Using an Agent Based Model to Measure Industry Regulations: A Case of Online Games in Korea

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Abstract

As the online game industry in Korea exceeds $10 billion, social concerns of the industry in terms of policies and regulation areas are increasing. Specifically an enforcement ordinance activated by Korean government in the year of 2014 is told to result in reduced activities in the industry. However, quantitative approaches have been limited to understanding the post effectiveness of regulations. The lack of prior simulation efforts to game industry regulations yields to misunderstanding on optimal level for ruling out side effects. In this study, we suggest the application of agent based model or ABM as a smart service to measure industry policy effects. We review cases applying ABM in various domains with considering the possibility of using ABM in understanding the effectiveness of web board game regulations. We find that the ABM approach would be useful in areas such as analysis of regulatory effects that reflect a variety of characteristics and measurement of micro-regulatory effects and simulation of regulations. Considering the usefulness of ABM comprehensively, we proposes new directions including establishing a proactive measurement procedure of regulatory effectiveness and procedural a data-based quantitative analysis.

Keywords: Industry Regulation, Smart Service, Agent based model, Simulation study

Introduction

The total market size of the online game industry in Korea is over 10 trillion won. Web board games have the largest share of online game sales based on its familiarity and simplicity. Usual web board game looks after a traditional card game that is easy to learn, based on cultural homogeneity in Korean society. Moreover, this gamble like games aim to earn more monetary points, which means a game company can sell digital items naturally.

Meanwhile, it should be noted that Korean web broad games have been continuously shrinking since 2008 when the government tightened regulations. Korean government has been strengthening regulations to online game services for years to protect young users from excessive spending and health problems. Currently, there are various online game regulations are acted by the Korea Media Rating Board and the Ministry of Culture, Sports and Tourism, and the Ministry. In particular, the Enforcement Decree of the Game Act, which was enforced by the Ministry of Culture, Sports and Tourism since February 2014, did not allow one user to purchase more than 300,000 won of game money on a monthly basis, and the cap of game money per game is limited to 30,000 won. In addition, a user should be banned if she or he lost money over 100,000 won in a day. The user cannot access any web board game for 24 hours. This situation shows that the game industry has become the main target of industrial policy and regulation.

On the other hand, scientific research to determine the content of proper regulations is lacking compared to their needs. Since various game industry regulations had been added, the sales and users of web board games significantly decreased. In contrast to government regulations having a large impact on the web board game industry, there are very limited cases of quantitative analysis of regulatory effectiveness. It should be noted that even that effort has been focused on a post-regulatory analysis method. The reality is that there is a lack of effectiveness analysis on regulatory and regulatory changes in web board games, which is likely to confuse policy direction for regulatory and regulatory changes.

In this study, as an alternative to analyzing the regulatory effectiveness of existing online games, we tried to examine the agent-based model or ABM. In particular, this study highlights future challenges and direction of research to measure the effectiveness of regulatory changes using new forms of a quantitative simulation method. This paper is organized as follows. First, we review the evolution of the actor-based model and organized the main concepts. Second, we examine the use of an actor-based model and finally considered whether an actor-based model could be applied to an online game regulatory effectiveness analysis by issue of regulatory effectiveness measurement.

Agent Based Model

ABM has been used in many fields of learning, as computing power develops. ABM has grown with the development of economic theory, computer computational speed, and image implementation technology.

ABM in the Early Stage

In the early computer age, von Neumann presented the cellular automatic data model, which was one of early attempts to apply ABM in research. Cellular automata models were initially used in biology, physics, and geography, but since then, they have been combined with methods to implement micro and dynamic characteristics, which have also been used in social science. Afterwards, efforts to analyze changes in individual factors in the model and identify changes in the system as a whole became more sophisticated as the performance of computers improved.

From a methodological perspective, Axelrod (1997) called ABM the third method of evaluation, which is different from the logic system of conventional social science, the inductive and deductive. ABM was typically used as a means of proving the decoupling model in social science (Schelling, 1971) and in the field of natural science, computer engineer Reynolds also worked on ABM to understand how a herd of animals migrated by reproducing behaviors with using Biods, the program in 1986. Since the late 1990s, rapid advances in computing technology and computing capabilities have allowed ABM to implement models that significantly improve the level of real-life reflection, enabling it to use the basis of social science and natural sciences as well as engineering tools to spread across a variety of scientific fields.

