time and RMT volume, disregarding the effect of the narrative structure [2, 3]. However, narrative structures of each game make motivations of RMT diverse and therefore considering narrative structures is crucial to include in the analysis. Hence the purpose of this study is to present the role of narrative structure in the association between playing time of MMORPGs and RMT volume.

We studied MMORPG based on the concept of "flow" [4] and the "puzzle of puzzles model" [1] and the twofold structure between reality and virtual reality. Then we expand individual motives for RMT into a game's heterogeneous properties according to its narrative structure. When players want to live in an MMORPG with strictly predetermined narrative structure, they want to enjoy the preorganized storyline of the game, while players who choose a game with weakly predetermined narrative structures do not. Therefore, RMT volume is less associated with the total usage of the game in the case of MMORPG with strictly predetermined narrative structure because RMT intrinsically makes players skip the preliminarily constructed steps and hindered in enjoying the hierarchical achievement structure. We demonstrate empirical evidence from the Korean MMORPGs market to verify the influence of narrative structure on the relationships between RMT and the usage of MMORPG. We gather the RMT volume and total time usage data for four years from the PC-Bang user database and collect narrative scores based on one of the representative online MMORPG user communities. Consequently, we prove the hypothesis that there is a different relationship for RMT with the games which are observed based on the strength of game's narrative structure.

The remainder of this article is organized as follows. The next section introduces a framework to understand MMORPGs. The third section analyzes the importance of the narrative structure in an MMORPG unlike other game genres which drives the dual structure of societies. The fourth section introduces the theory about personal motivations in RMT and deduces virtual reality based on the narrative structure. For demonstration, we adopt the viewpoint of social nominalism that has idiosyncratic properties including arbitrariness of individual decision on being oneself in the certain society. In the fifth section, we demonstrate empirical evidence from the Korean MMORPG market using the Korean PC-Bang database. The last section summarizes the research, states the overall conclusion, and discusses the limitations of this study.

## 2. Theoretical Background

MMORPG is similar to other genres such as First-Person Shooter (FPS) games like "Call of Duty," Real Time Strategy (RTS) games like Warcraft, or Multiplayer Online Battle Arena (MOBA) games like "League of Legends" in that several different players join each other online. However, an MMORPG is different from the rest in that a permanent avatar represents a player. In other words, players find "fun" from short competitions in other genres, but in MMORPG, a player is entertained by living another life through an avatar in virtual reality [5]. To create similar kind of fun in MMORPG, games of other genres have adopted a ladder system or sale of items for ornamental purposes, but these items are merely external factors that cannot fundamentally affect the results of the games. For example, League of Legends sells a variety of "skins" which decorates the characters in the game; if these "skins" affect the result of the "battle arena," the game would be decided by money and not by skill, which would hinder the pleasure originated from the game.

*2.1. Flow Channel.* MMORPG has distinct characteristics as compared with other genres, especially in terms of items. Collecting items to decorate and strengthen an avatar's power is an important source of fun by progression and becomes a player's primary motivation. Researchers [6, 7] found the source of fun by progression from positive psychology and refer to the concept of "flow" of Csikszentmihalyi [4]. Csikszentmihalyi [4] defined flow as the status of complete concentration with multidimensional joy and satisfaction. When gamers develop skills and execute activities, they feel anxious if the challenge is larger than their skills, or they feel boredom if the challenge is too easy [4]. Thus an equilibrium where continuing balance between skill and challenge existed is the flow channel, and when a gamer plays games within this flow they feel enjoyment and joy with exhilaration. Consequently, avatar's skills and items are supposed to accumulate, and corresponding challenges are supposed to be provided so that the gamer is intrinsically motivated.

