

Analysis of the Role of Individuals and Governments in Post-COVID-19 Health Issues: The Case of Korea

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Abstract

SUMMARY: This study was conducted in order to ascertain what role government and individuals should play in the event of a pandemic such as Coronavirus occurring in Korea in the future, using information deriving from news articles available at the Bigkinds news portal site in Korea. The analysis period ran from 11 March 2020, when the pandemic was declared by the World Health Organization, to 31 January 2023, almost three years later. Text mining analysis was conducted on all the articles, as a result of which six important roles that individuals should play, and ten roles that government should play, in a pandemic situation were suggested.

Keywords: pandemic, text mining analysis, role of individuals and government.

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1. Introduction

On 11 March 2020, the director-general of the World Health Organization (WHO) declared COVID-19 a pandemic. Since then, the damage caused by Coronavirus and its variant, Omicron, has been enormous. Even in Korea, as of 31 January 2023 the number of confirmed cases had reached 30 million, involving around 60 per cent of the population of 50 million, and deaths had numbered around 30,000 (<https://ncov.kdca.go.kr/>). Such a pandemic is highly likely to recur in the future, and so government and individuals should each make ready a 'preparedness posture' for such a situation (Ah, 2020). Against this background, this study intends to review the role of individuals and of government in countering a situation such as the Coronavirus pandemic should it occur in the future, focusing in particular on articles appearing in the media. The analytical method used in this study is text mining analysis such as is used in big data analysis, more

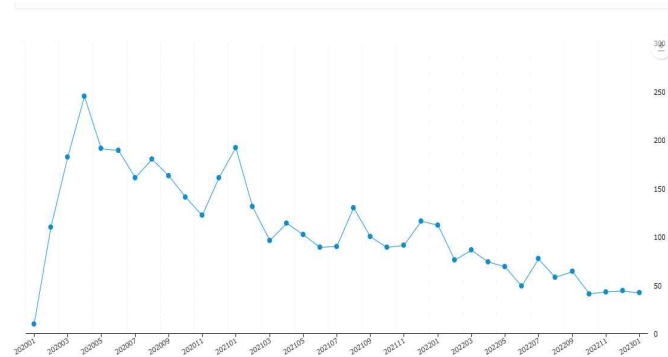
specifically, topic modelling analysis, pathfinder network analysis and cluster analysis.

2. Theoretical Review

The Coronavirus pandemic has had a huge impact worldwide, and Korean society is no exception. At the national level, as a result of the lack of preparedness for infectious disease disasters, it may be said that among both individuals and governments the response to COVID-19 has been at a standstill (Rebecca Liao and Ziyang Fan;Reinsdorf, 2020; Song and Kim, 2020). Local authorities that promoted clean areas have thrown some hospital patients into confusion. The cause of this problem is the lack of professionalism on the part of government. This Coronavirus pandemic has exposed serious problems in terms of the role both government and of individual citizens. Figure 1 presents Coronavirus-related articles appearing in the Korean media by month from January

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2020 to January 2023. It shows that the number of these exploded in March 2020 and then decreased over the years.



Source: extracted from Bigkinds portal

(<https://www.bigkinds.or.kr/>).

Figure 1. Number of articles in the Korean media relating to COVID-19 (1 January 2020–31 January 2023)

This chaotic situation may not have been limited to Korea. It is no exaggeration to say that almost all countries are in a state of panic, as this is an unprecedented situation worldwide. In particular, it is important to understand that when a situation like this pandemic occurs, the government should not be blamed, since it alone cannot solve these problems (James et al., 2020; Kang, 2020; Diewert, 2020; Cho, 2020). That is, citizens too must make co-operative and individual efforts at the individual level.

When a pandemic such as Coronavirus causes such great social confusion, one of the tasks academics must perform is to comprehensively review the problems that Korean society has experienced in its aftermath. In particular, it is necessary to take a hard look at the role of the government and of individuals and make efforts to prepare for similar situations in the future (Wang et al., 2020; Kim, 2020; Lee, 2020; Cao et al., 2020). The findings of academic research are important in this, but the contents of newspaper articles and the matters covered in broadcasting are closer to real life. Review of these contents is more meaningful, because the print and broadcast media deal with real people's lives (Hong, 2020; Blundell et al., 2020). However, in Korea, studies such as those involving big data analysis of media articles relating to Coronavirus have rarely been conducted, most studies (Kim, 2020; Lee, 2020; Lee et al., 2020) that have been carried out to date having focused solely on academic theories. Considering this, this study intends to present the roles that both individuals and government have played in a pandemic situation such as COVID-19 by utilizing text mining analysis, which is one of the big data analysis methods that have been widely used recently.