Features

ABM is a model to analyze macro-level results caused by micro-level changes, which aims specifically to building a model in a top-down manner, such as identifying the characteristics of an agent and defining the interaction between an actor and an environment. This may lead to detailed observations of the actors and the environment in which the model is targeted, or the analysis of data, or the process of calculating theoretical assumptions and their rationality.

ABM is different from conventional social science studies, such as logically weighing the assumptions contained in the repair model or verifying the validity of the assumptions with real data. It can also be seen that researchers are relatively free to construct bottom-up models and overcome some of the limitations of the analytical models of traditional economic approaches by increasing data access through big data and computing-based studies. It should be noted that ABM was developed based on several social and natural sciences theories to account for the aspects of changes occurring within the system, taking into account interactions between multiple actors. As the ABM name suggests, the modeling technique focuses on relationships between actors and actors. The economic approach, which is used as a representative quantitative analysis technique in the field of social science, requires mathematical analysis based on relevant data to understand socioeconomic phenomena. Nevertheless, they face limitations that do not adequately predict economic changes and changes that occur in practice. These limitations are built around conventional, historical data, resulting from structural problems of post-existing analysis, which lack the predictability and explanation of problems that have never been experienced. In other words, ABM has a relatively high degree of freedom in the analysis of economic rules and the interaction between actors, and external environments.

Actor

The actor refers to a microeconomic entity that is mainly classified into a household, a company or a government. ABM allows a variety of actors to be defined, as each economic entity can be considered as a group or be further divided into sub-categories. In terms of actual programming, variables and functions are not considered as actors. Generally, it would be appropriate to understand only objects capable of self-control and autonomous interaction are identified as actors. In this paper, the actor is regarded as an autonomous decision maker who wants to maximize economic utilities by learning from the environment and other actors in the context of web board game.

Behavior Rules

Behavior rules are expected to probabilistic or conclusive as they determine an actor's behavior. In an ABM simulation, we assumes that an actor has a set of action rules explicitly known. In addition, the actual behavior that occurs according to the rules is regarded as either deterministic or conclusively determined. In addition, the question of which action rules will be applied may be entirely arbitrary, may be the result of interactions with other actors, or may be the result of interactions with the environment. When building a model for analyzing the regulatory effectiveness of online games, action rules are implemented through the operator's decision-making system and can be given different rules of conduct for each given scenario, taking into account the high complexity of environmental issues.

Integrations

Interactions at ABM can be defined as interactions as final outcomes that have undergone learning and adaptation processes, an intermediate outcome characteristic that is influenced by acts and feedbacks made directly and indirectly between actors. Direct interactions result in the outcome of an action performed according to each defined action rule affecting the decision-making system of another actor, leading to arbitrary behavior. Indirect interaction refers to the effect of an actor's actions that causes a change in the external environment surrounding another actor, and again, a change in the behavior of another actor. This kind of interaction is represented by a iterative simulation structure within an agent based model.

Environment

Environment is defined as the space in which interactions with the actor's arbitrary actions occur in agent based modeling. It could be described as a realistic space in terms of an actor making decisions in a given external environment or a conceptual space built within an analysis program. Environment is also depicted by obstacles or resources affecting actors' decision-making or inactive elements which are restricting actors' behavior.

Researchers have expressed or overlooked the construction of an external environment too simple for the purposes and technical limitations of the study (Gilbert, 2008). Because it is not easy to identify all the complex external factors, it has been accepted to simply describe the environment around factors that have a significant impact on the agent. However, it is true that the environmental composition based on researchers' assumptions can be arbitrary, and there is a danger of underestimating the reality. It appears that prior activities are necessary to try and validate the environment as accurately as possible based on the analysis of the actual cases.

Model

ABM should be built on a clear design basis on how to develop with key elements such as actors, behavioral rules, interactions, and environments. Compared to conventional economic analysis methods, ABM has the flexibility to construct models for analysis purposes, thus providing a relatively free representation of the actual social structure. In addition, the size and direction of complex interactions can also be arbitrarily constructed, so results can be seen from a variety of perspectives (Bonabeau, 2002). Another characteristic of ABM is that it is possible to achieve inventive results by identifying the effects of new interactions. In order to fully explain the unexpected analysis results, a model design according to the structural analysis procedure is required. Unless sufficient theoretical grounds or empirical clues are supported preceded by constructing a model, interpretation of the results can be difficult or mundane, which limits implications. Although the structure and form of the actor-based model vary depending on the purpose and subject of the analysis, it generally follows the procedures illustrated in Figure 1.

