

Research Article

Redesigning and Implementing the Public Game Information and Rating System in South Korea

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Rating reviews in the game industry aim to enhance the protection of young users, promote game ethics, and prevent negative use of it as a gambling but recent studies and public opinions have reported that the current rating system in South Korea is excessively regulative. To address this issue, this study was conducted to redesign the public game rating system on the Game Ratings and Administration Committee (GRAC) for the public data usage based on the comparison with other better structured media rating systems. The redesigned system utilized a parsing technique to easily access specific data or items, and a Jsoup library was utilized in the Java environment. The system consists of a URL collection module, connection module, detailed collection module, and storage module. If a user requests information from a game rating database through the proposed system, the requested information is arranged sequentially and provided to the user in XML and JSON forms. The designed and implemented collection data were comparatively inclusive and structural to satisfy the public for the better and easier public data usage. This study is expected to help build an environment where game users can obtain information both easily and correctly, and it will eventually lead to a better understanding of the current game industry in South Korea and its clear way to go.

1. Introduction

The statistical data on a white paper published by the Korea Creative Content Agency in 2019 indicated that the South Korean digital game industry has shown a gradual growth since 2009 as depicted in Figure 1 [1]. Just when people's interest in games has increased and the game industry accomplishes good results at home and abroad, the regulatory review procedures, however, impeding the growth of the game industry in South Korea. According to Article 21 of the Game Industry Promotion Act, those who intends to create or distribute a new digital game shall go through the game classification system and receive a rating from the Committee [2]. Rating reviews aim to enhance the protection of young users, promote game ethics, and prevent negative use of it as gambling but recent studies and public opinions have reported that rating reviews are excessively regulative [3–5].

The Game Ratings and Administration Committee (GRAC) was launched in response to the controversy over whether the game “The Sea Story” was a gamble or not in 2006 as gambling is an illegal act in South Korea [6]. Since then, the GRAC builds the rating system to inform the users of the nature of the game. However, it is a complicated process to go through the rating system and it is more difficult to receive a pass. In addition, the GRAC suddenly charges high fees for the review process.

In 2019, the GRAC forced more regulations for indie games, test version games, and flash games that were published through the Internet. They have forced legal orders, thus, game developers have to go through the rating system before they publish the new game title to the game platforms including the zuzunza.com [7]. In addition, voluntary ratings were implemented to relieve regulation of the reviews. However, as shown in Table 1, the monitoring group for voluntary rating is composed of persons who have

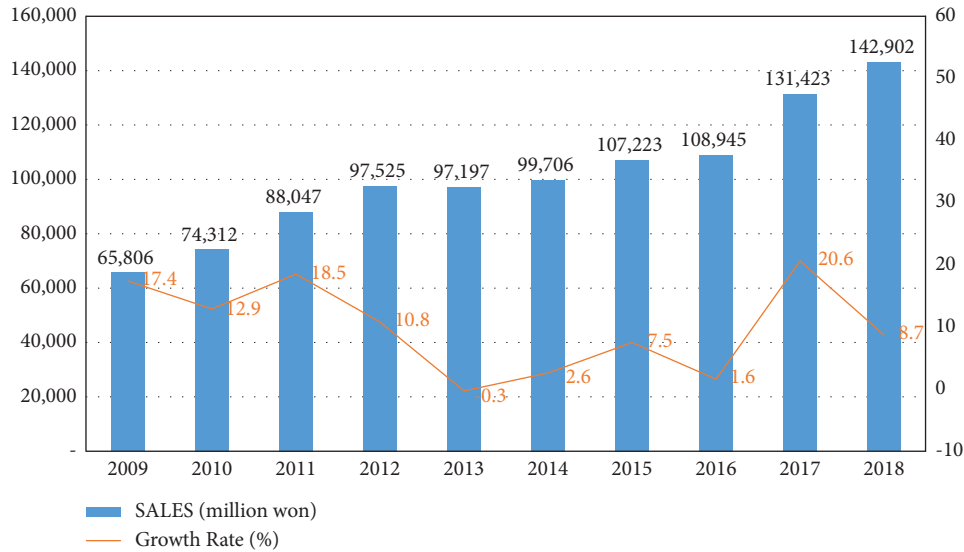


FIGURE 1: Overall size and growth rate of the Korean game market (2009~2018).

