Imposing Tax and Rebate Policy for Addressing Game Addiction Problem

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Abstract

Massively Multiplayer Online Games (MMOGs) are popular worldwide. Especially in Korea, there were about 19 million gamers in 2006. Despite this wide popularity, some players have become seriously addicted to online games, causing a serious social problem. However, studies and/or trials to address game addiction problems have rarely been performed. In this paper, we investigate the relationships among interested parties in the game industry and propose a base model to explain them. From the base model, we expect that casual gamers increase until some point of time, but decline afterward. The growth rate of total revenue from online games is decreased due to a reduced number of casual gamers over time and a negative image of online games. To resolve game addiction problems, we analyzed a self regulation policy and a tax and rebate policy in the base model. Through the analysis of the policies, we found that a tax and rebate policy is preferable to a self regulation policy. Under the tax and rebate policy, the total revenue of online games increases contrary to the concern of game companies, the social image of online games is improved and the number of game addicts decreases.

Keywords*: Massively Multiplayer Online Games (MMOGs); Game Addiction; Tax and Rebate;*

1. Introduction

In 2007, about 217 million people in the world enjoy the online games through the online game community. *World of Warcraft* from Blizzard Entertainment is the most popular game in the Massively Multiplayer Online Games (MMOGs) category

[comScore 2007; Woodcock 2008] as of February 12th, 2008. The western market value of MMOGs was more than $1 billion in 2007 and its revenue is expected to be $1.5 billion by 2011 [BBC News 2007].

In South Korea, as the government supports the game industry as a new source of economic growth, e-sports have become very popular. Most online game players under the age of 40 in South Korea play StarCraft which was developed by Blizzard Entertainment. The revenues for the total game industry were about ₩7,448 billion (about $7.448 billion) in 2006. The online game industry occupies 23.9% of the total game industry [Korea Game Industry Agency 2007]. The number of Internet users in Korea is about 34 million and around 56% of them (19 million) frequently play online games in South Korea [Jang 2007].

The more gamers in South Korea, the more problems occur in the society. As Anthony Faiola noted in a Washington Post article on May 27, 2006, "10 South Koreans -- mostly teenagers and people in their twenties -- died in 2005 from game addiction-related causes, up from only two known deaths from 2001 to 2004". According to Korea Game White Paper, people think of online games as negative (30.8%), positive (26.2%), and so so (26.2%). As people get older, their negative responses increased. To play online games, students don't go to school and young adults take several days off or even quit their jobs. Because of the increased negative image of online gaming characterized by reduced study time of students, an increased quitting rate of jobs, and/or aggravated violence, citizen's coalitions have suggested that the shutdown system or fatigue system which limit game playing time should be adopted. In general, game companies have refused to adopt the systems because it could lead to a reduction in revenue. Some game companies, however, have adopted the fatigue system. They adopted it not to reduce game addiction, but to postpone updating online game content. As the number of addicted gamers continues to increase and the negative image of online gaming becomes worse, the revenue of the online game industry could be severely reduced.

The problem of game addiction is not restricted to Korea; it is also present in many other countries. In China, in December of 2005, a 13-year old Chinese boy jumped from an apartment and died. It is believed that he mimicked the jump scene from the game "Warcraft 3" [Potkewitz 2005]. In America, one woman who lives in Hudson said that her son quit his job and killed himself because he was addicted to "EverQuest" [Miller II 2002].

To treat game addiction, the Thai government has applied a shutdown policy to the online game industry. As a result, people can't play online games between 10 P.M. and 6

A.M. In China, the government has applied a fatigue system to online gaming. When gamers play over 3 hours in a row, they don't get fully compensated from playing. If game playing time exceeds 5 hours, items and acquired experience will be deleted and gamers can't continue to play the online game.

In cases of social problems such as environment pollution, the government imposes taxes on factories to reduce pollutants. For cigarette smoking, not only to reduce the number of smokers but also to raise funds for education and health, the government imposes taxes on tobacco. In Korea, over 50% of the price of tobacco consists of several different taxes.

It is obvious that game addiction has become a major social problem in many countries and that developing new policy to address the problem is an imminent agenda. Nevertheless, most current researchers of online games focus on finding the main motivations for playing online games such as flow, fun, and social connection [Heeter 1994; Yee 2006; Wu 2007]. Because there are many stakeholders in the game industry and these stakeholders are interrelated with each other, it is difficult to analyze the effect of change on a stakeholder. For example, if a factor changes within the game industry, a stakeholder may experience a positive effect from the change, whereas another stakeholder may experience a negative effect). In this situation, because of this tradeoff, if the government develops new policy without considering the total effect of change, the policy may negatively or positively affect stakeholders.

System dynamics is a good methodology to understand and analyze the whole effect of change in an industry. Therefore, to suggest policy which could treat or prevent the problem of game addiction, considering this tradeoff, we applied system dynamics to the online game industry. Additionally, we chose to study Korea because online gaming is very popular and game addiction is a big issue in Korea. Therefore, this country can be one of the best cases to study game addiction problem.

In this paper, we consider stakeholders and analyze online game industry dynamically. From this approach, we address the following questions:

- What will happen in the online game industry if the government or game companies don't take any action regarding online game addiction?
- What will happen in the online game industry if game companies make an effort to reduce game addiction voluntarily?
- What will occur in the online game industry if the government regulates game companies?

The results of this study provide some insights that are helpful for the government and game companies to continue to develop game industry despite the negative effects of

online game addiction.

2. Literature Review

People have been using the Internet to search news, view TV and listen to music. Some individuals tend to spend too much time in using the Internet. As a result, people are worrying about excessive usage of the Internet. The concept of Internet addiction was first introduced by Kimberly S. Young who defined it as an impulse-control disorder without having an intoxicant [Young 1996]. Later, she developed a diagnostic questionnaire and defined addicted Internet users. The guideline designed by Young is now widely used to judge Internet addiction.

After people became more and more familiar with the Internet, they began to use it for playing games. Some students didn't go to school and some adults didn't go to work as a result of playing online games overindulgently. People became concerned about excessive use of online games; game addiction became an issue of current society. By reviewing video game-related literatures using meta-analytic methods, researchers found that playing violent video games increases aggressive behavior, physiological arousal and aggression-related thoughts and feelings. In addition, playing violent video games decreases pro-social behavior. [Anderson 2001]. Gamers play video games to escape from reality. However, excessive use of video games has serious risks for social development [Salguero 2002]. Stanford researchers found that men acquire much more satisfaction from playing video games than women. Therefore, men tend to be more susceptible to game addiction than women [Brandt 2008].

The more users of online game play games, the more researchers want to know why game users play games. Arcade video game users between the ages of ten and fourteen said that they prefer playing video games to playing with friends [Selnow 1984]. Players of the game "BattleTech" play the game for fun/excitement, violence/competition, and social interaction [Heeter 1994]. MMORPG (Massively Multi-player Online Role Playing Game) players are driven by the achievement and social components of the game [Yee 2006]. While addicted game users play online games for relieving dissatisfaction, non-addicted game users play online games to find satisfaction [Chiou 2006]. Trust and enjoyment are also important factors of intention to play online games [Wu 2007].