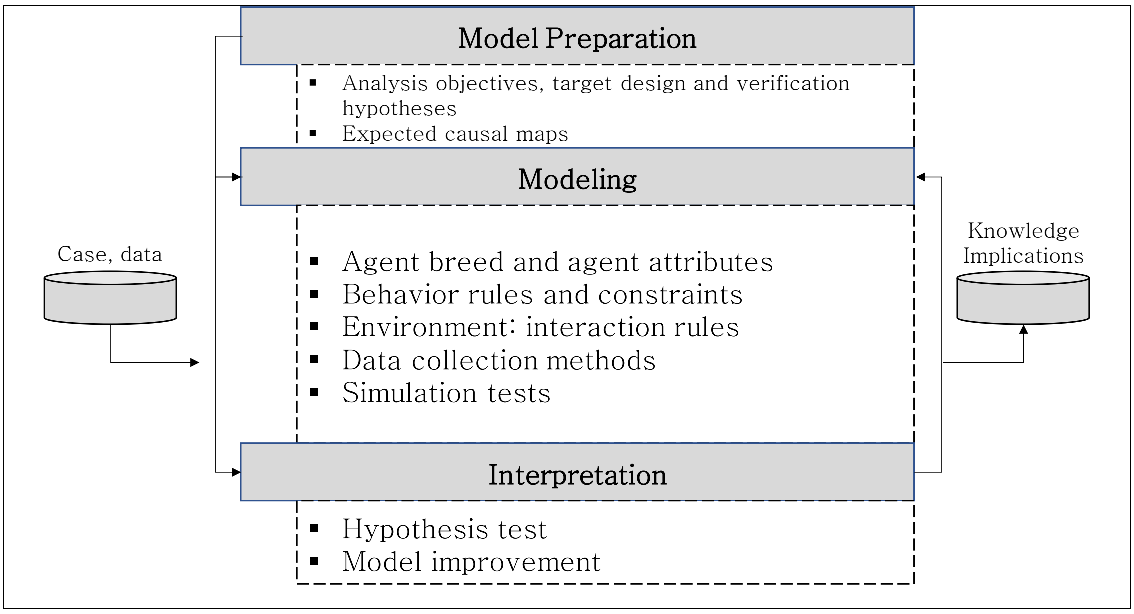

Figure 1. A Design of an ABM Model

ABM could be applied to conducting a study for theoretical exploration that explores the results by hypothetical models, or exploring a quasi-empirical event based on theoretical hypothesis with empirical descriptions, or developing a empirical-predictive machine for reasoning a real world consequences based on a sophisticated simulator. Using ABM for theoretical exploration can support real data that supports mathematical reasoning about what logical and theoretical issues will be revealed in the real world by simulation. If ABM is used for the purpose of observing quasi-experimental events, it can be used to validate policies with the benefit of determining the actor's behavioral assumptions at a realistic level based on existing data and then viewing the results of various variable scenarios. Also, ABM for empirical-predictive machines can be useful in understanding changes in future situations, requiring sophisticated design and accurate parameter inputs compared to ABM for theoretical exploration or near-realism observation purposes. Overall, ABM provides a realistic and appropriate solution to problems that would be realistically expensive and time-consuming.

The transport sector is one of the areas in which modelling-based studies are actively conducted in establishing relevant public policies. In particular, it is suitable for simulation analysis using ABM in areas where there are many interactions among various actors to developing urban spatial plans, improving public transportation system, redesigning traffic mitigation, and analyzing effects of new roads. In other words, studies in the transportation sector are mainly targeting the analysis of traffic flows and the interaction between mobility methods, taking into account the unique characteristics associated with movement of pedestrians and vehicles.

While the study of pedestrians in the transportation sector lacked research efforts in comparison to that of other means of transport, the enhancement of computer simulation has changed the situation. A study that applies ABM to vehicles and public transport sectors will reflect the technical characteristics of each vehicle method and the interactions that reflect external environments such as traffic regulations and geographical environments within the model. Based on ABM, Schindler (2013) analyzed that the introduction of an unmanned vehicle would improve the stability of all traffic. As such, although the utilization of ABM is still high in the field of walking and transportation, it is expected to increase in usability with the development of the GIS (Geographic Information Systems) and the traffic big data analysis method.