TABLE 1: Controversy over South Korea’s game monitoring group and qualification requirements in 2019.

Conditions of qualification requirement
(i) Disabled person/career discontinued women
(ii) Smartphone owners available in mobile open market
(iii) People who can participate in monthly offline meetings (required)
(iv) Document authoring person
(v) The four major uninsured persons

a poor understanding of digital games including job-discontinued women and disabled people which led to controversy on the lack of fairness and professionalism on the rating system [8–10]. This can result in the stoppage of a game service caused by wrong judgments from the non-professional groups and it makes a critical issue for the growing game industry [11]. Also, public data aims at “improving the quality of life and national economy by promoting people’s use of data owned and managed by a public institution” [12] and the GRAC belongs to a public institution and its game rating service is included in the public data.

Amid this controversy, this study was conducted to analyse and redesign the game rating system and its public data provided by the GRAC. This study is expected to help build an environment where game users can obtain information on the digital games both easily and correctly, which will eventually lead to a better understanding of the current game industry in South Korea and its clear way to go.

2. Literature Review

In other countries, research on the validity of game rating from a user’s perspective has been continuously conducted as well as on the role of parents in rating their children’s right to the use of games [13–16]. In South Korea, most studies related to rating classifications are conducted from

sociological and legal perspectives but the studies from an engineering perspective are insufficient to verify the validity of the rating review system [17–20]. Thus, this study was conducted to analyse both types and contents of game classification and the ways in which the data is delivered to the public through the GRAC website from an engineering perspective.

First, the GRAC provides information on games in a form of open API (application programming interface) based on the public data policy as shown in Table 2. The list of contents is the variables and description of information that can be received through the GRAC API [21].

The game review data are very limited because they simply enumerate the results of game ratings as shown in Figure 2 and Table 3. The information regarding the game content and the reasons for which the game has received the given rating is insufficient. On the other hand, an open API shown in Table 4 depicts a movie rating provided by the Korea Media Rating Board (KMRB) that includes the results of ratings as well as additional information on the movie such as synopsis and lead role\ and provides reasons for the ratings [22]. Public data that allow people to check information in more detail can be used to satisfy the people’s rights to know and can be used for application service aiming at providing information on movies.

This comparison clearly indicates that the GRAC rating system needs to provide more information just like an open API that provides a movie rating system. People can check information and reviews on games by browsing through their titles and rating number on the rating decision check page found on the GRAC website.

3. Research Methodology

The entire process in which this study designed and implemented a system is shown in Figure 3. In order to improve the game and rating system on the GRAC’s website, firstly this study drew the wider range of items that users can

TABLE 2: GRAC open API—list of game API output variables.

Request variables	Contents
Result	No special meaning as root element of search results
Tcount	Number of search results
res_date	Date and time of search results generation
Pageno	Search page number
Item	Game individual search results root element
Gametitle	Game name
Orgname	Rating organization
Entname	Applicant (company) name
Hoperate	Application rating (all, 12+, 15+, 18+)
Givenrate	Decision rating (all, 12+, 15+, 18+, reject(scheduled), reject, cancellation (scheduled), cancellation)
Rateno	Rating classification number
Rateddate	Rating classification date

```

<result>
  <tcount>4</tcount>
  <pageno>1</pageno>
  <res_date>2021-02-24 오후 3:36:46</res_date>
  <item>
    <gametitle>V4 [PC]</gametitle>
    <orgname>GRAC</orgname>
    <entname>Nexon Korea</entname>
    <hoperate>18+</hoperate>
    <givenrate>18+</givenrate>
    <rateno>CC-NP-191204-009</rateno>
    <rateddate>2019-12-04</rateddate>
  </item>
  <item>
    <gametitle>V4</gametitle>
    <orgname>GRAC</orgname>
    <entname>Nexon Korea</entname>
    <hoperate>18+</hoperate>
    <givenrate>18+</givenrate>
    <rateno>CC-0M-190918-002</rateno>
    <rateddate>2019-09-18</rateddate>
  </item>

```

FIGURE 2: GRAC Open API—game API output result.

TABLE 3: GRAC contents of providing public data (game API).

Items	Sample data
Game name	V4 (PC)
Rating organization	GRAC
Applicant name	Nexon Korea
Application rating	18+
Decision rating	18+
Rating classification number	CC-NP-191204-00
Rating classification date	2019-12-04

tap on the website for their search. For this, this study made a comparison with the well-designed website from the Korea Media Rating Board (KMRB). A database where the data collection and classification are performed is built to provide users with extended public data for game rating.