3. Research Design

3.1. Analysis target

The target of this study is articles published in national daily and local newspapers in Korea, along with national and local radio and TV broadcasts. The analysis period covers almost three years, from 1 January 2020 to 31 January 2023, and thus includes 11 March 2020, when WHO first declared a COVID-19 pandemic.

Among newspaper articles and broadcasts occurring during this period, those in which all the five words corona + government + individual + role + future appeared simultaneously in a sentence. A total of 4,093 articles met the above conditions, the total number of words included in them being 12,952. However, as a result of excluding words consisting of one letter, the total number of words included in the analysis was 12,091

3.2. Analysis method

The analysis method used in this study is text mining, recognized as one of the best big data analysis methods (Borgatti, 2013; Liebowitz, 2005; Newman, 2001; Haythornthwaite, 1996; Wasserman, 2009; Woo et al., 2013). The program used is Netminer 4.4. First, newspaper articles containing the five keywords are selected, but word networks containing the Korean words for 'individual' and 'government' are classified and processed separately. The reason for this is that the study aims to put forward the roles of the 'individual' and of 'government' in the COVID-19 situation in the future. As an example, a word network including the word 'individual' is constructed, word cloud analysis is performed first, and then the frequency of occurrence of words is reviewed. Next, topic modelling analysis is performed and twenty topics are extracted. These twenty topics are again subjected to pathfinder analysis to construct the skeleton of the network, and a method of extracting core topics by clustering them again is adopted.

4. Analysis Result

4.1. Analysis of individual roles

4.1.1 Basic analysis

The word cloud analysis results for the words extracted by constructing the ego network for 'individual' are presented in Figure 2.



Figure 2. Word cloud analysis (individual role)

Table 1, meanwhile, presents the words that appeared in order of frequency of occurrence. The word ‘corona’ shows the highest frequency, followed by ‘economy’ and ‘government’.

Table 1. Words appearing (individual role)

		1	2	3	4
		of Speech(Pi	Frequency	Word length	Name Type
1	코로나	Common Noun"	3,314.0	3.0	"."
2	경제	Common Noun"	1,267.0	2.0	"."
3	정부	Common Noun"	1,143.0	2.0	"."
4	대통령	Common Noun"	1,016.0	3.0	"."
5	국민	Common Noun"	915.0	2.0	"."
6	진행	Common Noun"	810.0	2.0	"."
7	확인	Common Noun"	720.0	2.0	"."
8	세계	Common Noun"	667.0	2.0	"."
9	차이	Common Noun"	666.0	2.0	"."
10	실제	Common Noun"	661.0	2.0	"."
11	한국	Proper Noun"	659.0	2.0	phical Name"
12	교수	Common Noun"	621.0	2.0	"."
13	바이러스	Common Noun"	596.0	4.0	"."
14	신종	Common Noun"	486.0	2.0	"."
15	기업	Common Noun"	486.0	2.0	"."
16	위기	Common Noun"	483.0	2.0	"."
17	정책	Common Noun"	461.0	2.0	"."
18	방역	Common Noun"	461.0	2.0	"."
19	서울	Proper Noun"	452.0	2.0	phical Name"
20	확진	Common Noun"	438.0	2.0	"."
21	시장	Common Noun"	437.0	2.0	"."
22	확산	Common Noun"	419.0	2.0	"."
23	개인	Common Noun"	419.0	2.0	"."
24	미국	Proper Noun"	411.0	2.0	phical Name"
25	감염증	Common Noun"	411.0	3.0	"."

4.1.2 Topic analysis

First, in order to derive twenty topics, the Latent Dirichlet Allocation (LDA) technique (Bourdier, 1984; Brandes and Erlebach, 2005; Freeman, 1979), a topic-

modelling derivation technique of the Netminer 4.4 program, was used. The results are shown in Figure 3.