Although studies of infectious diseases and species differ in their approaches based on role and biology respectively, they share the common concepts like the eaten- and the eater relationship. These similarities enable development of mathematical algorithms underlying each other to be derived. On the other hand, the use of ABM is steadily increasing to simulate the diffusion model and observe the results. In general, the spread of infectious diseases is suitable for ABM as it has nonlinear characteristics and requires consideration of various environmental variables. It is also considered that interaction between actors has a significant effect on epidemics. Recently, ABM is also applied to research on human diseases (Carpenter and Sattenspiel, 2009).

Various studies have been conducted considering the unreasonable choices of foreign economic players. It should be also noted that the need for research on interactional effects between economic players increases. In particular, an existing economic approach may not be appropriate if external shocks from the market, such as financial and real estate markets, tend to amplify within the market system, causing unexpected results. In fact, the sub-prime mortgage crisis in the United States in 2007 led to a global economic crisis as problems in the U.S. real estate market spread to the financial markets. However, not only the U.S. government but also economists were not predicting the process and the outcome exactly and timely.

Since the sub-prime mortgage crisis, there has been a lively discussion of the limitations of analysis through existing economic approaches and increased demand for alternative methods of analysis. A study by Poggio et al. (2001) looking at the availability of ABM for financial markets attempted to compare results from real-world experimenters and simulation results from hypothetical actors in financial markets. The results of the experiments carried out in accordance with the six experimental scenarios were reproducible through, which suggested the possibility of viewing problems through ABM that would be difficult to identify through actual experiments. It also proposed the possibility of a combination of experiment participants in real and modelled actors in a simulation. For example, Brock, Hommes and Wagener (2009) used ABM with the results that Hedging, an investment technique supporting stable investment, can disrupt market stability by inducing excessive investment.

There are many studies using ABM in the real estate market. The real estate market is the field that various characteristics relating to urban features are studied, where city spatial theories have been developed. In this situation, ABM provides insight into spatial characteristics by modeling decision makers and citizens' choices and behavior in compression. Geankoplos et al. (2011) analyzed that individual real estate investors tend to use an investment approach that increases leverage based on past investment experience as well as optimistic expectations for rising housing prices. Brown and Robinson (2006) conducted a study of changes in the behavior of urban reckless development due to changes in the criteria for choosing real estate for housing. They modelled preference behavior by type of actor derived from actual Detroit area studies to increase the precision of analysis. Based on this, a simulation analysis was conducted under random conditions. In addition, virtual space was constructed to identify changes in urban development patterns according to the actor's preference, which provided useful insights to policy makers. In financial and real estate markets, individual or group decision-making behaviors can ultimately affect the market. In those research fields, ABM will be used more along with existing analysis methods due to high level of interaction between actors during decision-making process.

ABM Application in Online Game Industry

Analysis of government regulatory effectiveness is essential in the online game industry, as government regulation has a profound effect on the industry as a whole. In this chapter, we outlines the possibility of online game regulatory effectiveness analysis using ABM with a pilot case and presents additional challenges in implementing a framework that realizes this regulatory effectiveness analysis.

Empirical studies on Korean web board games are fairly limited, and a modeling effort with a simulation is rare. Existing studies may be grouped into skepticism, separatism, regulation-based approach and macro effects analysis. First, the skeptic view is that online gaming users may show pathological symptoms due to obsessive Internet access and anonymity (Griffiths, 1999). Second, from a separatist perspective, a rather abstract argument that the Internet is dangerous needs to be verified. For example, a study by tracking 18 months of actual user data shows mixed results of adaptive and pathological users (La Plante et al., 2008). Third, a regulatory-based approach views that it should be weighed to determine whether which is more appropriate among institutional control, or self-imposed control (Gainsbury et al., 2015). Fourth, the macro-regulatory effect analysis approach takes the total volume-based time series analysis (Yoo and Jeon, 2015; Jang et al., 2016).