As game addiction is a social problem, governments want to regulate or take action to reduce the problem. Similar situations occur in other industries. To reduce the number of cigarette smokers and lung cancer, the government imposes taxes on the price of

cigarettes. To restrict the emission of pollutants, the government forces companies to pay taxes. We can say that “externality”, an economic term, exists in this situation because non-related people are damaged from these pollutants. When externality exists, tax imposition could be a solution to solve the problem. In Korea, the price of cigarettes includes taxes such as local education and health, which comprise about 63% of it [Sung 2008]. Using system dynamic research, Arquitt has shown that environmental pollution can be restricted by tax and rebate policy [Arquitt 2005]. Cavana has analyzed the effect of changes in excise duties on cigarettes [Cavana 2006].

3. Model Building

Game addiction leads to many problems such as health risks and quitting a job/school. To treat these problems, we first need to understand the online game addiction and relationship of the interrelated parties then develop a base model for simulation. Because system dynamics is useful to understand the impact of stakeholders, we applied system dynamics methodology to the online game industry.

In this paper, to model the online game industry, six phases of modeling process were applied; 1) problem definition, 2) system conceptualization, 3) model representation, 4) model behavior and evaluation, 5) policy analysis, and 6) model use [Roberts 1983]

3.1. Problem definition

In this part, we define the scope and main questions of this research. Gamers can be classified into several different categories such as video game player, arcade game player and online game player. As discussed, Korea has a number of popular online games like Lineage and Ragnarok and many people play online games. In this paper, we focus on the online game industry in Korea.

To analyze the game industry comprehensively, it is indispensable to build a base model based on the current Korean game industry. After developing a base model, we will analyze the main questions: what will happen in the game industry if the current situation continues? And what should government do to reduce game addiction?

3.2. System conceptualization

The total structure of the online game industry (Figure 1) has positive feedbacks and negative feedbacks. The online game industry is affected by these responses. The

revenues of the online game market will increase or decrease depending on which feedback is strong or not.

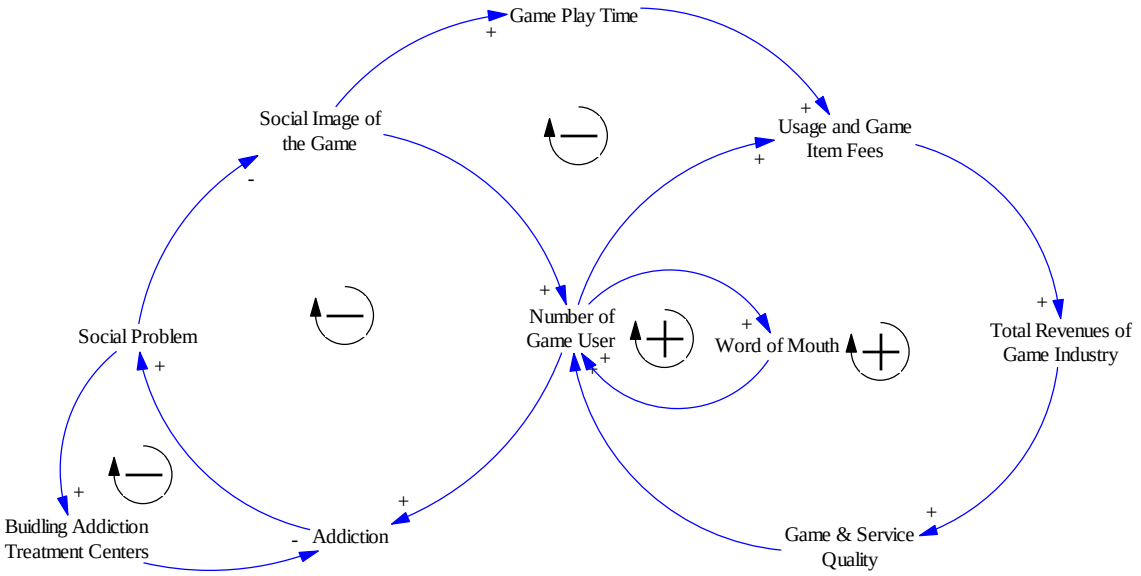


Figure 1: Feedback Loop of Game Industry

3.2.1 Positive feedback loops

In Korea, gamers said that *StarCraft*, developed by Blizzard Entertainment, is very fun to play. This notion spread by word of mouth and as a result, the number of online gamers playing *StarCraft* increased. Most online gamers less than 40 years old can play the game in Korea. Other popular games such as Lineage and Cart Rider have experienced the same process. In 1999, the total number of gamers was about 1.83 million in Korea. However, the number was about 19 million in 2007. According to Korea Game White Paper, a gamer spent ₩8,053 (about $8.0) for online games at PC Bangs (a place where people usually play games that is similar to an Internet Café) in 2004 and ₩19,068 (about $19.0) in 2007. The number of game-related companies increased from 2,908 in Jan. 2004 to 3,631 in Dec. 2006. Most game companies invested below 5% of their total sales in 2004. However, companies have begun to invest much more money for R&D to develop popular games with competitive quality.

From these facts, we can conclude that the online game market has a couple of positive feedbacks (Figure 1). First, as the number of game players increases, the word of mouth effect would also be amplified. This word of mouth effect influences other

game users. If one game gains good word of mouth, it would attract more gamers to play the game and vice versa. Second, an increased number of online game players would augment or positively affect revenue of PC Bangs. As the usage fees of PC Bangs and the number of online game players increase, the total revenue of the game industry is expected to be positively expanded, resulting in an improved service quality.

3.2.2 Negative feedback loops

According to Der Spiegel published in Feb. 2006, the number of addicted gamers is around 750,000 in Korea. Faiola reported the deaths of ten young people, possibly resulting from online game addiction. In addition to this, on-line games also have a negative effect on the relationships between family members. As children play online games longer, parents more strictly control the game playing time of their children and the conflict between parents and young people would increase. To treat game addiction, the Korea Game Industry Agency, supported by the Korean government, built 5 addiction treatment centers in July 31 2007.

From these data, we can deduce that the online game market also has many negative feedbacks (Figure 1). First, as the number of game players increases, that of addicted game players would also increase. This would cause more social problems, which could further generate a negative social image of games. Therefore, the number of game players would decrease. Second, the increased social problems would make society build more addiction treatment centers, which would result in a decline in game addiction. Third, the more positive social image of games, that is the opinion of people on online games, the more gamers play online games. An increased number of game players could increase the total revenues of the game industry. As revenues grow, game companies can update and release new versions of games more quickly.

3.3. Model representation

After analyzing the online game industry, it is necessary to make a stock and flow diagram to simulate the model. In this part, we generate 6 sections regarding the online game industry: 1) internet user, 2) addiction, 3) PC Bang revenue, 4) online gamer usage fee, 5) revenue of online game industry, and 6) current government policy.

3.3.1. Internet user section

According to statistics, the number of internet users was 29,220,000 as of 2003. Therefore, the initial value of Internet User which is a stock variable in the model is 29,220,000. We assume that the Internet population will increase by 0.3% every month.