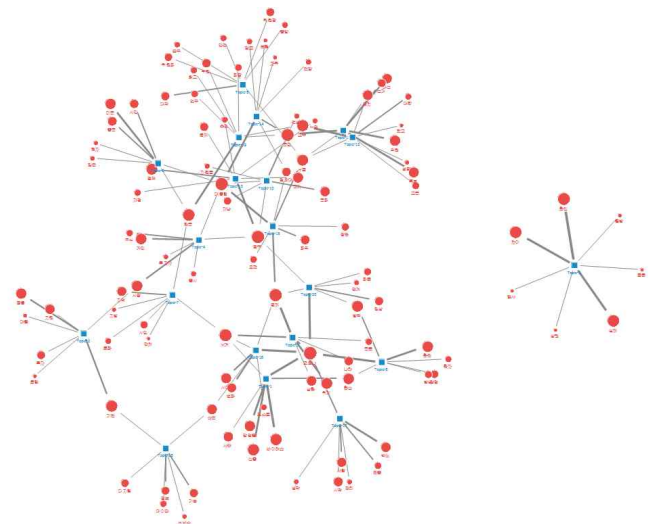


Figure 3. Topics on individual roles

As Figure 3 shows, a total of twenty topics relating to the individual's role in the Coronavirus situation were derived. Seven words are included for each topic. In order to reduce these twenty topics again, ego network analysis was used to reduce them back to the network in a situation where the word ‘individual’ was subtracted. The reason for this is simplicity, since the current network is a network relating to the role of an individual, and so the word ‘person’ has various words and networks. By means of this process, degree-centrality analysis was attempted with a reduced network. Figure 4 shows the result of the degree-centrality analysis in the reduced state.

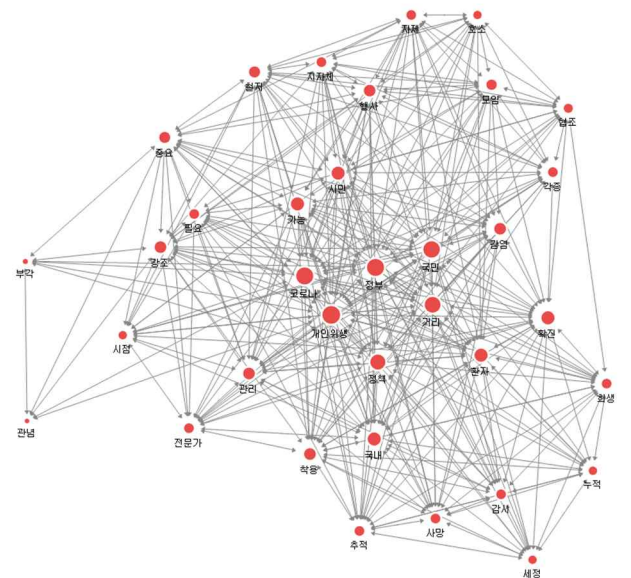


Figure 4. Result of reduced degree centrality analysis

The in-degree and out-degree centrality scores of the words derived from the above analysis are shown in Table 2.

Table 2. Degree centrality scores of words

		1	2
		In-Degree Centrality	Out-Degree Centrality
1	개인위생	0.013799	0.013799
2	확진	0.011242	0.011242
3	모임	0.007900	0.007900
4	정부	0.006355	0.006355
5	세정	0.006139	0.006139
6	철저	0.005209	0.005209
7	자제	0.005080	0.005080
8	관념	0.004902	0.004902
9	코로나	0.004437	0.004437
10	추적	0.004092	0.004092
11	국내	0.003323	0.003323
12	정책	0.003257	0.003257
13	희생	0.003018	0.003018
14	누적	0.002425	0.002425
15	환자	0.002330	0.002330
16	강조	0.002114	0.002114
17	행사	0.001980	0.001980
18	거리	0.001961	0.001961
19	부각	0.001961	0.001961
20	시점	0.001917	0.001917
21	국민	0.001704	0.001704
22	필요	0.001608	0.001608
23	감시	0.001590	0.001590
24	지자체	0.001435	0.001435
25	각종	0.001352	0.001352

Again, through concentric circle analysis, the roles of keywords can be examined. Figure 5 shows the results of concentric circle analysis of the individual's role in the Coronavirus situation.