Model Design

Libraries designed to design ABM vary, with examples such as NetLogo, Cougar, or Repast, and independent programs depending on the nature of the study. This pilot study designs ABM using MESA, an ABM library based on Python. The high compatibility with this Python-based data processing library provides the advantages of a more flexible simulation design as it facilitates the extraction and utilization of data needed for analysis and enables intuitive programming. We designed agent behavior to show random patterns over time. RandomActivation, a name of class in Mesa, is prepared to implement this process well. Data generated from the simulations is also collected by the DataCollector, Mesa' class as shown in Figure 2. Mesa seems to be appropriate to model social science phenomena in that the architecture is simpler and intuitive than other competitors.

```
from mesa.visualization.ModularVisualization import ModularServer
from mesa.visualization.modules import CanvasGrid, ChartModule, TextElement
from mesa.visualization.TextVisualization import (
    TextData, TextGrid, TextVisualization
)

from model import SchellingModel


class SchellingTextVisualization(TextVisualization):
    '''
    ASCII visualization for schelling model
    '''

    def __init__(self, model):
        '''
        Create new Schelling ASCII visualization.
        '''
        self.model = model

        grid_viz = TextGrid(self.model.grid, self.ascii_agent)
        happy_viz = TextData(self.model, 'happy')
        self.elements = [grid_viz, happy_viz]

          ⋮            ⋮            ⋮            ⋮
```

Figure 2. Using MESA, a Python Framework for ABM (e.g., Schelling Model)

All data inputs or outputs from the simulation model were processed using Microsoft's Excel worksheet. We utilized Pandas, a data manipulation library for Python, to exchange data between Excel and Mesa. We obtained random numbers needed for simulations using Numpy's random number generator. Like statistical programming languages such as R, Python is desirable for data science studies because it has the necessary tools to use data frames by Numpy and Pandas. The Matplotlib package was also used to visually verify the results and we designed classes with assuming multi-core environments.

Parameters

It is crucial to determine the value of attributes for actors and environments using an ABM. The values should be adequate to reflect reality. We conducted a survey to determine values based on data from actual users. The results of parameter settings that reflect data about game users are summarized in Table 1.

Table 1. A Sample Table

Parameter	Explanation
Marketing_effect	Proabability of attracting users to a game
Payment_customer	Ratio of paid users

Gold_threshold	A minimum required payment (cyber credit) for participating in a game round
Money_gold_conversion_rate	A money exchange rate between cash and cyber credit
First_lockdown_rule	A regulation for monthly payment ceiling
Second_lockdown_rule	A regulation for daily payment ceiling
Game_prob	A chance for entering a game room as usual
Game_likeness	A personal propensity to a game
Gold_join	An inintial free game credits by joining
Refresh_month	A monthly renewed game credits
Refresh_month_discount_lower	A refreshment discount monthly (minimum)
Refresh_month_discount_higher	A refreshment discount monthly (maximum)
Addiction_judge	Overindulgence threshold
Max_game_affordable	A maximum amount of disposable income for games
Escape_effort	A chance to quit a game forever
Addiction_effect_min	A chance of overindulgence (minimum)
Addiction_effect_max	A chance of overindulgence (maximum)
Addiction_cure_min	A chance of recovering from overindulgence (minimum)
Addiction_cure_max	A chance of recovering from overindulgence (maximum)
Max_batting	A maximum batting amount per game
Lockdown_policy	A regulation for 24 hour grounding
Strategy	If true, a user can exchange money with cyber credit through illegal channels
Cheating_propensity	A personal propensity to relying on illegal channels (i.e., cheating)
Cheating_propensity_personal_difference_max	An average of differences between users to Cheating_propensity (maximum)
Cheating_learning	A chance of imitating others' behavior to cheating

In the web board game context, we did not assume any behavior patterns as default settings. That is, each actor is in a completely random state at the beginning of the simulation. RandomActivation provides the appropriate ability to describe such situations. The results of user's actions were constantly recorded based on the point at which each simulation moments (also known as Tick) were completed. In our model, user behavior was implemented as a GameModel object, and the actions taken by each actor were registered and managed in a schedule object.

For simulation purposes, the behavior of game users is assumed to be determined daily and the number of games per day is also statistically determined. To be clear, we have focused on overindulgence to playing a web board game and excessive cash expenditure. In addition, it was assumed that environmental changes caused by regulatory policies affected them. From the start of the month, the upper limit on the amount of cash available to game users is reset. The number of times a user can play a game per day is also designed to be determined by the amount of cash spent. The amount of game batting is also set at random; however, the upper limit is restricted as following government policies in reality.

