

Emerging Gender Issues in Korean Online Media: A Temporal Semantic Network Analysis Approach

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In South Korea, as awareness of gender equality increased since the 1990s, policies for gender equality and social awareness of equality have been established. Until recently, however, the gap between men and women in social and economic activities has not reached the globally desired level and led to social conflict throughout the country. In this study, we analyze the content of online news comments to understand the public perception of gender equality and the details of gender conflict and to grasp the emergence and diffusion process of emerging issues on gender equality. We collected text data from the online news that included the word 'gender equality' posted from January 2012 to June 2017 and also collected comments on each selected news item. Through text mining and the temporal semantic network analysis, we tracked the changes in discourse on gender equality and conflict. Results revealed that gender conflicts are increasing in the online media, and the focus of conflict is shifting from 'position and role inequality' to 'opportunity inequality'.

Keywords: Gender equality, gender conflict, online comment, text mining, semantic network analysis

Introduction

In the modern information society, most social conflicts are expressed through online social media such as news comments and social network services. Conflicts through online media are easily expressed and publicized, and information is sometimes distorted and exaggerated, thus

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amplifying group conflicts. On the other hand, conflicts can be purified or mediated through the process of being publicized online when extreme opinions or undemocratic online behavior are criticized by the majority and thus consensus is reached. Therefore, the role of online media in the process of managing and resolving social conflicts is gradually increasing, and it is necessary to pay attention to the social interaction process in it (Lee, 2012).

Gender conflicts, like other social conflicts, are expressed in the way of commenting on online news and sharing on social media, and the content mostly comprises blame, aversion, and sexual insult towards opposite-sex peers. The most important feature of online gender conflicts is bilateral, that is, two peers exchange offense and defense against each other, while other social conflicts such as regional, ideological, and multicultural conflicts are mostly unilateral, and tend to focus on the disadvantages of the minority group. Recently in South Korea, 'online mirroring' has emerged as a strategy to mock and criticize opposite-sex peers by creating and exchanging online coined words (Kim, 2017). In general, mirroring speech can be used to build rapport with others (Iacoboni, 2008). However, some of the Korean online users use this term to describe taking back criticism in a sarcastic way in a controversial situation. The mirroring strategy was first known to be used in 2015 on a Korean feminist website to pay back misogyny by creating reflective symmetric words containing misandry. It is used not only to tease the opponent through coined words but also as a tool to justify and reproduce hatred.

Although social conflicts spreading through online media are becoming diversified and scaled up in the age of big data, there are not many studies related to them. In particular, research on gender conflicts on online media is at an early stage. Through the analysis of online media content dealing with gender equality and conflicts, this study is aimed to achieve two research objectives. One is to identify emerging issues and its temporal changes by understanding the contents of gender equality discourse formed in online media. The other is to establish methodology for the first research objective by combining text mining and social network analysis from a time-series perspective. This paper is composed as follows. We outline general research trends related to gender equality and conflicts on online media and draw research questions. Next, we introduce the research methodology and analysis procedure. The analysis results are discussed in terms of theoretical and policy implications.

Theoretical Background

Research on Gender Issues.

UNICEF refers to gender equality as "means that women and men, and girls and boys, enjoy the same rights, resources, opportunities and protections. It does not require that girls and boys, or women and men, be the same, or that they be treated exactly alike." (Roger, 2011). Gender equality encompasses equality in the social status, power, and mutual relationship between men and women, both in the public and private spheres. The most important condition for achieving all kinds of equality, as well as gender equality, is 'equal in participation' (Fraser & Honneth, 2003). Gender

conflicts have long been recognized as one of the factors impeding social integration. The gender conflict domain encompasses the conflicting interests of men and women in both individual, group, and national policy levels (Lee, 2013). Since gender role recognition and gender sensitiveness are formed by the social structure, the individual and public domains of gender conflict are mutually influential.