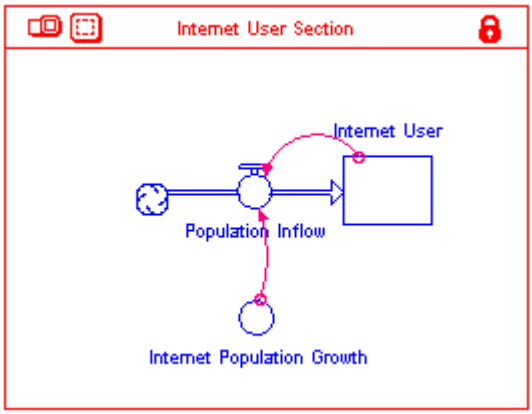


Figure 2: Internet User Section

3.3.2. Addiction section

To model this section, SIS (Susceptible, Infectious, Susceptible population) and the Bass Diffusion model are adopted because the game addiction process is very similar to an epidemic situation and technology adoption process [Sterman 2000].

Like SIS, gamers can be classified by game usage patterns: potential gamers who can play games but don't actually play games; casual gamers who play online games from time to time; and addicted gamers who ignore their duties for playing game and play online games many times for many hours.

A portion of Internet users will be potential game players. Potential game players can be casual gamers by word of mouth and R&D of online games. R&D of online games is computed by current total revenues of online games divided by initial total revenues of online games and affected by the social image of online games.

Casual gamers can become addicted gamers by addiction rate and a delay is applied to this model because a casual gamer can't become an addicted gamer right after playing an online game.

Casual gamers can be potential gamers by self treatment or parent pressure and addicted gamers can be transformed to casual gamers and potential gamers by treatment or parent pressure. It is assumed that the treatment rate from casual gamer to potential

gamer is higher than that of addicted gamer to casual gamer and that the treatment rate from addicted gamer to casual gamer is higher than that of addicted gamer to potential gamer. A delay is applied to this model because a few months are required to treat online game addiction. The treatment rate is influenced by social image because parents and other people push their children or friends to recover quickly if society has a bad image of the game.

The maximum level of addiction in the model comes to 10% of the total number of gamers. Social problems increase as the ratio of number of addicted gamers to total number of gamers goes up. The maximum value of social problems is 1 when the number of addicted equals or exceeds 10% of the total number of gamers. The social image of the game has a value from -1 to 1 as social problems increase.

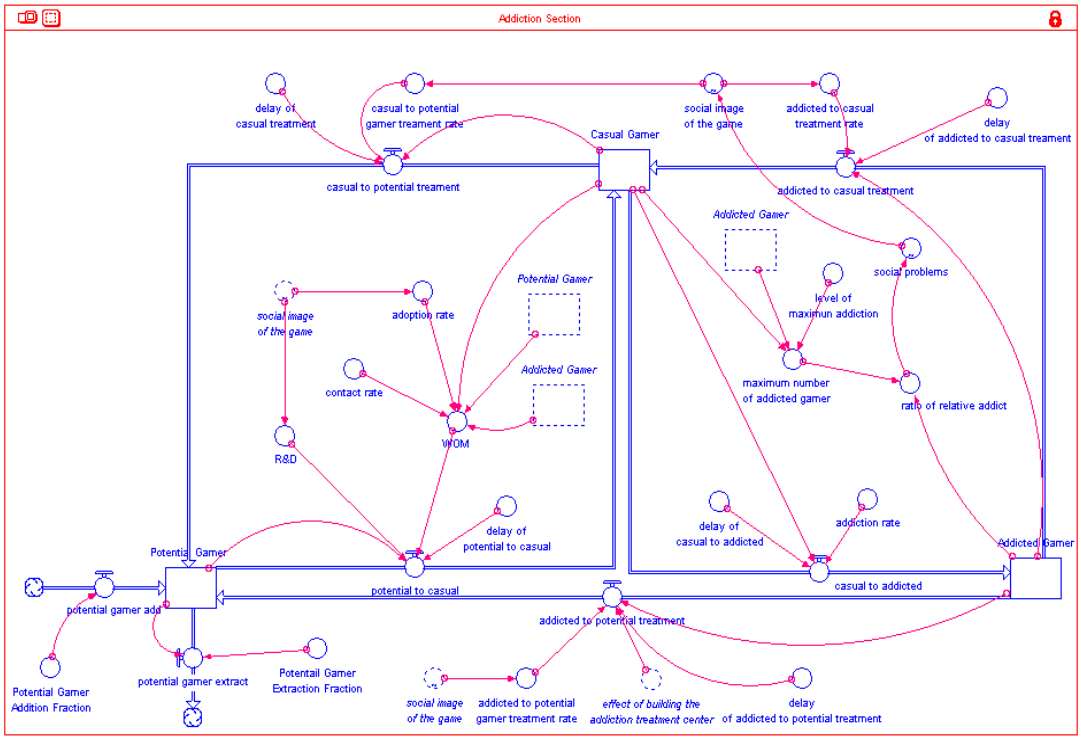


Figure 3: Addiction Section

3.3.3. PC Bang revenue section

The revenues of PC Bangs come from casual gamers and addicted gamers. From the 2004 Korea Game White Paper, we calculate the expenditure of on-line gamers using PC Bangs. As expected, addicted gamers pay much more money than casual gamers.

The usage fee of PC Bangs increases by the growth rate of gamers' expenditure and the positive social image of online gaming. It is assumed that the initial usage rate of PC Bangs is 1 and is influenced by the social image of the game.