*2.2. The Puzzle of Puzzles Model.* The Puzzle of Puzzle Model devised by Castronova [1] is the first economic approach to

virtual reality. The model is as follows:

$$S = \alpha R - \beta (C - \Omega)^2 . \tag{1}$$

Let $S$ be emotional satisfaction of player, let $R$ be available reward, let $C$ be actual challenge level, let $\Omega$ be ideal challenge level of the player, and let $\alpha$ and $\beta$ be parameters. From (1), it is evident that a player's emotional satisfaction increases as the available reward increases and the separation distance between ideal challenge level and the actual challenge level increases. If actual challenge level is assumed to be dependent on the player's skill, the player reaches the highest emotional satisfaction at ideal challenge level; thus the point is equivalent to the flow channel [3]. MMORPGs continuously repeat a challenging puzzle with the proper difficulty level for the player to be satisfied and rewarded so that the intrinsic motivation of the game can be sustained. These steps begin with a tutorial where a player develops her skills (player versus avatar); after she is familiarized (united as one), the avatar develops its skills to solve objects to face virtual reality (avatar versus in-game environment); in some games it leads to an avatar versus avatar challenge at the end. These puzzles are supposed to contain a narrative structure and are one of the factors by which MMORPGs keep the players on the flow channel.

## 3. Narrative Structure of MMORPGs

MMORPG is a game genre that consists of avatars, opponents, maps, items and money, and a narrative structure [8]. Among these components the narrative structure, the literary concept of the structural composition between hierarchical events that follows a plot [9], makes a distinction between MMORPG and the other genres. A certain fiction can only be presented to or interact with readers who follow the intention of the author's design. Since the narrative structure originates in the literature, there has been a conflict between narratology and ludology, preceded by Huizinga [10] about the possibility of understanding game. The former argues that traditional Aristotelian dramatic experience consists of characters, background, and events analyze the game, while ludology places emphasis on the simulation. For example, an old puzzle genre such as Tetris does not have a story, but rules, results, and the interactive experience that matters the most cannot be explained by narratology [11]. However, in the perspective of recent game studies, Juul [11] argues that a game cannot exist where the game stresses on just a current simulation, denying the roll and possibility of narrative in the game. For example, if an RPG is viewed as successive puzzles, narrative can be placed according to Csikszentmihalyi's flow channel in the interaction called puzzle. Therefore, we define the concept of narrative structure as a hierarchical storyline mainly composed of compulsory quests that logically differ from game to game.

Several genres other than RPG or MMORPG, including adventure, RTS, MOBA, and shooting, are compelled to contain a narrative structure. A representative example would be World of Warcraft (WoW), which was once most popular MMORPG in the world. The WoW was based on an RTS

game, Warcraft series, which was first released in 1994 and recently released again in 2003. The Warcraft, a kind of RTS, contains a fantasy-based background, but a player does not need to know about narrative structure to play an RTS. In other words, the Warcraft contains storyline and, however, does not create any cyberspace. On the other hand, MMORPG WoW inherited the background of the Warcraft to the virtual world [12]. In WoW, players chose character growth through the "quest" system [13], which forces them to follow the storyline strictly to proceed with the game. The degree of importance for players to follow storyline varies depending on characteristics of MMORPGs. For instance, Lineage, a Korean MMORPG, is less dependent on narrative structures and thus a novice can proceed in the game by merely leveling by hunting as the quests are optional in the game. Meanwhile such "blood pledges" of Lineage are able to obtain a kind of sovereignty by siege warfare in game [14]. An operator of the game adheres to a laissez-faire policy about their hierarchical governance structure to maximize random, accidental, or happenchance story. For example, in Lineage 2, a coalition of blood pledges began a liberation war and rioted against one blood pledge that had monopolized politico-economic power of the entire server and exerted its authority and reign on potentates [15]. The game operator NC Soft did not intervene for over four years of the liberation war, while it maximized the voluntary configuration of conflict [16].

A game's narrative structure is diversified according to genre of the game as discussed in advance. Overall a game that is overly dependent on narrative tends to restrict a players' freedom to keep them stay on the flow channel that maximizes a player's emotional satisfaction. The restriction is not an exogenous condition to overcome, as is generally regarded in the contemporary economic theory, but rather a source of utility. An individual makes a payment to obtain more freedom from restriction in the general case; on the other hand, she pays a price to be confined in a puzzle-like game [1]. That is, being voluntarily confined is compensated with a new experience that is only possible in a virtual reality. A player can only act within a controlled space, with controlled skill, and with controlled methods that are designed to be enjoyable by the developers of the game. Thus the narrative structure is able to create many different types of games. In an MMORPG, a player as a consumer can choose the virtual reality she wants to live in that is different from thrown projections of real life [17]. Consequently a developer's goal is to maximize a player's subjective freedom by creating narrative as a nature that imposes restrictions on a player's objective freedom. A game developer needs to understand the dual structure of societies to successfully implement this strategy.