Research on gender conflict in Asian cultures mainly takes a normative approach suggesting the necessity of solving gender role discrimination and raising gender sensitivity in home and society. Park and Lee (2014) studied marital conflicts due to differences in perception of role expectations and actual conducts in multicultural families. Park (2013) found that the difference in the perception of role division of home labor and parenting is the major cause of the conflicts. Other related studies revealed that time allocation conflict of couple over the work - family balance negatively affects family health, and there is a difference in degree between men and women (Park, 2009; Jeon, Park & Kim, 2008; Peng et al., 2010). Overall, gender conflict has been structured according to social customs and ideologies that have been formed for a long time, therefore, it is important to make careful observations and publicize rather than finding quick resolutions (Song & Song, 2016). From a methodological point of view, many studies have been conducted through traditional case studies or surveys. With the explosion of online media and the emergence of big data, the public is expressing gender conflict through various means. However, the attempts to gather opinions from various sources and to analyze different aspects of gender conflicts quantitatively and qualitatively are relatively lacking.

Gender Issues in Online Media.

Previous literature on gender issues in online media can be classified into two research streams. The first stream focuses mostly on how discriminatory images and discourses about women are produced, distributed, and reproduced in online media (Popa & Gavrilu, 2015). The approach has been also interested in the way gender equality perception and conflict are expressed. For example, the Korea Women 's Policy Institute collected female-directed hostile comments from one major portal news and one representative online discussion board called a 'daily best storage' which is notorious for its extreme right contents. They found the difference in the degree of expression and choice of words between the two online spheres (Ahn et al., 2015). Lee et al. (2016a) collected gender-specific comments, posts, and chat articles from online news, communities, and Internet broadcasts and discovered seven themes describing how the discourse on sexual discrimination is being formed through online media. Park et al. (2010) conducted a content analysis of the opinion columns of major Korean newspapers at intervals of 1998, 2003, and 2008 examining how gender discrimination structures were being reproduced. Hong (2017) analyzed the content of four major daily newspapers about reports on the murder of a woman in a public restroom in Seoul, Korea in 2016, and compared the difference in reporting behavior between conservative and progressive media.

The other research stream, which is still at an early stage, deals specifically with gender conflict in detail. For example, Litchfield (2018) investigated discriminatory or abusive comments in social

media relating to Serena Williams's performance during the 2015 Wimbledon Championships. The study revealed 'gender questioning' and 'racism' shaped multiple forms of oppression is perpetrated by the online environment. These kinds of findings eventually lead to normative solutions to achieve gender equality in terms of policy and behaviorism (Nande et al., 2019). Chetty and Alathur (2018) argue the necessity of proper policies on Internet Service Providers and online social networks to counter hate speech. Jane (2016) examined feminist 'digilante' responses to misogyny and called for collective activities to achieve the legislative and corporate reforms. Very recently, this research approach echoed traditional feminist research on media, leading to the opening of the special issue on misogyny (Ging & Siapera, 2018).

Previous research has mostly relied on anecdotal study, i.e., individual collections of phenomenon analysis for specific events for specific gender issues, and the range of data for analysis is often short term (i.e. six months). In other words, there has been only cross-sectional analysis, limited to the longitudinal analysis approach. Therefore, it is necessary to study how gender issues change over time according to social trends and policy interventions by fully exploiting the characteristics of Big Data on online media. Thus the present study tries to extend previous research on gender issues in online media focusing on gender conflict and to contribute to academia and policy practitioners in terms of methodological advance. We have established the following Research Questions.

RQ1. How has the theme of gender issues in online media changed and what is emerging issue?

RQ2. How does Big Data analysis help identify emerging gender issues in online media?

Research Design and Methodology

Research Subjects.

The subject of this study is the news articles dealing with gender issues published through the online news portal and the comments to those articles from the subscribers. While news articles are characterized by unilateral information delivery to the public, commenting on articles is a voluntary and active way of expressing opinions on specific issues (Choi et al., 2008). Therefore, the amount of comments on social issues in online media represents the degree of public interest, and the content of the comments is an important source to understand the reactive agenda of the public opinion (Wallsten, 2007; Meraz, 2011). As online commenting is the most immediate way to respond to the public agenda, researchers recently started to include text data from online comments into research subjects (Russell Neuman et al., 2014). Thus this study collected online news and their comments as subjects of study to identify emerging gender issues in online media. Until recently there were limited tools to collect and analyze large amounts of online comment text, however, the recent development of Big Data programming language can enhance efficiency of online media research.

Methodology.

The theoretical basis for detecting emerging issues can be found in the traditional future studies. Horizon scanning, one stream of the future studies, is a method of predicting the future by analyzing data generated in the external environment (Amanatidou et al., 2012). Identification of future signals and emerging issues generated by horizon scanning has been a major research interest of the future study (Ansoff, 1975; Coffman, 1997; Kamppinen et al., 2002).