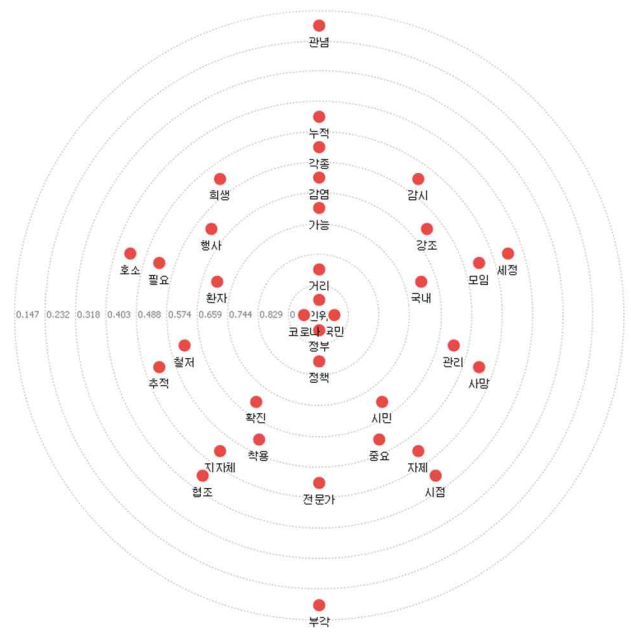


Figure 5. Results of concentric circle analysis
(individual role)

4.1.3 Pathfinder network analysis and clustering analysis

In order to understand individual roles in the Coronavirus situation, which is the aim of this study, in the form of a network, it is necessary to make efforts to ensure that important keywords are exclusively included in one topic without duplication of topics. Of course, in this process, it is necessary to simplify the complex network. For this reason, in this study pathfinder network analysis was performed. This aims at simplification of the network, and, as a method for expressing only the framework of the network, it helps to uncover some concise implications. Figure 6 shows the pathfinder network analysis results.

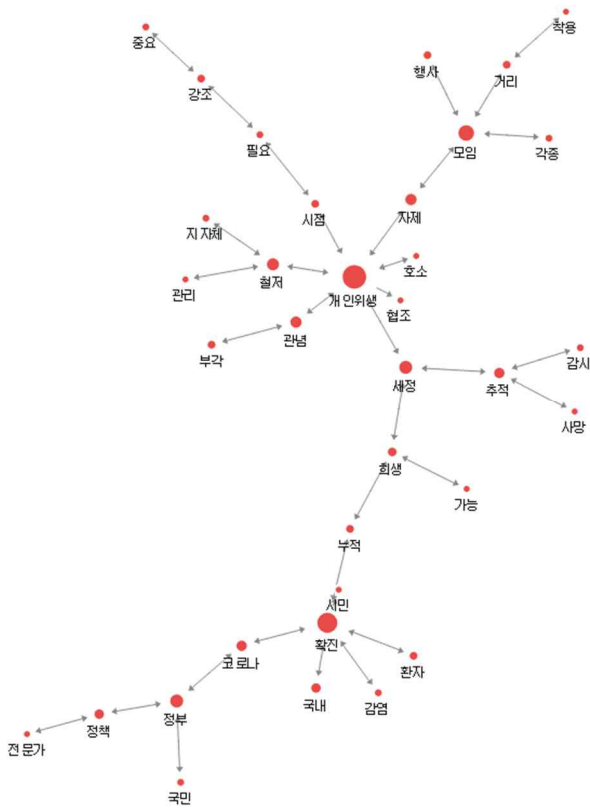


Figure 6. Result of pathfinder network analysis

Figure 6 clearly categorizes individuals' role in the Coronavirus situation. Cohesion analysis was performed to reconstruct these into several topics. As a detailed method for performing cohesion analysis, the skeleton derived from the pathfinder network analysis was divided into several communities again. As a result, a cluster was derived, as shown in Figure 7. The result of this clustering is different from that of other topic analysis, in that the clusters do not have the same number of words, but a different number of words according to their characteristics.