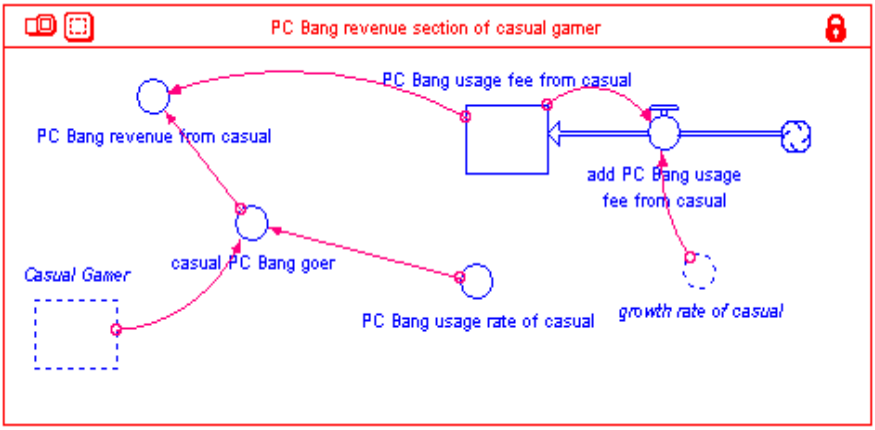


Figure 4: PC Bang Revenue Section of Casual Gamer

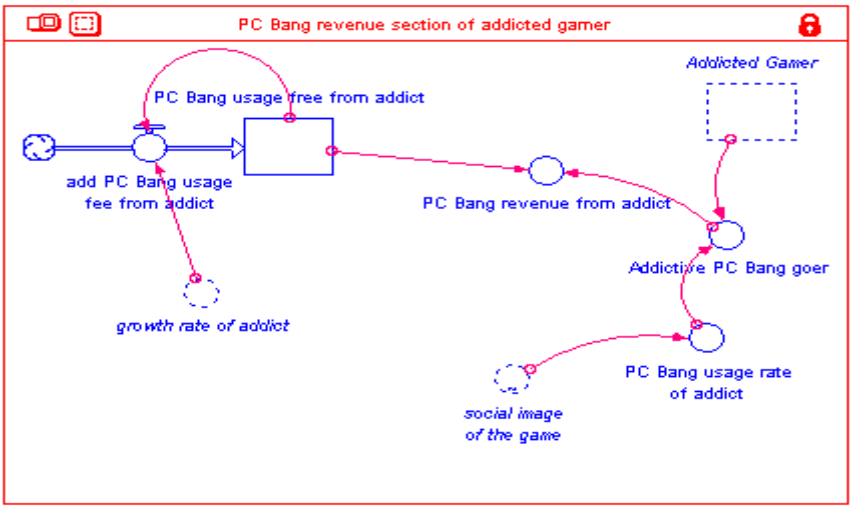


Figure 5: PC Bang Revenue Section of Addicted Gamer

3.3.4. Online gamer usage fee section

The revenues of online game companies come from casual and addicted gamers. Addicted gamers spend more money than casual gamers. These gamers' expenses include the usage fee for online game playing, PC Bangs and game items. The revenue from casual gamers is multiplied by the number of casual gamers and the usage fee

from a casual gamer. This equation also applied to the calculation of the revenues from addicted gamers. The growth rate of the usage fee from casual and addicted gamers is influenced by the growth rate of expenditures and the social image of online games.

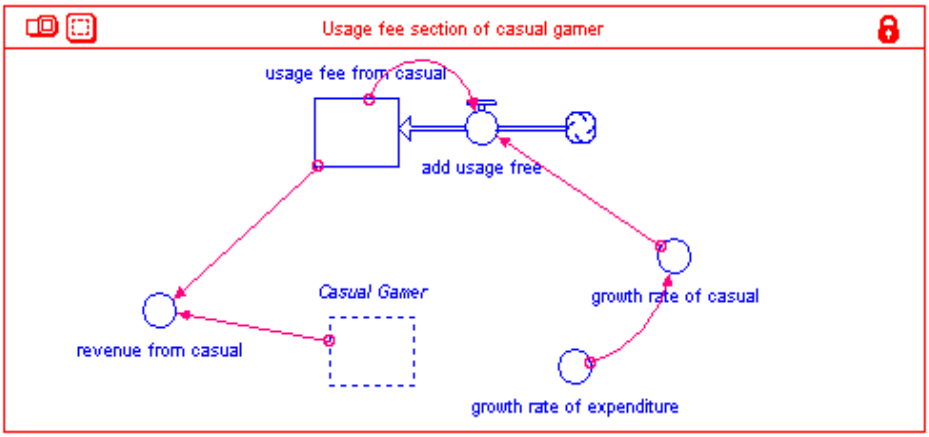


Figure 6: Usage Fee Section of Casual Gamer

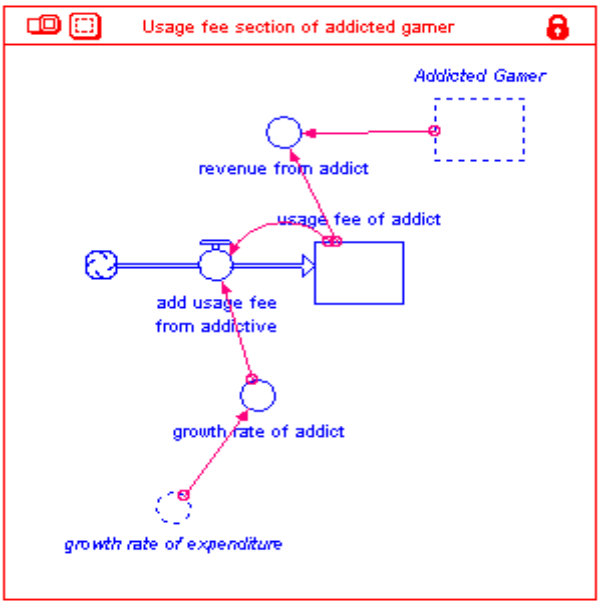


Figure 7: Usage Fee Section of Addicted Gamer

3.3.5. Revenue of online game industry section

The revenues of the online game industry are generated from casual gamers, addicted gamers and PC Bangs. It is assumed that owners of PC Bangs pay the game title usage

fees to each game company by about 15%.

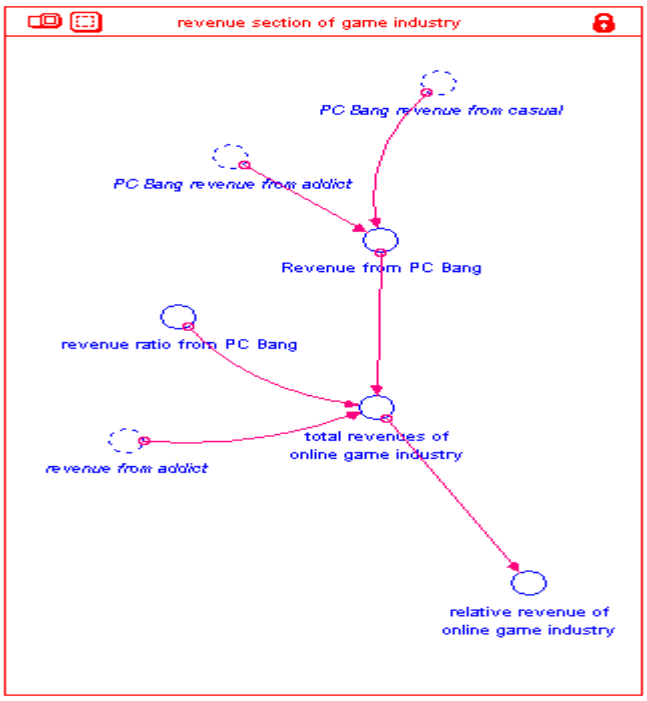


Figure 8: Revenue Section of Game Industry

3.3.6. Current government policy section – building addiction treatment centers

The Korea Game Industry Agency has built 5 addiction treatment centers in Korea in July 31 2007. This means that the treatment centers affect the base model after 56th month because this simulation started in 2003. After operating the centers, the government will build additional treatment centers.

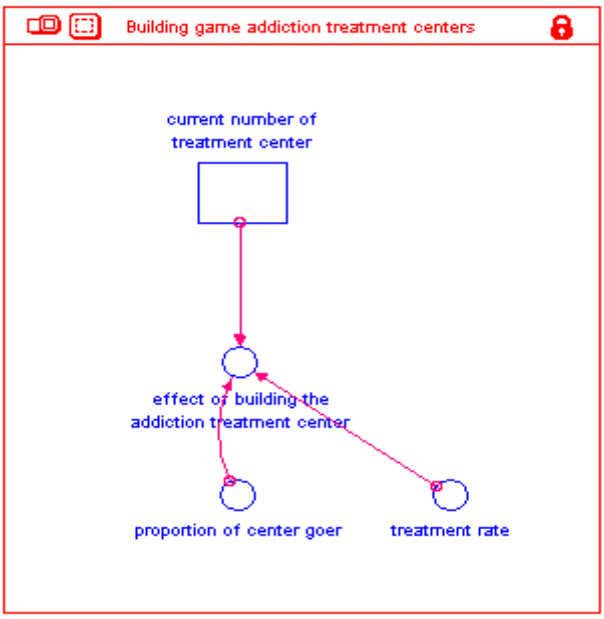


Figure 9: Government Policy Section

3.3.7. Simulation model of online game industry

The online game industry consists of 8 sections. Previously mentioned sections are connected with each other shown in Figure 10. From this stock and flow diagram, it is possible to analyze the online game industry and test alternative policies.