Game users can enter a game waiting room and enjoy the game according to their preference and degree of possession of game money. We have introduced the assumption that once we start playing games, users can play over and over again. However, the maximum number of games is never played indefinitely by reflecting the results of survey. In the game, opponents are completely randomized following by uniform distributions. Therefore, it is not necessary to identify the opponent. This also faithfully reflects the regulatory reality of the game.

We designed more than two players, less than three, to participate in the game. We designed a simulation model simpler by assuming that a winner and other losers were always divided when a game was over. The winner's profits and losses to the losers were zero sum. No additional bonuses were taken through the game.

The state of overindulgence was determined by the number of games played per day on average. The criteria refer to the Korea Creative Content Agency's overindulgence survey in 2017. We posed that the overindulgence state could be improved naturally or by external factors including family care and deterrent actions. There is no tolerance for overindulgence, which means users who have been overindulged once or more times may enter overindulgence state again and again. We did not consider the additional effects of multiple overindulgence in simulations.

Results

Figure 3 shows that monthly overindulgence rates of game users. According to the results, if users continue playing a game that was released on the market more than 70 months, the maximum overindulgence population ratio will be lowered from 8.14 percent to 7.2 percent. Meanwhile, the rate of overindulgence tends to decrease as the time allowed to play games decreases. Overall, indulgence tendency of game player shows an increasing pattern in the early days of game market; however, it has been reduced through inflection point and appears to be entering a stabilization stage quickly. In addition, we can observe that the less time available to plying a game, the lower the risk of overindulgence. In consequence, the most important factor in controlling the rate of overindulgence is how much time for a user consumed in a game.

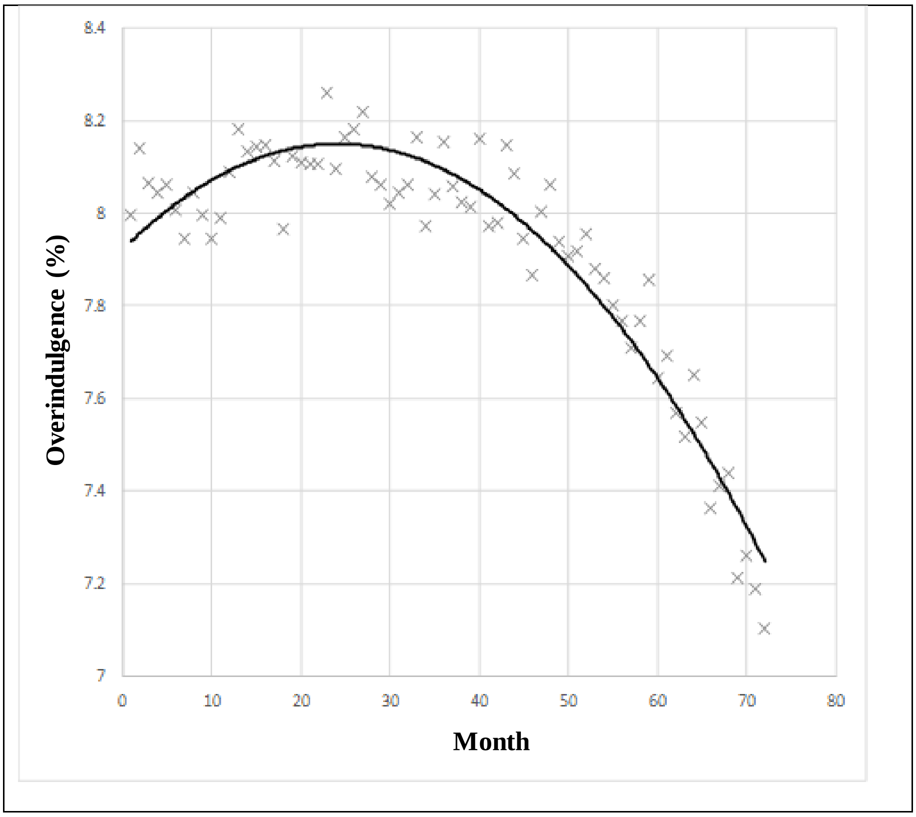

Figure 3. Ratio of Monthly Overindulgence Population in Simulations

Compared to actual data, the results of the ABM simulation are verified. The results of Korea Creative Content Agency's overindulgence survey in 2017 show that most game users have a play time of less than an hour. On the other hand, if users are game users for more than four hours, the ratio of overindulgence or overindulgence will greatly increase to 22.3 percent. The ABM simulator in this study reflects this reality well, which means there is a significant correlation between game time and overindulgence.