4. Analysis of the Rating System and Interface by the Game Ratings and Administration Committee

The GRAC provides game rating data which are distributed through its website. People can check the information on games on the page of “a decision on rating” that allows users

to understand the reason why the decision on rating of games was made as shown in Figure 4 [23]. The website also provides the links that moves to pages related to games and rating reviews that include “detailed information on games,” “a written decision,” “rating history,” and “present condition of the acquisition of overseas grade.”

The “detailed information on games” page allows users to check the detailed information on games that have requested a rating review as shown in Figure 5. Users can move to the relevant pages through the hyperlink on the game titles displayed on the “check for a decision on rating.” Users can check each item that includes the basic information on games such as “genre” and “nationality.” Users can also check for the basic information on ratings, for example, the “date of rating” and the “rating number.” According to the items on the relevant pages, the summary of the description and sample data can be obtained as shown in Table 5.

The “a written decision on game rating” page allows users to check a decision on rating of games that have requested rating reviews as shown in Figure 6. The content of a decision on games that requested rating includes the reason for the rating, a description of the game in one sentence, and the information on game contents. In the item of “indication of content information,” sensationality, violence, fear, unsuitability of languages, drugs, crime, and speculation are indicated based on the standard for consideration of ratings in the relevant studies.

Users can collect data on the page of “a written decision on games.” The summary of descriptions and sample data according to the items on the relevant pages can be obtained as shown in Table 6.

In order to improve the GRAC’s rating and information system, the game information items were derived based on “detailed information on games” page and the “a written decision on game rating” page that the GRAC website provides to the public as shown in Table 7.

5. Results

5.1. Extending on Game and Rating Information Items. After making a comparison with KMRB, this study drew the items that are needed to be improved from the page of

TABLE 4: Korean media rating board open API—media rating list API output result.

Items	Sample data
Director	Jang Joon Hwan
Director nationality	Korea
Decision rating	15+
Leading role	Kim Yoon-Seok, Ha Jung-Woo, Yoo Hae-jin, Kim Tae-Ri, Park Hee-Soon, and Lee Hee-Jun
Movie species	A film drama
Original title	1987
Production year	2017
Producer	Friendship film Co., Ltd.
Country of production	Korea
Screening time	130 minutes 0 seconds
Standard	DCP
Title	1987
Reasons for core harm	Violence
Topic	15+
Sexuality	All
Violence	15+
Fear	15+
Drugs	15+
Lang	12+
Imitative risk	15+
Plot	A film about the 1987 torture death of the late Park Jong-Chul and the death of Lee Han-Yeol’s tear gas
Rating classification number	2017-MF02149
Rating classification date	20171211

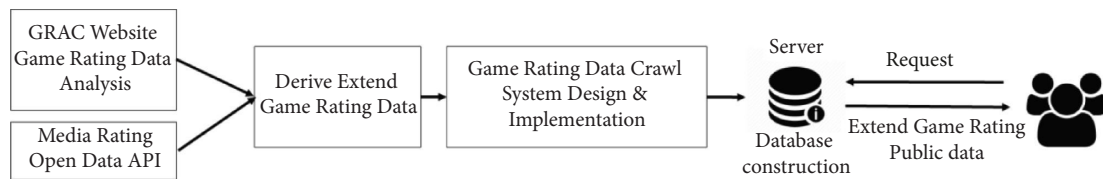


FIGURE 3: An entire process to build the Public Data Expansion Model.

Game title	applicant	Classification Date	rank	Classification number	cancel	Decision date	manual	Agency	decision Contents	rank Record	Overseas rank
V4 (V4)_[PC]	Nexon Korea Co., Lt d.	2019-12-04		CC-NP-191204-009		2019-12-04					
V4 (V4)	Nexon Korea Co., Lt d.	2019-09-18		CC-OM-190918-002		2019-09-18					

FIGURE 4: Checking for a decision on the rating page (Google Translate Web).

“detailed information on games” and “a written decision on game rating” as shown in Table 8. The relevant items can be extracted from the GRAC database that contains the information on games and can be collected from the GRAC’s website. This redesigned and extended data base can allow users to check the information on game rating reviews more clearly and prepare a foundation that can be used in analysing and visualizing big data as shown in Table 8.