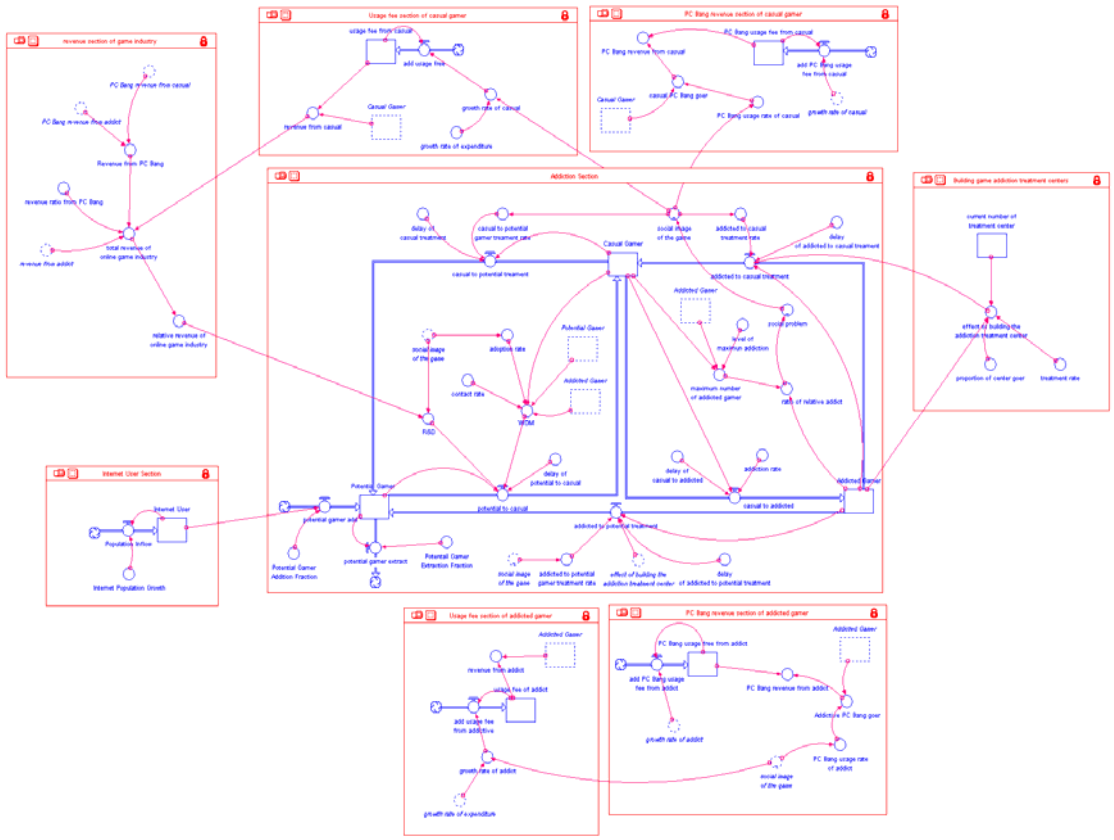


Figure 10: Stock and Flow Diagram of Online Game Industry

4. Analysis

4. 1. Base model

Based on the Korean online game industry, especially the Korea Game White Paper, we developed the base model. The total revenues of the online game industry in the model were computed by a bottom-up approach which we calculated from casual gamers' and addicted gamers' game expenditures because there is no information in the Korea Game White Paper about casual gamers' and addicted gamers' game fee.

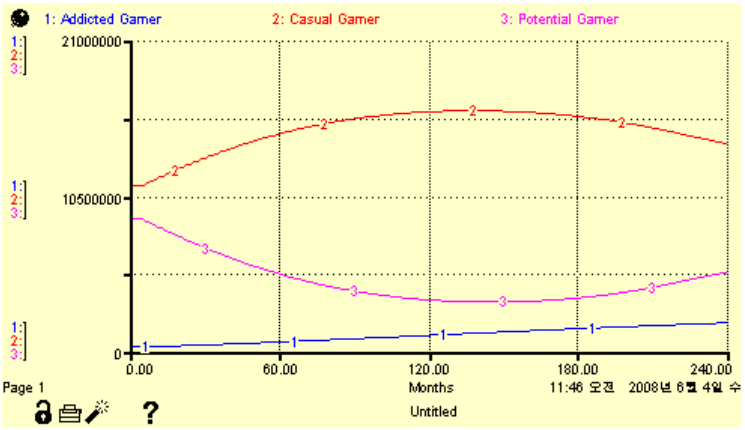
To simulate this base model, system dynamics software, Stella, is used and the length of the simulation is set from 0 to 240. DT is 1 and the unit of time is a month. 0 month means the first month of year 2003 and 240th month means the last month of year 2022. Basic data is based on the Korea Game White Paper 2004.

4.1.1 Simulation results

In Figure 11, the number of casual gamers increases to 16,278,939 at the 137th month. After the point, casual gamers slightly decrease because the image of online games becomes worse. Though the number of addicted gamers increases, the growth rate of the number of addicted gamers decreases over time. The number of potential gamers decreases for the first 145 months. After the 145th month, the number of potential gamers increases because the bad image of online games makes them hesitant to play online games.

The results from the base model run showed a positive correlation between the total revenues of online games and the number of addicted gamers. The increased number of addicted gamers could contribute to the augmented total revenue of online games. However, the growth rate of total revenues of online games decreases mainly due to the reduced number of casual gamers and/or the bad image of online games.

As the number of addicted gamers increases, the social image of online games becomes worse. If this situation continues, the negative image of online games would negatively affect the online game industry.