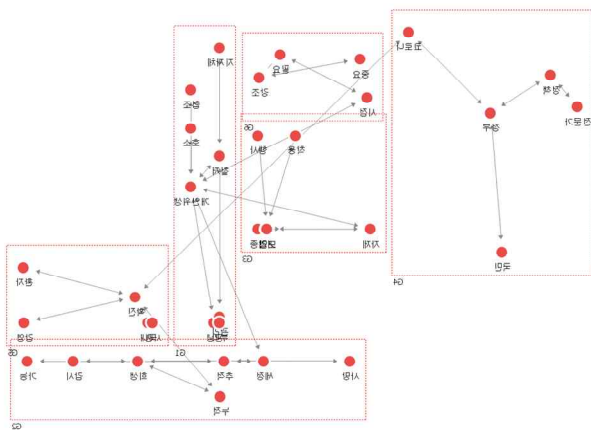


Figure 7. Results of cohesion analysis (individual's role)

The cohesion analysis results are summarized in Table 3.

Table 3. Clustering results

Group	Cluster configuration	Composed words	Characteristic
1		local government, management, thoroughness, personal hygiene, appeal, cooperation, idea, prominence	Personal hygiene and co-operation of local government
2		surveillance, tracking, cleaning, death, sacrifice, accumulation, possibilities	Surveillance systems and personal hygiene
3		gathering, restraint, event, various, distance, wearing	Refraining from personal events and gatherings
4		government, corona, people, policy, experts	Responses centred on government policy experts
5		confirmed, citizen, domestic, infected, patient	Confirmation as citizen and likelihood of becoming a patient
6		emphasis, timing, necessity, importance	Importance of a particular point in time

4.2. Analysis of the role of government

4.2.1 Basic analysis

The role of government in the Coronavirus situation is especially important. In order to construct a network for the role of government, an ego network including only ‘government’ was constructed in the network at the initial stage. The result of word cloud analysis consisting of the words included in this network is shown in Figure 8.



Figure 8. Word cloud analysis (role of government)

The above network is shown in order of frequency of appearance of words in Table 4.

Table 4. Emergence of words (role of government)

		1	2	3	4
		of Speech(P	Frequency	Word length	Name Type
1	경제	immon Noun"	1,267.0	2.0	"_"
2	정부	immon Noun"	1,143.0	2.0	"_"
3	대통령	immon Noun"	1,016.0	3.0	"_"
4	국민	immon Noun"	915.0	2.0	"_"
5	세계	immon Noun"	667.0	2.0	"_"
6	교수	immon Noun"	621.0	2.0	"_"
7	바이러스	immon Noun"	596.0	4.0	"_"
8	신종	immon Noun"	486.0	2.0	"_"
9	기업	immon Noun"	486.0	2.0	"_"
10	위기	immon Noun"	483.0	2.0	"_"
11	정책	immon Noun"	461.0	2.0	"_"
12	방역	immon Noun"	461.0	2.0	"_"
13	확진	immon Noun"	438.0	2.0	"_"
14	시장	immon Noun"	437.0	2.0	"_"
15	확산	immon Noun"	419.0	2.0	"_"
16	개인	immon Noun"	419.0	2.0	"_"
17	감염증	immon Noun"	411.0	3.0	"_"
18	금융	immon Noun"	402.0	2.0	"_"
19	의원	immon Noun"	395.0	2.0	"_"
20	국가	immon Noun"	384.0	2.0	"_"
21	시대	immon Noun"	353.0	2.0	"_"
22	산업	immon Noun"	348.0	2.0	"_"
23	정치	immon Noun"	347.0	2.0	"_"
24	상황	immon Noun"	327.0	2.0	"_"
25	사태	immon Noun"	297.0	2.0	"_"

4.2.2 Topic analysis

As with the analysis of the government's role in the Coronavirus situation and the analysis of the individual's role, twenty topics were first derived. The results are shown in Figure 9.