While playing a game, certain type of players may acquire more freedom and is less dependent on the narrative structure. That kind of game consumers or players could prefer a game that allows more objective freedom since even games that are less dependent on narrative structures can provide different types of rewards that other games dependent on narrative structure can provide. This could be conceptualized as an extrinsic reward. One of the reasons for the success of

Lineage, one of the popular Korean MMORPG, is that the game can provide new forms of enjoyment even after the avatar has reached the maximum level at which the player is familiarized with all the skills. Even after all of the quests are completed, instead of letting players reach the tip of flow channel and feeling burdensome, Lineage provides another type of enjoyment by siege warfare between blood pledges [18]. Steinkuehler [14] described that the narrative and history of Lineage could be created by within- and between-pledge activities.

Yee [19] proposes three categories for motivations for playing online games: achievement, social, and immersion with ten elements. It is natural that each component has weak correlations with the other and no motivation is more important than the others [19], and eventually all factors play roles for any game. However, under the assumption that achievement is the general motivation of playing any games [7], a combination of achievement and immersion is mainly the motivations behind playing games more dependent on narrative structures.

Niman [7] argued that fiery from triumph at the end of an intrinsic reward [20] and Csikszentmihalyi's flow channel is a necessary condition and that the sufficient condition is an incorporation of extrinsic rewards inspired by self-esteem from comparison to others. Therefore, a combination of social factors such as achievement, socializing, relationship, and teamwork can be the motivation for playing a game that is less dependent on narrative structure. Thus enjoyment can be provided to a player through the extrinsic reward from forming communities, mutual competition, and pride from comparison. Lineage's blood pledge and siege warfare system can help a hardcore user who can be bored to take one more step at the end of the intrinsic reward.

## 4. RMT, Narrative Structure, and Playing MMORPGs

Since RMT plays the role of a bridge between reality and virtual reality, affecting motives and rewards of playing game, there have been attempts to explain this phenomenon by not only game researchers, but also social scientists studying e-business and policy [21–24]. Though the marginal cost of producing the virtual product is almost zero, the products are different from nonrival information goods as that they are not instantaneously reproduced [25]. At this moment, since MMORPG is the online platform in which the most available data were accumulated, most researches deduced results from MMOPRG data. Meanwhile, more users need to enjoy a game for an MMORPG's virtual reality to be massive. Therefore, the number of users is important for sustainability of MMORPG and for developers who earn profit from the users, as profits of an online game come from its playing time [26]. Thus, like the existing literature, we focus on the effect of RMT on game usage.

*4.1. RMT in MMORPGs.* Simpson [27] introduced the MMORPG Ultima Online as a closed economy and suggested that the entire economy consisting of NPC, players, and

resources can collapse from inflation caused by overproduction. Nowadays, economic aspect became crucial factor to manage the virtual world so thus patches or updates have been dedicated to manage economic problems as well as traditional gameplay issues [28]. In this context, RMT can be seen as international trade between the real and the virtual economy; that is, the real economy affects the virtual economy thorough RMT as a foreign economy influences the domestic economy. On the other hand, RMT also seems to disclose contradictory natures of game consumption. A game as amusement is obviously a field of leisure in labor economics. Thus, voluntarily spending time on MMORPG must be an action of generating more utility. However, Kelly [29] emphasized that most games contain costs and boredom from repetitive activities for skillfulness though almost time spent playing an MMORPG can be rewarded as enjoyment. Thus, RMT could directly affect the enjoyment of a player. A player can utilize RMT to actively change their enjoyment based on their motivation for game usage and can be passively affected from other player's RMT. This is the motivation for analyzing the effect of RMT on MMORPG depending on the narrative structure. Since RMT is a factor that is external to the game, we should first look into the internal factors that determine the marketability of an MMORPG. Since MMO-RPG is an RPG before being an MMO, the game's narrative structure is the internal factor that produces entertainment. Thus, we need to consider each game's narrative structure to understand the influence of RMT on MMORPGs.