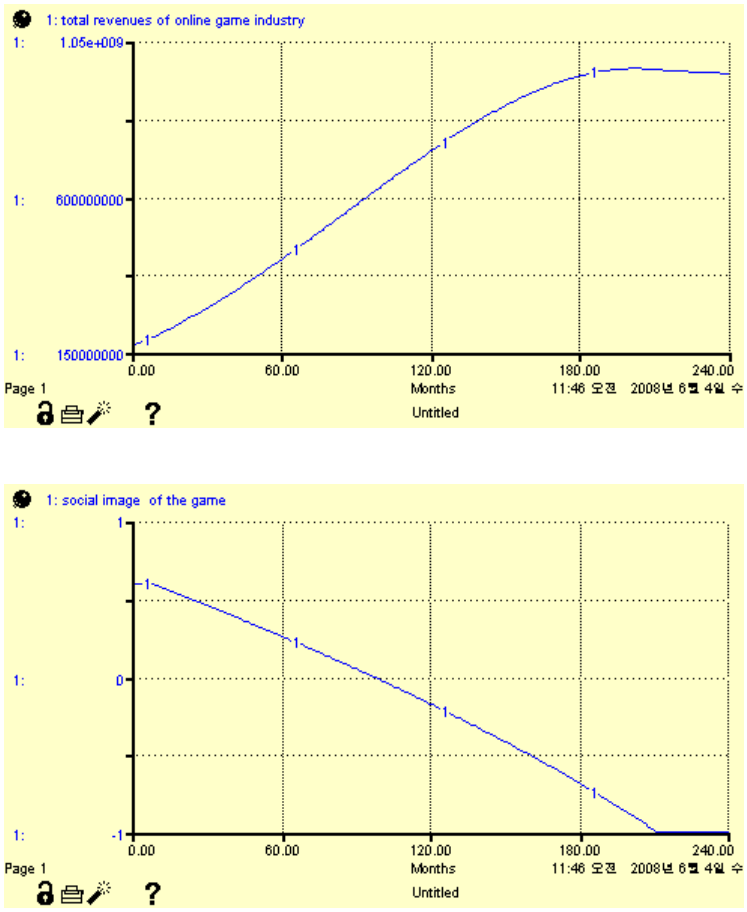


Figure 11: Results of Base Model Run

4. 1.2. Sensitivity analysis

Change of contact rate

We assume that the contact rate in the base model is 30. To get the validation of the base model, the contact rate from 25 to 35 by 5 is changed. We conclude that first, as the contact rate increases; the number of casual gamers also increases, and then decreased possibly due to aggravation of the image of the online game industry resulting from the augmented number of addicted gamers. However, the actual number of casual gamers increases with a higher contact rate, which may contribute to the expanded number of addicted gamers. Second, although the number of casual gamers eventually decreases even at a higher contact rate, the total revenue of the online game industry increases partly because of the expanded number of casual and addicted gamers when the contact rate is high. This means that the higher the contact rate, the more the

total revenues of online games increases. However, the increased number of addicted gamers causes a negative social image of online games.

Change of addiction rate

It is assumed that the addiction rate of the base model is 0.0005. For sensitivity analysis, the addiction rate is changed from 0.0004 to 0.0006 by 0.0001. When applied to high addiction rates, the number of casual gamers decreases, compared to low addiction rates. However, the number of addicted gamers augments, and the bad image of on-line games heightens. An increased rate of becoming addicted gamers from casual gamers and magnified bad images of on-line games may contribute to the decreased number of casual gamers upon high addiction rate. Thus, these two factors lead to a reduction of total revenue of the on-line game industry.

In the sensitivity analysis, all results show similar patterns to those of the base model. Therefore, we can say that this model is valid and concrete from the sensitivity analysis.

4.2. Policy analysis

From the base model, we find that the number of casual gamers and total revenue of online games gamers initially increase up to a certain point, followed by a gradual decrease. However the number of addicted gamers increases with time. This situation will be a serious problem of online game companies and society.

Table 1: Policy Comparison

	Base model: do nothing	Policy 1: self regulation of game company	Policy 2: tax and rebate policy
Adoption of fatigue system	X	O	O
Tax and rebate	X	X	O

To reduce the negative image of the online game industry and revitalize the industry, we suggest two ideas which are interconnected. First, the game industry adopts a fatigue system to reduce addicted gamers voluntarily. This will positively affect the game industry after all. Second, to produce an effective outcome from the fatigue system, the government should adopt a tax policy known as the Pigovian tax which was suggested by Pigou [Varian 1992]. The tax and rebate policy will be one of the most effective

methods by which the Korean government can urge game companies to adopt the fatigue system. At first, the government imposes the tax on online game companies and then the Korean government rebates taxes only if game companies adopt the fatigue system. The remaining money after rebates will be used for building addiction treatment centers.

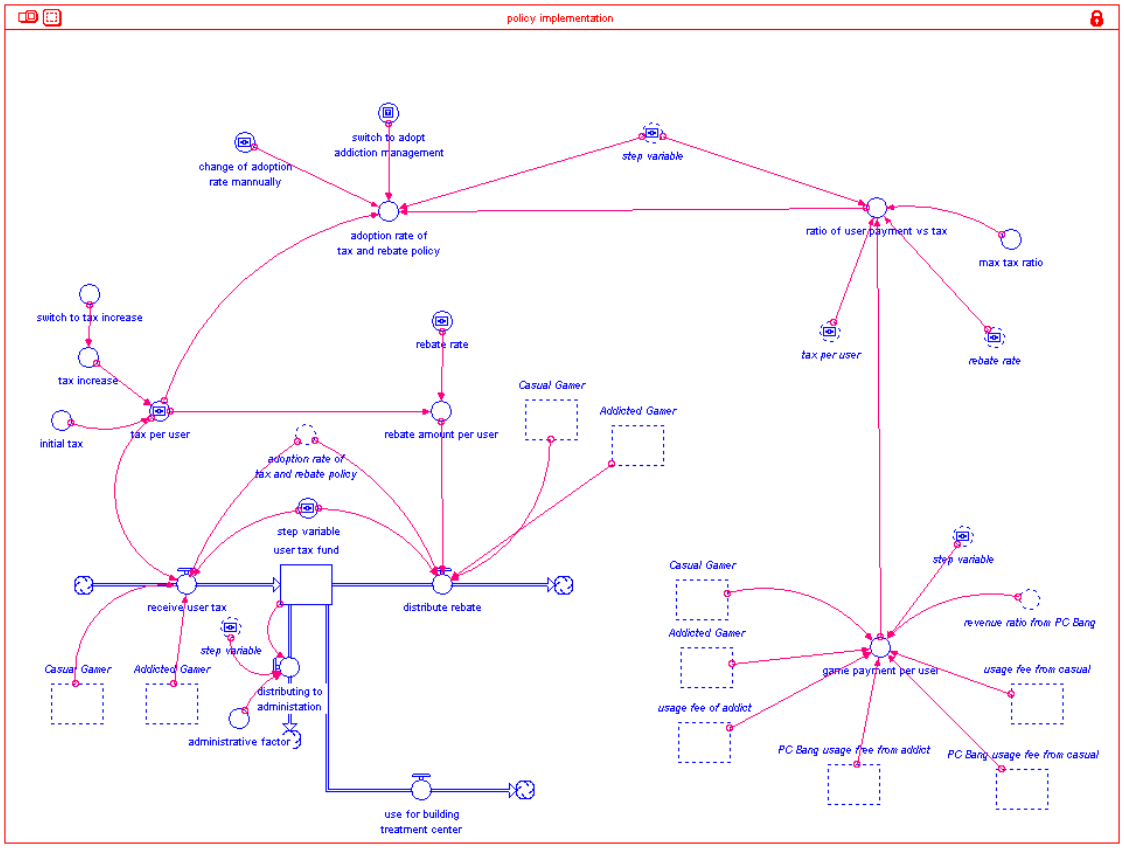


Figure 12: Tax and Rebate Policy Section

Based on this idea, we add a self regulation policy, which game companies adopting fatigue system do voluntarily (policy 1) and tax and rebate policy (policy 2) to the base model. To incorporate a tax and rebate policy, the current government policy section in the base model is revised.