5.2. *Designing and Implementing the Public Data Collection System.* Then, this study designed and implemented a system that collects game rating data to provide users. The

collection system was built based on the working environment as shown in Table 9. A parsing technique was used to easily access specific data or items and a Jsoup library was utilized in the Java environment. Jsoup is a library that enables users to easily find or extract data that they go by using a DOM search or a CSS selector. It can also implement the collection process by accessing a web page with a simple code. Jsoup allows users to make the analysis and access both effective and ineffective tags provided in a tree structure approach [24].

The system was designed to collect rating data from GRAC’s homepage as shown in Figure 7. The system consists of a URL collection module, connection module, detailed

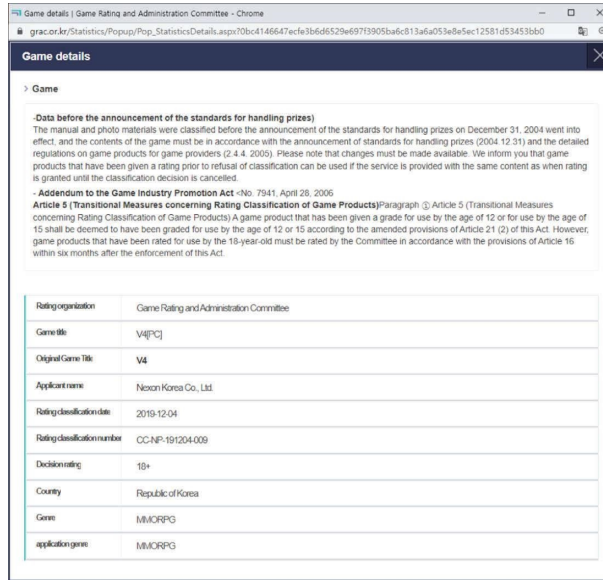


FIGURE 5: Game details (Google Translate Web).

TABLE 5: Game details item description.

Items	Sample data
Rating organization	GRAC
Game title	V4 (PC)
Original game title	V4
Applicant name	Nexon Korea
Rating classification date	2019-12-04
Rating classification number	CC-NP-191204-009
Decision rating	18+
Country	Korea
Genre	MMORPG
Application genre	MMORPG

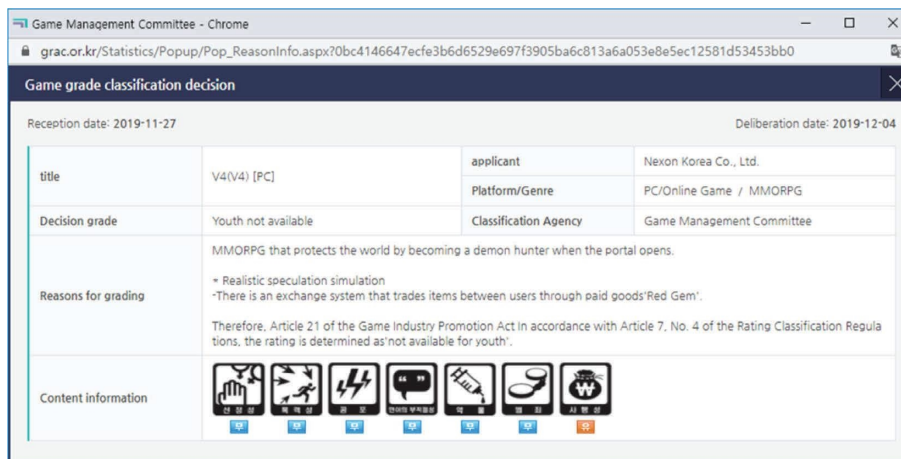


FIGURE 6: Game rating on page of a written decision on games page (Google Translate Web).

collection module, and storage module. The scheduler controlled the requests and modules.

The system collected detailed page URLs of each game and then verified whether the data exists in the relevant URLs. Then, the detailed page URL of each game was

accessed to collect the rating data and store them in the database to build the data for game rating. Then, the system determined the state on whether data were stored normally by a scheduler, the time when the collection was done, and the time when storage was completed. Table 10 shows the

TABLE 6: Game rating on page of a written decision on games item description.