Some of the existing literature argues a negative relationship between RMT and MMORPG usage. Castronova [30] analyzed the negative externalities of an RMT using traditional economic supply-and-demand analysis. From this foundation, several strands of the literature on human-computer interaction presented a method to detect a player who plays "gold farming," a behavior to produce in-game items and currency for real-world profit, or who is an automatic program called a bot [31–33]. Other studies show that RMT has a positive effect on game usage. Huhh [34] and Huhh [2] showed with a model that RMT can lower the minimum number of players required to meet the critical mass that ensures the sustainability of the MMORPG because MMORPG has a network effect. This result contradicts Castronova [30], arguing that utilizing RMT enables game publishers to differentiate service price for consumers to increase profitability. Additionally, gold farming only appears in popular games, thus signaling that the game is well-made.

The existing literature about RMT and MMORPG usage has analyzed games in various perspectives; however, the studies have ignored the degree of dependency on narrative structure of each game. Additionally, most literature discussed the issue using data from only one specific game. Hence, we tried to reveal that narrative structure affects the relationship between RMT volume and MORPG usage with the data from multiple games.

Just as practical considerations affect the real economy, the virtual society of each MMORPG could be affected by narrative structures as an institution that restricts the objective freedom of players. Therefore, we should analyze

motives at the microlevel of RMT, taking into consideration the heterogeneous narrative structure of MMORPGs.

*4.2. Motives of RMT.* Spending time on a game as leisure provides utility, while utility is also generated by decreasing grinding time as a cost since time is a typical economic resource. Because the efficient execution of quests suggested by the MMORPG produces utility, enjoyment occurs when a player saves time [7]. Extant literature investigates personal motivation in RMT to understand different desires. Lehdonvirta [35] theoretically related the playing motivation model by Yee [36] to the motivation behind RMT and argued for the validity of the framework through individual case studies on four types of MMORPG. Lehdonvirta [35] found that achievement and immersion oriented players generally have negative perspectives on RMT as compared to socially oriented players. However Lehdonvirta [35] also showed that if the structure of hierarchical achievement in a game is not clear, an achievement oriented player does not have a negative perspective on RMT. To understand this, the puzzle of puzzles framework can be used.

Starodoumov [3] described the case where a player reaches their ideal quest by adopting RMT to the puzzle of the puzzles model [1] with Figure 2. This means that players with and without the sufficient skills for a quest can achieve higher satisfaction by adjusting the difficulty of the quests using RMT. In other words, if the hierarchical achievement structure represented by the narrative structure does not exist, a player can proceed in a game by searching for their ideal challenge level using RMT and subsequently reaching the state of "flow."

*4.3. Effects of RMT Depending upon Narrative Structure.* Therefore, the different effects of RMT based on the narrative structure of a game can be understood by developing a player's motivation on RMT. For the study, we need the underlying assumption that social oriented players are the majority in the game that produces enjoyment from social functions and that achievement oriented players that have a negative perspective on RMT are the majority in the game that produces enjoyment from a hierarchical achievement structure. For this assumption we have to cognize the virtual societies that each MMORPG constructs from the viewpoint of methodological individualism. As described in Figure 1, virtual reality is clearly different from reality where projected individuals exist. Individuals of the virtual society voluntarily decide to exist in the virtual society. Therefore, unlike the ontology of the real-world society, where there is sharpening conflict between the stance of social nominalism and social realism, the ontology of virtual reality clearly supports social nominalism.