It is assumed that one treatment center needs $50,000 per month to operate and the tax and rebate policy starts in Jan. 2009 (72th month). In self regulation policy, it is assumed that 20% of game companies adopt fatigue system voluntarily. In tax and rebate policy, it is also assumed that the tax per user is $1 and the rebate rate is 70%.

Table 2: Policy Implementation Results at 240th Month

	Base Model	Policy 1: self regulation of game company	Policy 2: tax and rebate policy
Potential Gamer (Unit: 000)	5,301	4,439	4,133
Casual Gamer (Unit: 000)	14,047	15,088	15,461
Addicted Gamer (Unit: 000)	1,860	1,687	1,620
Total revenue of Online Game Industry (Unit: 000)	$959,313	$976,168	$1,011,806
Social Image of Online Game	-1.0	-1.0	-0.9
Adoption Rate of Fatigue System	0%	20%	16%
Number of Addiction Treatment Centers	5	5	33

Table 2 shows the results after applying the policy to the base model. In policy 1, the total revenue of the online game industry increases and society has a more positive social image of online games than the base model. In policy 2, whereas the total revenue of the online game industry and the number of casual gamers are bigger than others, the number of addicted gamers decreases, and the social image of the game increases. Therefore, policy 2 is preferable to policy 1. As a result, we strongly suggest the Korea government to apply the tax and rebate policy as soon as possible to reduce game related problems.

4.2.1. Sensitivity analysis of policy 1

Change of adoption rate of fatigue system

To analyze the effect of the adoption rate of the fatigue system, we change the adoption rate from 0.2 to 0.5. As shown in Table 3, if more companies adopt the fatigue system, the social image of on-line games gets better with a concomitant increase of total revenue of the industry. However, an adoption rate of 0.4 produces the highest value of revenues when compared to other rates. That is possibly because the increased adoption rate decrease the growth rate of usage fee of gamers.

Table 3: Sensitivity Analysis of Adoption Rate of Fatigue System

	Adoption rate=0.2 (policy 1)	Adoption rate = 0.4	Adoption rate = 0.6	Adoption rate=0.8
Potential Gamer (Unit: 000)	4,439	3,773	3,350	3,059
Casual Gamer (Unit: 000)	15,088	15,887	16,414	16,737
Addicted Gamer (Unit: 000)	1,687	1,556	1,455	1,373
Total revenue of Online Game Industry (Unit: 000)	$976,168	$991,883	$983,547	$965,848
Social Image of Online Game	-1.0	-0.78	-0.63	-0.51
Adoption Rate of Fatigue System	20%	40%	60%	80%

4.2.2. Sensitivity analysis of policy 2

Change of tax

To analyze the effect of the tax rate, the tax rate from $1 to $3 is changed. It is assumed that the maximum tax is 5% of the average online gamers' expenditure.

Table 4: Sensitivity Analysis of Tax

	Tax=$1 (policy 2)	Tax = $2	Tax = $3
Potential Gamer (Unit: 000)	4,133	3,319	2,789
Casual Gamer (Unit: 000)	15,461	16,477	17,154
Addicted Gamer (Unit: 000)	1,620	1,422	1,277
Total revenue of Online Game Industry (Unit: 000)	$1,011,806	$1,039,682	$998,618
Social Image of Online Game	-0.9	-0.59	-0.39
Adoption Rate of Fatigue System	16%	33%	53%
Number of Addiction Treatment Center	33	70	70

From Table 4, we can find that the higher rate of tax improves social images of online

games, compared to the lower rate of tax. However, the heavy initial tax leads to a decline in total revenues of the on-line game industry.

Change of rebate rate

The rebate rate from 0.6 to 0.8 is changed to find the effect of the rebate rate. If the government provides a higher rate of rebate to companies, the adoption rate of the fatigue system is increased as shown in Table 5. Intriguingly, the total revenues decrease with a higher rate of rebate. It is likely that when the government provides lower rates of rebate, game companies think that the low rates of rebate don't affect their profit. Therefore, the need to adopt the fatigue system would go away.

Table 5: Sensitivity Analysis of Rebate Rate

	Rebate rate = 0.6	Rebate rate = 0.7 (policy 2)	Rebate rate =0.8
Potential Gamer (Unit: 000)	4,237	4,133	4,058
Casual Gamer (Unit: 000)	15,345	15,461	15,541
Addicted Gamer (Unit: 000)	1,632	1,620	1,616
Total revenue of Online Game Industry (Unit: 000)	$1,011,844	$1,011,806	$1,007,232
Social Image of Online Game	-0.92	-0.9	-0.88
Adoption Rate of Fatigue System	14%	16%	18%
Number of Addiction Treatment Center	38	33	25

Tax increase per specific year

In policy 2, to find the effect of tax increase after a specific year, the tax is increased by $1 from every 3 year to every 6 year. Frequent tax increase generates improved social images, decreased total revenue, compared to the infrequent tax increase. Infrequent tax increase decreases adoption rate of fatigue system. Government should consider these tradeoffs to increase tax per specific year.

Table 6: Sensitivity Analysis of Tax Increase after a Specific Year

	Per 3 years	Per 6 years	No change (policy 2)
Potential Gamer (Unit: 000)	3,416	3,879	4,133
Casual Gamer (Unit: 000)	16,444	15,824	15,461
Addicted Gamer (Unit: 000)	1,357	1,511	1,620
Total revenue of Online Game Industry (Unit: 000)	$958,313	$999,721	$1,011,806
Social Image of Online Game	-0.52	-0.74	-0.9
Adoption Rate of Fatigue System	100%	49%	16%
Number of Addiction Treatment Center	60	55	33

4.3. Discussion

In this paper, two policies - self regulation of game companies and a tax and rebate policy for the online game industry are compared.

Self regulation of game companies, through voluntarily regulation of online game content, is effective in reducing negative images of online gaming and increasing the total revenue of online game industry. When the government imposes taxes on online game companies and rebates the money, the total revenue of the online game industry more increases and the negative image of online games more decrease than self regulation. From this analysis, the tax and rebate policy is a better solution to reduce game addiction problems than the self regulation of game companies.

The government should consider the following points when implementing the tax and rebate policy; the more tax government imposes, the more people have a positive social image of online games. The more rebate the government provides, the more game companies adopt the fatigue system. Even though the government may apply a tax and rebate policy to online games, if there aren’t enough addiction treatment centers, the effect of a tax and rebate policy to solve the social problems will be limited.

Therefore, when the government applies a tax and rebate policy, at first, the government should impose a high tax and then rebate a high portion of the received tax. The remaining tax should be used for building enough addiction treatment centers for addicted gamers to access easily.

5. Conclusions

In South Korea, we can see a lot of online game addicts as well as many PC Bangs and online game players. In this situation, the Korean government has taken some action such as entrance restrictions of PC Bangs after 10 PM and a rating system of online game titles to reduce the problem of game addiction. However, these actions have proven ineffective. To address this problem, we used system dynamics approach to find the relationship among the interested parties of the online game industry and the impact of game addiction on the game industry and Korean society in general.