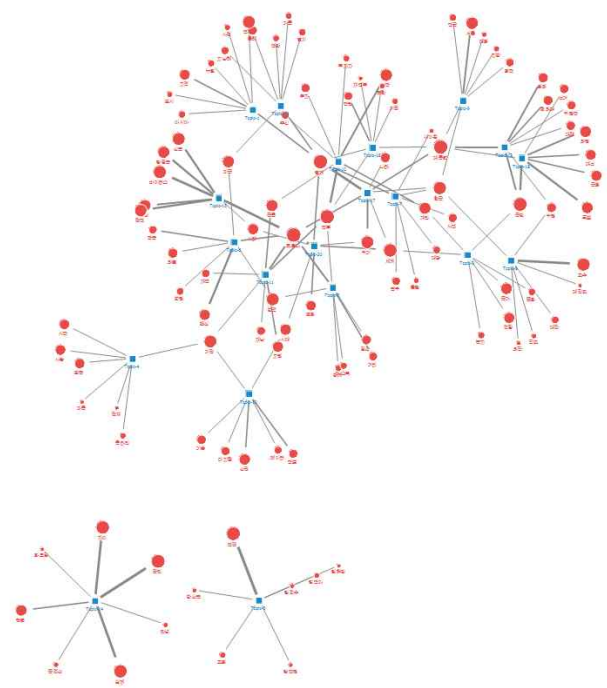


Figure 9. Topics on the role of the government

As Figure 9 shows, a total of twenty topics relating to the government's role in the COVID-19 situation were derived. The figure was designed to consist of seven words for one topic. The number is too great and needs to be reduced. To this end, using the ego network analysis method, it was reduced back to the network in the situation where the word 'government' was omitted. The reason for this is that, as mentioned above, there is no reason for the word 'government' to be included in the network because the current network is related to the role of government. Through this process, degree-centrality analysis was attempted with the reduced network, Figure 10 showing the result of degree-centrality analysis in the reduced state.

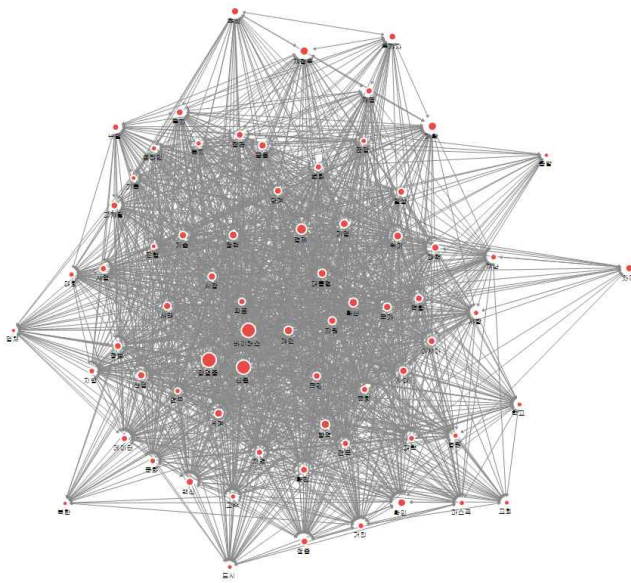


Figure 10. Result of reduced degree centrality analysis

The in-degree and out-degree centrality scores of the words derived as a result of the connection centrality analysis performed above are shown in Table 5.

Table 5. Degree centrality scores of words (role of government)

		1	2
		In-Degree Centrality	Out-Degree Centrality
1	감염증	0.036289	0.036289
2	신종	0.035908	0.035908
3	바이러스	0.034561	0.034561
4	경제	0.020745	0.020745
5	확산	0.016357	0.016357
6	기획	0.015975	0.015975
7	방역	0.015705	0.015705
8	개인	0.015685	0.015685
9	재정부	0.015223	0.015223
10	위기	0.014925	0.014925
11	세계	0.014754	0.014754
12	대통령	0.014632	0.014632
13	정책	0.014145	0.014145
14	확인	0.014117	0.014117
15	기업	0.013765	0.013765
16	지원	0.013405	0.013405
17	산업	0.013060	0.013060
18	시장	0.012991	0.012991
19	사태	0.012977	0.012977
20	차이	0.012903	0.012903
21	금융	0.012793	0.012793
22	기술	0.012767	0.012767
23	국가	0.012674	0.012674
24	대책	0.012379	0.012379
25	시대	0.012219	0.012219

Again, through concentric circle analysis, it is possible to examine the roles of keywords included in the network. Figure 11 shows the results of a concentric circle analysis of the government's role in the COVID-19 situation.