MMORPGs need avatars of each player to form a virtual society, but the game's essential characteristics and the strength of narrative structure are predetermined by game developers, as sovereignty transferred leviathan [37]. Thus a virtual society is formed through "time-reversed social contract." Before individuals (players) who transferred sovereignty to leviathan exist, leviathan (developer) or the
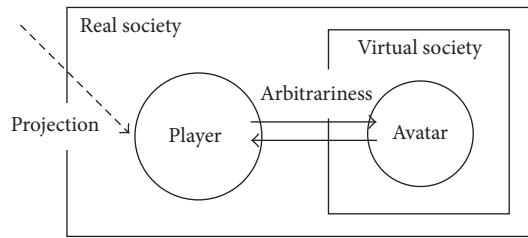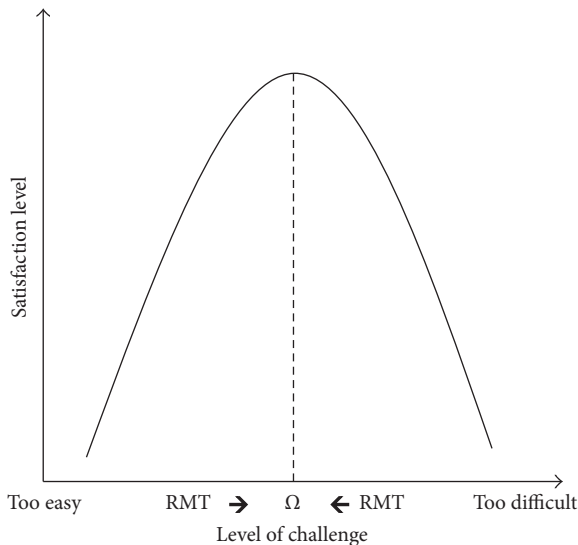
Figure 1: The dual structure of societies.



Figure 2: RMT influence on the satisfaction of the player [3].

autocrat acquired sovereignty by transfers created in the society that restricts the objective freedom of individuals. Then, the individuals (players) decided to be (play) or not. Once virtual reality is formed, the decision whether to exist in the virtual reality as an avatar is made in the real world by the player as seen in Figure 1. From the viewpoint of the real world, virtual reality is a good or product to enjoy leisure, and a player would consume based on their needs in an exclusive market with differentiated products. Consequently, for the achievement oriented player who has a negative view of RMT plays a game with strong hierarchical achievement structure, RMT disturbs the flow of the narrative structure. The social oriented player who does not have a negative view of RMT plays a game in which RMT does not disturb the flow, without strictly predetermined narrative structure in the same vein. We conclude that the characteristic of time-reversibility of social composition and arbitrariness for individual's decision on existence makes the majority of the individuals in a virtual society resemble the innate nature of society. For example, an avatar of a social oriented player would exist in a game that produces enjoyment through social functions and maintains the flow of players. In other words, an avatar derives enjoyment through the narrative structure and the sustenance of the flow of players. As a result, we can expand the individual micromotives of RMT to the virtual society.

In this respect, the model in Starodoumov [3] only describes games where the narrative structure is less important. In such a game where players focus more on social functions, RMT can have a positive influence on overall game usage. However, in case of games with strictly predetermined narrative structures, players can maximize enjoyment by proceeding in games with sophisticated stories without breaking away from immersion. In this case, RMT can distract a player's immersion, and if they skip the narrative time line by RMT, the intrinsic reward of enjoyment can be reduced. This is consistent with the argument that an achievement and immersion oriented player has negative view of RMT if there is a clear hierarchical achievement structure.

Therefore, we hypothesize that there is a difference between the effects of RMT depending upon the intensity of narrative structure. We inductively test the hypothesis to present empirical evidence.

*Hypothesis.* The playing time of games with weakly predetermined narrative structure is more positively associated with the RMT volume than the playing time of games with strictly predetermined narrative structure.

## 5. Empirical Evidence

We present empirical evidence from the Korean MMORPGs market since Korean MMORPG had become a standard design in the Asian online game market until early 2000s. In terms of consumption, the Korean game culture is characterized by PC-Bang. The IT initiative of the Korean government made broadband Internet available throughout the entire country, which contributed to the development of online games, and PC-Bang served as a catalyst to this phenomenon. PC-Bang was available where fast Internet could be used for a low price, especially by young Koreans, and a de facto community where they socially interact with acquaintances emerged [38]. On the other hand, it seems paradoxical that an offline-local form of game usage pattern called PC-Bang was formed during this time. Huhh [39] explained that PC-Bang complemented the online culture that allowed for building relationships; especially, MMORPG gamers could play a variety of online games for low prices due to the IP-Pricing system (IP-Pricing means that each PC-Bang is charged a price in accordance with the number of fixed IP addresses by the game publisher [35]). It is important to note that computer hardware technology could not keep up with people's expectation and desire. Generally, PC-Bang was furnished with computers with better performance than those of home PCs, and therefore, users tended to utilize PC-Bang.