Items	Sample data
Game title	V4 (PC)
Applicant name	Nexon Korea
Platform/genre	PC/OnlineGame/MMORPG
Decision rating	18+
Rating organization	GRAC
Reasons for rating	When the portal opened, MMORPG became a demon hunter and protected the world. *Copying realistic gambling practices (i) Exchange system exists to trade items between users through paid goods 'Red Gem' (skip)
Content descriptors (sexuality, violence, fear, language, drugs, crime, and gambling)	YES: gambling NO: sexuality, violence, fear, language, drugs, and crime

TABLE 7: Derived items based on the pages provided the GRAC website.

Related pages	Page items	Derived items	Classification
Detailed information on games page	Game title	Game title	Game information
	Country	Country	
	Applicant name	Applicant name	
	Genre	Genre	Rating decision information
	Original title	Original title	
	Decision rating	Decision rating	
	Rating organization	Rating organization	
Rating classification date	Rating classification date		
Rating number	Rating number		
A written decision on the game rating	Platform/genre	Platform/genre	Game information
	Reasons for rating	Reasons for rating	
	Content descriptors	Key reasons for harm rating Sexuality, violence, fear, drugs, language, and gambling	

TABLE 8: Game rating classification information, public data extension item description, and sample data.

Items	Sample data
Game title	V4 (PC)
Country	Korea
Decision rating	18+
Hoperate	18+
Rating organization	GRAC
Applicant name	Nexon Korea
Genre	MMORPG
Platform	PC/OnlineGame
Reasons for rating	*Copying realistic gambling practices (Exchange system exists to trade items between users through paid goods 'Red Gem')
Sexuality	NO
Violence	NO
Fear	NO
Drug	NO
Language	NO
Crime	NO
Gambling	YES
Game content description	When the portal opened, MMORPG became a demon hunter, and protected the world.
Rating classification number	CC-NP-191204-009
Rating classification date	2019-12-04

TABLE 9: Data collection system environment.

Items	Contents
Base language	JAVA
Development environment (program)	Eclipse
Development environment (OS)	Windows 10 64bit
Development equipment	I7-7700K 4.20 GHz, RAM 16GB
Using library	Jsoup