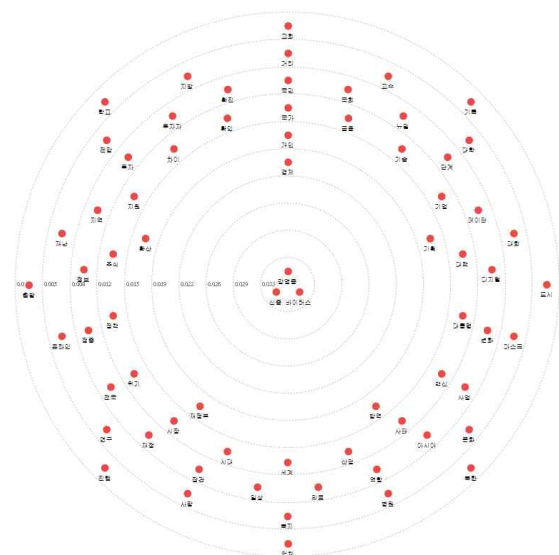


Figure 11. Results of concentric circle analysis (role of government)

4.2.3 pathfinder analysis and clustering analysis

In order to grasp future important information on the government’s role in the COVID-19 situation in the form of a network, topics should not overlap and important keywords should be included exclusively in one topic. For this purpose, pathfinder network analysis was performed, as used above. This aims at simplifying the network so as to increase researchers’ understanding. This method simply expresses only the framework of the network, thus helping to uncover essential implications. Figure 12 shows the results of pathfinder network analysis of the government’s role in the Coronavirus situation.



Figure 12. Result of pathfinder network analysis

From Figure 12, the Government’s role in the Coronavirus situation can be clearly identified, and the role of words at each stage identified by connecting them with other words. In order to classify these by role, it is necessary to perform cohesion analysis. Through cohesion analysis, the task of dividing the entire network into several communities was performed. As a result, the cluster shown in Figure 13 was derived. Again, the result of this clustering differs from that of other topic analysis in that the clusters do not have the same number of words, but rather each has a different number of words according to its characteristics.

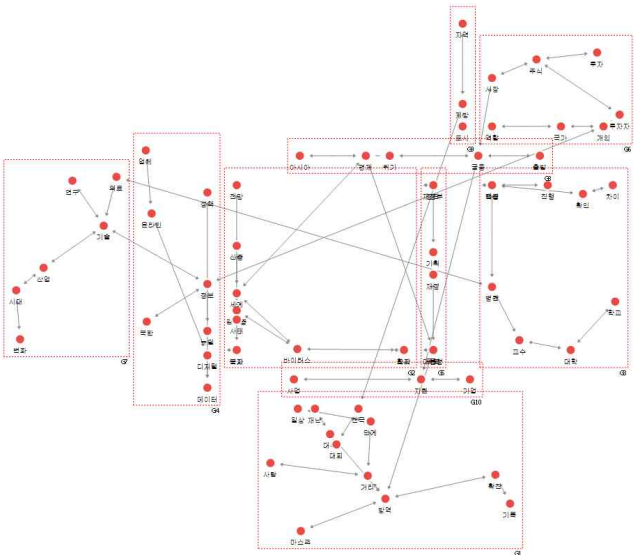
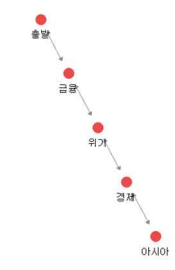
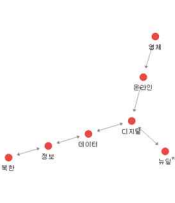
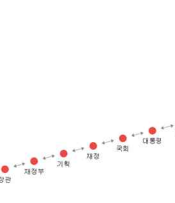
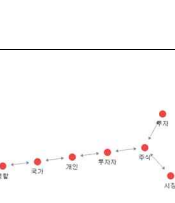
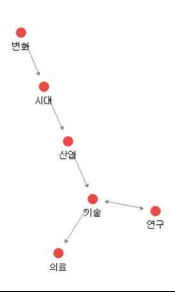
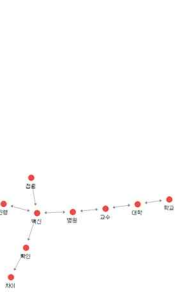


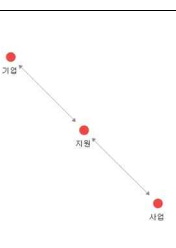
Figure 13. Results of cohesion analysis (role of government)

Regarding the role that government should play in the Coronavirus situation, the results of cohesion analysis are summarized in Table 6.