*5.1. Data.* We use the database gathered from Gametrics (this description is on http://www.gametrics.com/services/gametrics_guide.pdf) that collects statistical data with respect to its clients of PC-Bangs. The data was gathered from a daily random sample of 4,000 PC-Bangs using the management software that Gametrics had distributed to predict the total usage of every PC-Bang in South Korea.

We collected the data for total time usage and total quantity of RMT items of Korean MMORPG markets for four years (208 weeks) from 2011-05-03 to 2015-04-27 on a weekly basis. Then we arranged the MMORPGs in descending order by aggregating four years of time usage data to select the most used games on a sustained basis during the 208 weeks for analysis, which means that we selected the games that were launched before 2011-05-03 and sustained their service at least until 2015-04-27. To classify the MMORPGs based on the intensity of the narrative structure, we referred to MMORPG.com, which is one of the most popular communities to assess the game elements among game players. On the basis of the highest total playing time, the following top eight games are selected among assessed games in Cyber Creations (MMORPG.com): Aion, Lineage 2, World of Warcraft, Maple Story, TERA, MU Online, Mabinogi, and Rohan in order.

*5.2. Method and Results.* We supposed that a game highly rated in terms of narrative has a strictly predetermined narrative structure. In the same vein, we assumed that a game lowly rated has a weak predetermined narrative structure. Since only eight games were available, existing in both Gametrics and Cyber Creations, we relatively evaluated the games and separated the games into two groups depending on the degree of predetermination related to narrative structure. As the number of games is not enough to apply statistical methods, we tried to decide an objective branch point. Hence, we counted the games rated lower than 6.9 as a low-rated group and the other games rated over than 7.0 as high-rated group. Among the eight games selected, Lineage 2 (6.8), TERA (6.8), MU Online (6.8), and Aion (6.9) have low ratings in the narrative subsection (among the 8 sections of ratings in MMORPG.com, we use the score of "Role-Playing" subsection). World of Warcraft (7.2), Maple Story (7.2), Mabinogi (7.4), and Rohan (7.1) belong to the high-rated group. We compare the ratio of the playing time to the RMT volume, which is a proxy of the influence of RMT, between the groups with high and low ratings. Table 1 provides the general information of each game.

Since the purpose of analysis is to examine the difference between usage of the high-rated games and usage low-rated games, we adopt an ANOVA process. The time/RMT variable is a unit of time usage of the game while the RMT is executed; that is, its expression is the slope of the time usage over the RMT volume. According to our hypothesis, the high-rated games are played with very little RMT. On the other hand, the low-rated games are played with more RMT. Table 2 presents the descriptive statistics and the results. The first row shows the result of the hypothesis using ANOVA analysis. The low-rated narrative group has a significantly higher influence of RMT. Therefore, we conclude that the playing time of games with weakly predetermined narrative structure is more positively correlated with the RMT volume than the playing time of games with strictly predetermined narrative structure. There is a significant difference between two groups, which supports our hypothesis.

We extend the data sample to 12 games to check the robustness. The Kingdom of the Wind (7.1), Dekaron (7.1), and Ragnarok Online (7.2) are added to the high-rated group,

and Hero Online (5.9) is added to the low-rated group. The second row of Table 2 displays the results. The difference of two types of groups is significant and low-rated group has the higher association. It is consistent with the first analysis and the hypothesis.

## 6. Conclusion

We discuss the characteristics of the narrative structure of MMORPGs during the process of development and RMT during management process after they are launched. We deduce results based on the dual structure of societies, in which a person in the real world decides whether to exist in the virtual society. This considers virtual reality as created in the viewpoint of time-reversed social nominalism. This study contributes to developing an understanding of RMT on MMORPGs in the way that we recognized the role of narrative structure with regard to extend previous literature [2, 3]. We find that the effects of RMT have differences in overall game usage according to narrative structures that confine players in the "flow" and provide players' enjoyment. Since achievement and immersion oriented players have a negative opinion of RMT, there is a less positive impact on the games with strictly predetermined structure than those with weakly predetermined narrative structure. We verified the conclusion using Korean PC-Bang data and empirically found that the deductive conclusion is inductively supported. In addition, we showed that the past RMT literature has neglected MMORPG's heterogeneity of narrative structures.