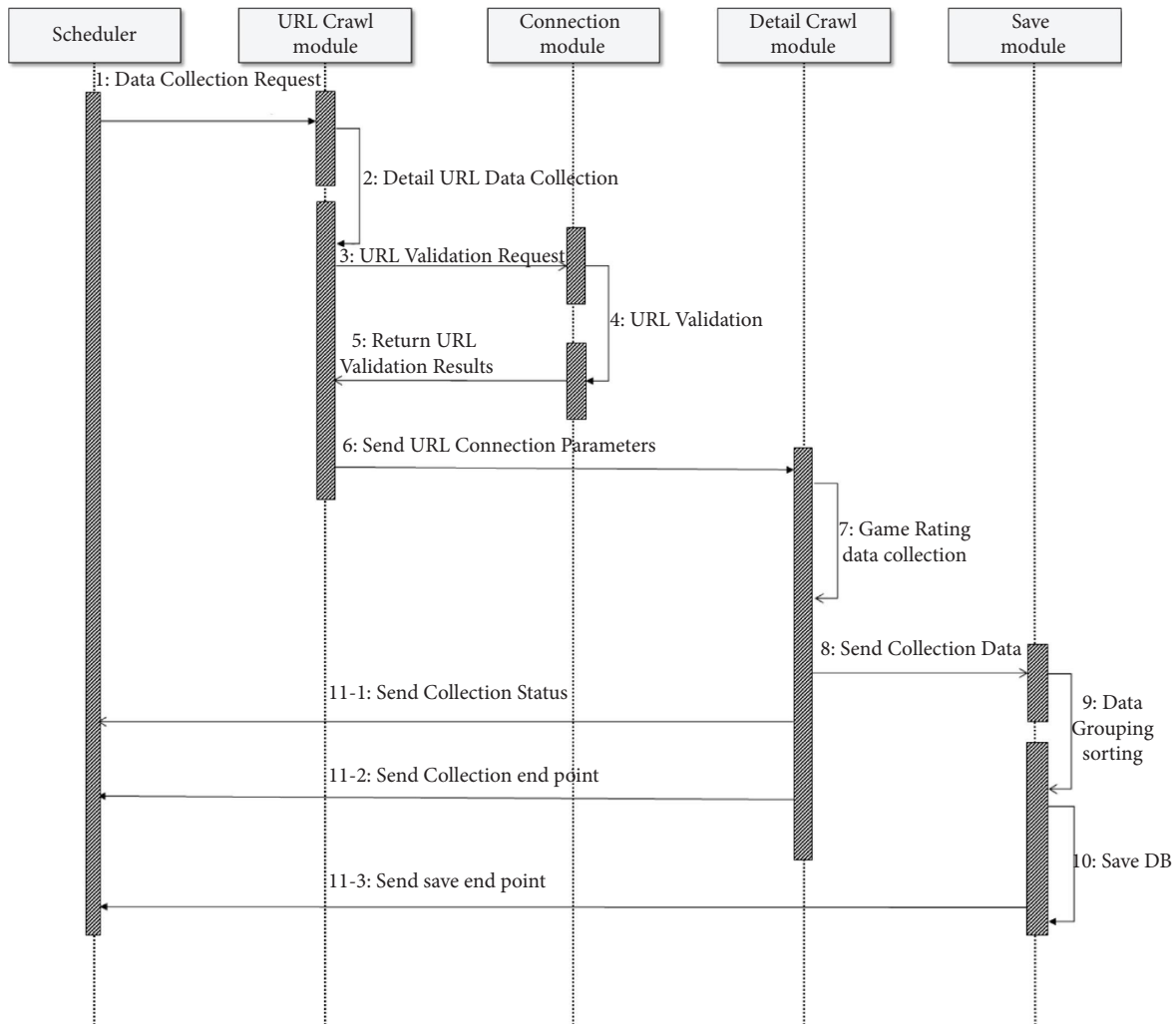


FIGURE 7: Classification data acquisition system sequence diagram.

TABLE 10: Data collection history.

Items	Volumes
Data range collected	1988.01.01 ~ 2020.05.10
Registered games	80,180
Game details page	80,180 (contains pages where only URLs exist)
Classification decision page	29,963

results of data collection through the system. The collected data for game rating amounted to a total of 80,180 from May 12, 2020 to May 15, 2020 as shown in Table 10.

If a user requests information from a game rating database built through the proposed collection system, a preindexed dataset delivers the user’s requested data. The

```

<result>
  <tcoun>1</tcoun>
  <res_date>17:19 2021-2-26</res_date>
  <item>
    <gametitle>V4 [PC]</gametitle>
    <national>Korea</national>
    <givenrate>18+</givenrate>
    <hoperate>18+</hoperate>
    <orgname>GRAC</orgname>
    <entname>Nexon Korea</entname>
    <genre>MMORPG</genre>
    <platform>PC/OnlineGame</platform>
    <coreHarmRsn>* Copying realistic gambling practices - Exchange system exists to trade items between users through paid goods 'Red Gem')</coreHarmRsn>
    <Harm_list>
      <sexuality>NO</sexuality>
      <violence>NO</violence>
      <fear>NO</fear>
      <drugs>NO</drugs>
      <lang>NO</lang>
      <gambling>YES</gambling>
    </Harm_list>
    <game_Continfo>When the portal opened, MMORPG became a demon hunter and protected the world.
    </game_Continfo>
    <rateno>CC-NP-191204-009</rateno>
    <rateddate>2019-12-04</rateddate>
  </item>
</result>

```

(a)

```

result
  tcoun : "1"
  res_date : "17:19 2021-2-26"
  item
    gametitle : "V4 [PC]"
    national : "Korea"
    givenrate : "18+"
    hoperate : "18+"
    orgname : "GRAC"
    entname : "Nexon Korea"
    genre : "MMORPG"
    platform : "PC/OnlineGame"
    coreHarmRsn : "Copying realistic gambling practices- Exchange system exists to trade items between users through paid goods 'Red Gem'"
    Harm_list
      sexuality : "NO"
      violence : "NO"
      fear : "NO"
      drugs : "NO"
      lang : "NO"
      gambling : "YES"
    game_Continfo : "When the portal opened, MMORPG became a demon hunter and protected the world."
    rateno : "CC-NP-191204-009"
    rateddate : "2019-12-04"

```

(b)

FIGURE 8: Classification extended public data output results (ENG): (a) XML; (b) JSON.

requested data are arranged sequentially based on their IDs and provided to the users in XML and JSON forms as shown in Figure 8.