Table 6. Clustering results (role of government)

Gro up	Clustering configuration	Composed words	Characteristi c
G1		national, competition, countermeas ure, disaster, quarantine, mask, check, technology, distance, person, stage, daily life	The Government’s development of disaster technology and step-by-step measures to assist people’s daily lives
G2		outlook, world, culture, welfare, virus, infectious disease, avalanche, new species, spread, church	The global outlook for emerging infectious diseases and the need for countermeas ures from a welfare point of view

G3		departure, finance, crisis, economy, Asia	Need to respond to the Asian economic crisis
G4		company, online, digital, New Deal, policy, data, information, North Korea	The need for data information policies such as the New Deal policy in response to digitalization
G5		people, president, National Assembly, finance, planning, Ministry of Finance, minister	The President, the National Assembly, the Government and the people need a unified response
G6		investment, stock, market, investor, individual, country, role	Government protection for investors
G7		change, era, industry, technology, research, medical	Medical technology and industry support in response to new changes
G8		progress, inoculation, vaccine, check, difference, hospital, professor, university, school	Co- operation in the developmen t and operation of vaccines by hospitals, universities and schools

G9		province, city, region	Considerati on for underdevelo ped areas in the Coronavirus era
G10		corporate, support, business	Support for business in the Coronavirus era

5. Conclusion and Implications

The results and implications of this study may be summarized as follows. The aim of this study is to explore the role models that individuals and government in Korea should follow in order to keep safe in the Coronavirus situation. To this end, articles covered in various daily newspapers and broadcasts in Korea from 11 March 2020, when the World Health Organization (WHO) declared a global Coronavirus pandemic until 31 January 2023, around three years later. Text mining analysis was performed on these. In order to divide the entire article according to the role of the ‘individual’ and the role of ‘government’, the ego network including ‘individual’ and that including ‘government’ were separately constructed and analysed.

First, word cloud analysis and frequency analysis of words were performed for the entire network. Next, topic modelling was performed in order to construct around twenty topics, and then an additional ego network was performed to narrow them down again. The desirable roles for individuals in the COVID-19 situation, as derived through this process, may be presented as follows:

- (i) Individuals should ensure thorough management of personal hygiene, and local government should support this.
- (ii) A surveillance system for infectious disease patients and a monitoring system for personal hygiene management should be established.
- (iii) Individuals should refrain from holding events and gatherings.
- (iv) Individuals should trust the government’s policy experts and listen to their opinions.
- (v) As citizens, we must be aware that the possibility of becoming a confirmed case always exists.
- (vi) In a situation like the COVID-19 pandemic, it is necessary to recognize that a specific point in time often has importance, and to be aware of the actions that individuals should take at that point.

Turning to the role of government, our analyses show that the government should:

- (i) prepare step-by-step measures for disaster technology development relevant to people’s daily lives
- (ii) prepare counter-measures from the global perspective of new infectious diseases and welfare
- (iii) respond to the economic crisis in Asia as a whole

- (iv) establish employment policies such as the New Deal policy in response to digitalization using data-based information
- (v) create a climate in which the President, the National Assembly, the government and the people can together make concerted efforts
- (vi) protect investors
- (vii) offer support for medical technology and industry in response to new changes
- (viii) promote co-operation between hospitals, universities and schools in vaccine development
- (ix) give priority consideration to underdeveloped regions
- (x) actively support companies

The text mining analysis and ego network analysis methods used in this study have advantages in terms of methodology, but at the same time display problems. For example, if the size of the main keyword identified according to the number of topics set through comparison between the co-occurrence networks of the main keyword changes, there is a statistically significant difference in the main connection structure between them extracted through the pathfinder network. Therefore, there is a need for clustering through complementary methods such as cohesion analysis.

This point raises the need to perform a multifaceted analysis by using various analysis methods in combination. In the future, the possibility of an epidemic like Coronavirus hitting the world at any time can be predicted by analysing the recent pandemic situation. In this case, it should be emphasized that there is a strong need to distinguish between the individual’s role as a citizen and the government’s role in managing all citizens. It is hoped that the inadequacies and methodological limitations of this study will be obviated in future studies.

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