Meanwhile, in the early days of the game, the rate of overindulgence steadily increased, and the trajectory path gradually went through an inflection point. It seems that overindulgent users of the game will remain at a high level until sometime. However, if other conditions do not change, the level of overindulgence is greatly reduced at a given time. It is believed that the normal massive multi-user online role playing games, also known as MMORPG, will be able to maintain the high level of initial overindulgence pattern level by refreshing game settings including posing more quests or releasing new items. However, it should be noted that traditional web board games in online are actually very difficult to modify rules since those rules identify the game. A web board game needs to be based on well-formed strategies with a precondition that stable rules are guaranteed over a long period of time. Items can be provided in games, but it does not hurt fun to play only when they are kept to a level that does not undermine fairness. In this regard, the level of overindulgence of online web board games is likely to undergo considerable adjustment since launch. In this sense, we should pay careful attention to measurement timing to the level of overindulgence. When negative evidence of some overindulgence in the early days of the game is found, measuring the level of overindulgence can lead to somewhat exaggerated conclusions. On the other hand, observations are collected too late, damage caused by overindulgence can be underestimated.

What is the background for such a result? Step-by-step tracking on simulation status shows that users' disposal money is associated with the number of game play per day. In reality, most users are free users, and our simulations are based on user surveys as the same. After losing the bonus money for signing in a game, game players reduce the actual playing time by the limit of batting money. If a user wants to play again, he or she has to wait for filling up with a money account for free, which leads to a lower risk of overindulgence. In a real world, a game company provides a free random items to keep users play a game.

So, what would happen if some users had a very large overindulgence propensity? The results of the simulations show that overindulgence may continue for a considerable period of time. As a result, the tendency to overindulge is in control, but the damage over the period is expected to be significant. Figure 4 shows simulation result when the user's involvement in the game is significantly greater (addiction effect = 0.4). The linear trend line shows that the width of the change continues in the direction of reduction (slope = -0.05, R2=44%). The rate of change of overindulgence will change from a minimum of 38.6 percent for three years (36 months) to a maximum of 42.1 percent after six years.

The question we were wondering was: "Will policy efforts help avoid being overindulgence?" The results of the simulations clarify two facts. First, overindulgence depends on the total amount of game money available to game users. This means that controlling disposable income in the game can have a significant impact on the level of overburden.

We set the total amount of monthly disposable, the total amount of daily cash disposable, and the limit of cash we can lose daily in our simulations. The effect of the first condition seems to be cumulative. The user in a game is not able to recover from normal conditions until the next month if she or he lost all, which means game participation is impossible due to the short of disposable money. During this period, users' overindulgence propensity is constantly reduced.

Conclusions

Research on online game regulation using ABM is very insufficient. One of reasons is that the online game industry has not introduced enough to simulation research communities. However, in recent years, game regulation is an issue that can have huge social consequences. On the other hand, it is socially and ethically undesirable to introduce an experimental method to understand the effects of game regulation by sacrificing game users' economic benefits. Nevertheless, efforts are needed to quantitatively measure and understand the effect of regulation, as regulation should not even hinder the growth of the game industry while creating conditions that are socially desirable.

ABM helps researchers design models based real world assumptions and data to analyze risky and costly problems. By assuming different scenarios and conducting analyses repeatedly with low cost, researchers timely understand the essential structure behind the phenomenon. In this study, we have introduced how ABM, which has been used in various research areas, can be applied to analysis cases of online game regulatory effectiveness. This study is the first research case in which the micro-effects of regulation are analyzed by a simulation method.

The simulator in this study requires constant improvements. First of all, the data in reality should be more reflected in order to introduce a dynamic model, which is more suitable for understanding the effects of regulation in time varying situations. In addition, tracking how overindulgence propensity changes longitudinally can help adjust the agent and environment variables in the simulation to be more realistic.

The results of our simulations firstly show that game users have not maintained a certain level of overindulgence. In other words, different conclusions on the performance of regulations can be made depending on when measuring the effectiveness of regulations. Korean game regulator authorities have not publicly commented on the agreed methods for measuring regulatory effectiveness. Similarly, game developers have never released data to the public for scientific evidence against overindulgence. Efforts to overcome this situation and secure a more scientific and rational basis can be compatible with keeping the game industry and the public health.

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