In order to prove the utilization of the extended result data through the redesigned system in this paper, a comparison was made with other rating systems of movies. First, the preexisting GRAC rating system presents fragmentary items such as the game name, the decided rate, and the rating institution. On the other hand, the proposed extended data shows detailed information on the game's genre, platform, descriptions, and the reasons for the review, sensationality, and violence as shown in Table 11. Thus, the extended data can be used as the basis for analysing the ratings. Second, it can be seen that the proposed game rating system is comparatively inclusive and structural enough to satisfy the

public for the better and easier public data usage as shown in Table 12.

6. Discussion

After analysing the current system of the GRAC, the information provided to the public are very limited compared to other media rating system such as movies. Thus, this study first drew the items to be added for better understanding and fair rating system, and secondly designed a data collection system tailoring to the extended public classification data. The designed and implemented collection system successfully built the expanded public data provision foundation and was comparatively inclusive and structural to satisfy the public for the better and easier public data usage.

TABLE 11: Data collection history.

Variable names	Existing API result data	Extended result data
Gametitle	V4 (PC)	V4 (PC)
National	-	Korea
Givenrate	18+	18+
Hoperate	18+	18+
Orgname	GRAC	GRAC
Entname	Nexon Korea	Nexon Korea
Platform		PC/OnlineGame
Genre	—	MMORPG
coreHarmRsn	—	*Copying realistic gambling practices - Exchange system exists to trade items between users through paid goods 'Red Gem')
Sexuality	—	NO
Violence	—	NO
Fear	—	NO
Drugs	—	NO
Lang	—	NO
Crime	—	NO
Gambling	—	YES
game_Continfo	—	When the portal opened, MMORPG became a demon hunter and protected the world.
Rateno	CC-NP-191204-009	CC-NP-191204-009
Rateddate	2019-12-04	2019-12-04

TABLE 12: Comparisons among the rating system of movies, video, and (proposed) digital games.

Categories	Movies	Videos	Digital games
Information	Director	Director	—
	Director’s nationality	Director’s nationality	Country
	Main actor/actress	Main actor/actress	Applicant name
	Genre	Medium	Genre
	Original title	Original title	Original title
	Production year	Production year	—
	Producer	Producer	—
	Production country	Production country	Country
	Running time	Running time	—
	Size	Size	Platform
Title(translated title)	Title(translated title)	Game title	
Plot	Plot	Game description	
Rating information	Decision rating	Decision rating	Decision rating
	—	Desired rating	Desired rating
	—	-	Rating organization
	Rating number	Rating number	Rating number
	Rating classification date	Rating classification date	Rating classification date
	Key reasons for harm rating	Key reasons for harm rating	Key reasons for harm rating
	Topic	Topic	—
	Sexuality	Sexuality	Sexuality
	Violence	Violence	Violence
	Fear	Fear	Fear
Drugs	Drugs	Drugs	
Language	Language	Language	
Copycat risk	Copycat risk	Gambling	

7. Conclusion

As the game industry and its users are rapidly expanding in South Korea, the public needs to check and gain the information about the games are also increasing. Unlike rating agencies in other countries that are comprised of private institutions, the GRAC in South Korea serves as a public

institution [25]. Korean public institutions have a legal obligation to disclose the data that they held so the rating system needs to be thoroughly examined to strengthen fairness and the public’s right to know [26]. To properly perform this obligation, the entity must provide specific classification information including the research results, rather than just formal disclosure [27]. Thus, this paper was

conducted to redesign the game rating system that the GRAC currently provides to make it a proper and fair rating system.

Further studies on expanding to big data analysis methods such as clustering and factor analysis will be conducted to predict the time of deliberation of games. Recently, research such as performance analysis of ML models for game grade prediction has been conducted [28]. This study will be the basis for expanding research to artificial intelligence or machine learning for game grade classification. In addition, the advanced big data analysis will be considered by utilizing ICT technologies such as machine learning and artificial intelligence.

Data Availability

The data used to support the findings of this study are available from the corresponding author upon request.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

Authors' Contributions

Conceptualization was done by K.-H.S.; data analysis was done by K.-H.S.; data curation was done by K.-H.S.; original draft preparation was done by K.-H.S. and K.-J.Y.; review and editing was done by K.-J.Y. All authors have read and agreed to the published version of the manuscript.

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