There are several limitations in our research. First, the importance of MMORPG's narrative structure could change over time. Most MMOPRGs, excluding ones that serve as social network service, contain a type of narrative structures necessarily and players are to follow the structure in the beginning of the game after launched. Importantly the significance of narrative structure is based on whether developers continuously add new stories through patches or updates. In this context, our research has a shortcoming since we used a single rating for the narrative structure of each game, while analyzing four years of playing time and the quantity of RMT. Second, this research used Korean PC-Bang data on only 12 games in the Korean MMORPGs market that could be identified by the authors. This PC-Bang database is not a complete enumeration and it does not include the behavior of individual gamers at home. It means that Gametrics, the Korean PC-Bang database, used the sample PC-Bangs and estimated the population of playing time. If the statistics of Gametrics are biased, we cannot guarantee the empirical results of ANOVA analysis. In addition, there are underlying assumption that there is no difference in consumption behavior between gamers in PC-Bang and gamers at home. Future research should verify if this is the case. Furthermore, we choose the games that had been serviced during the sample period. It could generate survival bias, accordingly the results could undergo influence when we include the games interrupted before the end of sample period. We should also mention that the cut-off criteria used in separating group were not decided by a statistical method but a relatively evaluation among the sample. Finally, the

TABLE 1: Descriptive information.

| Ranking | Game | Publisher | The date of issue (Korea standard) | Ratings (role-playing) |
|---|---|---|---|---|
| 1 | Aion | NC Soft (Korea) | 2008-11-25 | 6.9 |
| 2 | Lineage 2 | NC Soft (Korea) | 1998-09-01 | 6.8 |
| 3 | World of Warcraft | Blizzard (US) | 2004-11-23 | 7.2 |
| 4 | Maple Story | NEXON (Korea) | 2003-04-29 | 7.2 |
| 5 | TERA | Bluehole (Korea) | 2011-01-25 | 6.8 |
| 6 | MU Online | Webzen (Korea) | 2001-11-19 | 6.8 |
| 7 | Mabinogi | NEXON (Korea) | 2004-06-22 | 7.4 |
| 8 | Rohan | Playwith INC (Korea) | 2006-03-07 | 7.1 |
| 9 | Kingdom of the wind | NEXON (Korea) | 1996-04-01 | 7.1 |
| 10 | Dekaron | Dekaron Project (Korea) | 2005-05-03 | 7.1 |
| 11 | Ragnarok Online | GRAVITY (Korea) | 2002-07-29 | 7.2 |
| 12 | Hero Online | MGAME (Korea) | 2005-01-25 | 5.9 |

TABLE 2: Descriptive statistics and empirical results.

| (Time/RMT) | High-rated | | Low-rated | | $p$ value |
|---|---|---|---|---|---|
| | Mean | SD | Mean | SD | |
| 8 games | 193.82 | 475.01 | 251.51 | 463.53 | .013* |
| 12 games | 125.75 | 369.16 | 310.46 | 502.08 | .000*** |

* and *** denote $p < .05$, and $p < .001$, respectively.

empirical results are based on the Korean MMORPG market and therefore, we cannot generalize the conclusions to other markets. We believe that the future research will need to prove the mediating effect of narrative structure on the association between RMT and the usage of MMORPG. It will extend our result that proves the existence of difference. Moreover, we suggest that future research with international MMORPG market data would generalize the results of our findings.

Nexon, who developed the world's first MMORPG, announced that it may adopt exchange system (this description is on http://www.mmobux.com/articles/320/what-nexon-s-groundbreaking-universal-currency-exchange-means-for-the-publisher-and-mmorpg-industry). Using "Nexon stars" as key currency issued by Nexon platform, it will create a system where items and game money can be exchanged between different MMORPGs provided by Nexon. It is certain that both game developers and researchers need to understand the importance of managing RMT as well as creation of MMORPG as virtual world [40]. Thus we believe that our conclusion, the effect of RMT is different based on MMORPG's narrative structure, provides managerial implications to game developers.

## Competing Interests

The authors declare that they have no competing interests.

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