Using the system dynamics approach, it was shown that the number of casual gamers increases until the 137^{th} month if the current situation of the online game industry continues. After the 137^{th} month, the number of casual gamers decreases. Because the image of online games becomes worse, the positive word-of-mouth effect decreases, and potential gamer don't transform themselves into casual gamers and even casual gamers go back to potential gamers. Second, the number of addicted gamers increases. However, the growth rate of the number of addicted gamers decreases because of the bad image of online games and the decreased number of casual gamers. Third, the total revenue of online games initially increases up to a certain point because casual gamers and addicted gamers increase. However, the total revenue of online games decreases because the number of casual gamers decreases and the image of online games becomes bad. Fourth, as the number of addicted gamers increases, the social image of online games becomes worse.

After evaluating the current situation of the online game industry, a self regulation of the game industry and a tax and rebate policy is suggested and compared with the base model. From this analysis, we find that the tax and rebate policy is a better solution to reduce game addiction problems than the self regulation policy.

Therefore, to reduce problems caused by online game addiction without compromising growth of game industry, the government would want to implement a tax and rebate policy and build a sufficient number of game addiction treatment centers for addicts to have an easy access.

References

Arquitt Steve, Xu Honggang and Ron Johnstone. “A system dynamics analysis of boom and bust in the shrimp aquaculture industry”, *System Dynamics Review* 21(2005): 305 – 324

Anderson, Craig A. and Brad J. Bushman. “Effects of Violent Video Games on Aggressive Behavior, Aggressive Cognition, Aggressive Affect, Physiological Arousal, and Prosocial Behavior: A Meta-Analytic Review of the Scientific Literature”, Psychological Science 12(2001):353-59

BBC News. “Virtual worlds are 'worth $1bn'”, March 20, 2007, http://news.bbc.co.uk/1/hi/technology/6470433.stm.

Brandt, Michelle L. “Video games activate reward regions of brain in men more than women, Stanford study finds”, Stanford School of Medicine, http://med.stanford.edu/news_releases/2008/february/videobrain.html.

Brightman, J. “Study: Video Games Can Promote Sociability”, GameDaily, August 17, 2006, http://www.gamedaily.com/articles/features/study-video-games-can-promote-sociability/69323/?biz=1.

Cavana Robert Y. and Leslie V. Clifford. “Demonstrating the utility of system dynamics for public policy analysis in New Zealand: the case of exercise tax policy on tobacco”, *System Dynamics Review* 22(2006): 321 – 348

Chiou, Wen-Bin and Chin-ShengWan. “A Further Investigation on the Motives of Online Games Addiction”(paper presented at the National Educational Computing Conference, San Diego, U.S.A, July 5–7, 2006).

comScore, Inc. “Worldwide Online Gaming Community Reaches 217 Million People”, July 10, 2007, http://www.comscore.com/press/release.asp?press=1521.

Faiola, Anthony. “When Escape Seems Just a Mouse-Click Away”, Washington Post, May 27, 2006, A section, http://www.washingtonpost.com/wp-dyn/content/article/2006/05/26/ AR2006052601960.html.

Ford A. “Simulating the controllability of feebates”, System Dynamics Review 11(1995): 3–29.

Heeter, Carrie. “Why Play (VR) Games?”, March 1994, http://commtechlab.msu.edu/publications/files/whyplay.html.

Homer, J. B. “A System Dynamics Model of National Cocaine Prevalence”, System Dynamics Review 9(1993):49-78.

Jang, Jong. H. “National Game Population - 19,840,000”, JoongAng Ilbo, April 01, 2007, http://article.joins.com/article/article.asp?total_id=2680335 (in Korean).

Kajia, Deng. “Online gamers mostly students, study finds, ShanghaiDaily, December 7, 2007, http://www.shanghaidaily.com/sp/article/2007/200712/20071207/article_340860.htm.

McInnes, C. J. “Study: Online Games Make You More, Not Less, Social”, Game Politics, October 19, 2006, http://gamepolitics.livejournal.com/343408.html.

Miller II, Stanley A. “Death of a Game Addict”, Journal Sentinel, March 31, 2002. http://www.jsonline.com/story/index.aspx?id=31536.

Ng, Brian D. and Peter Wiemer-Hastings. “Addiction to the Internet and Online Gaming”, Cyberpyschology & Behavior 8(2005):110-113.

Korea Game Industry Agency, “Korea Game White Paper 2007”, 2007

O'connor, A. “The Claim: Violent Video Games Make Young People Aggressive”, New York Times, August 30, 2005, Health section, http://www.nytimes.com/2005/08/30/health/psychology/30real.html?_r=1&adxnnl=1&oref=slogin&adxnnlx=1197637768-e1OTJdC2nfcOkIjeIxsLpg.

Potkewitz, H. “Chinese Parents Blame Video Game Maker for Deadly Plunge of Teen”, Los Angeles Business Journal, December 5, 2005. http://findarticles.com/p/articles/mi_m5072/is_49_27/ai_n15969016.

Roberts, N., David Anderson, Ralph Deal, Michael Garet and William Shaffer. Introduction to Computer Simulation: A System Dynamics Modeling Approach, 1983, Addison-Wesley.

Salguero, Ricardo A. Tejeiro and Rosa M. Bersabe Moran, “Measuring problem video game playing in adolescents”, Addiction 97(2002):1601-1606.

Selnow, G. W. “Playing Videogames: The Electronic Friend”, Journal of Communication 34(1984): 148-156

Sieberg, Daniel. “Video Game Addiction: A Medical Disorder?”, June 22, 2007, CBS News, http://www.cbsnews.com/stories/2007/06/21/health/main2965003.shtml.

Sterman, J.D. Business Dynamics: Systems Thinking and Modeling for a Complex World, McGraw Hill, 2000

Subrahmanyam, K., Kraut, R. E. Greenfield, P. M., and Gross, E. F. “The Impact of Home Computer Use on Children’s Activities and Development”, The Future of Children: Children and Computer Technology 10(2000): 123-144

Sung, MyungJae. “History and future of cigarette tax system”, The Tax Times, March 03 2008, http://www.taxtimes.co.kr/hous01.htm?r_id=112405 (in Korean).

The Naeil Daily, “Opening of Internet Addiction Treatment in Seoul”, http://news.naver.com/main/read.nhn?mode=LSD&mid=sec&sid1=102&oid=086&aid=0000064289 (in Korean).

The Korea Economic Daily, “Children 68%, Worry about Aftereffect of Online Game”, May 04 2007, http://www.hankyung.com/news/app/newsview.php?aid=2007050428897 (in Korean).

Varian, Hal R. *Microeconomic Analysis*, Norton & Company, 1992.

Woodcock, B. S. “An Analysis of MMOG Subscription Growth Version 22.0”, MMOGCHART.COM, February 12, 2008, http://www.mmogchart.com/Chart1.html.

Wu, Jiming and De Liu. “The Effects of Trust and Enjoyment on Intention to Play Online Games”, Journal of Electronic Commerce Research 8(2007):128-140

Yee, N. “Motivations for Play in Online Games”, CyberPsychology & Behavior 9(2006): 772-775

Young, K. S. “Internet Addiction: The Emergence of a New Clinical Disorder”, Cyberpsychology & Behavior 1(1996): 237-244.