Weak signal, one kind of future signal, is defined as ‘the future-oriented information behind future trends, changes and emerging phenomena’ (Hiltunen, 2008). Futurist Hiltunen (2008) proposed a theoretical framework for detecting weak signals by tracking the increase and expansion of certain signals and issues. Subsequent research continued to find a way to identify weak signals from big data including online media based on quantitative and qualitative analysis. Yoon (2012) suggested employing text mining to distinguish *weak signals* from *strong signals*. He employed term(word) occurrence frequency in documents as a means to detect the unusual patterns and changes in the business environments. After that, Park and Kim (2015), in their analysis on the new energy industry, expanded issue classification by adding *latent signals* and *not strong but well-known signals*. Recently, Lee and Park (2018), in their study to detect future issues in artificial intelligence technology, suggested adding analysis on co-occurrence of words and content analysis before confirming the final issue classification of Park and Kim (2015). (See Appendix for more information)

So far, the methodology for detecting future signals is mostly focusing on the static nature of emerging issues depending only on the occurrence frequency of individual words, not considering the semantic structure of a document. Also, they assume issues derived by collection of words are independent not considering the linkage between words and expansion of issues. In other words, we cannot track the dynamics of issues evolution in which existing issues combine with other issues to form a new emerging issue. To address these limitations, there is a need for qualitative analysis using semantic network analysis (Cho et al., 2012; Sudhahar et al., 2015; Wang & Rada, 1998; Wasserman & Faust, 1994). More importantly, the semantic network analysis with a time-series approach is required to understand how receivers interpret current issues and form a new opinion (Lee & Park, 2018). The temporal aspect of network is useful when the entities to be analyzed are interacting in the specific events in the underlying network (Aggarwal, 2011). In the present study, comments on online news are a valuable source to capture receivers’ interpretation, underlying issues, and their interactions as well.

Therefore, this study analyzes the semantic structure of text collected from online comments using temporal social networks analysis (Monge & Contractor, 2003) as a method to detect emerging issues. The method focuses on identifying the process by which words (nodes) come together and form dense communities before and after a policy event regarding gender issues (Backstrom et al., 2006; Palla et al., 2007).

Data Collection.

Before the collection of the whole dataset, a pilot study was carried out to identify search keywords. We extensively searched some of the representative news articles dealing with gender issues and determined search keywords including 'gender equality,' 'female,' 'gender conflict,' 'gender inequality,' 'feminism,' and 'women's studies.' Of these keywords, 'gender equality,' 'gender inequality,' 'feminism,' and the like fit into the topic of gender conflict. As a result, these groups of words were selected as the final search keywords.

In order to set the timeline to collect news articles and comments, we paid attention to a radical change in gender policy stance that occurred in South Korea in 2015. The Basic Law on Gender Equality was enforced in July 2015. The law was enacted based on the principle of human rights and individual dignity, which seeks to resolve conflicts arising between traditional practices of gender discrimination and the push for gender equality. Under this law, men and women are given equal treatment and opportunity to participate in all sectors of society, sharing equal responsibilities and rights. In fact, this law was renamed after the Basic Law on Women's Development enacted in 1995. The underlying concept of the old one is to establish healthy homes and to have both men and women participate in the development of the State and society and share responsibilities through the promotion of gender equality, protection of motherhood, rectification and elimination of gender discriminatory mindsets, and development of women's abilities based upon individual dignity. The revision was intended to shift policy from matching the social status of women with that of men to equality for both men and women. In connection with the enactment, a basic plan for gender equality policy was set up in June 2016 with several innovative policy measures such as encouraging parental leave or expanding the number of kindergartens. Since this political change triggered nationwide controversy regarding gender equality, it has been a key interest for academics involved in the study on gender equality in Korea. For this reason, we set the timeline of the data from 2012 to 2017, i.e., before and after the implementation of the law in 2015 to identify significant changes in discourse in social media sphere.

A web crawling tool was developed using Python, a recent computer programming language for Big data analysis. The tool collected all the online news published in the corresponding timeline (2012 - 2017) from the biggest news portal in South Korea and collected comments from each news article.

About 15,000 texts from online comments were collected and processed through the Korean language analysis tool KrKwic. A tool used for temporal semantic network analysis is NodeXL, which is a well-known social network analysis tool (Park & Park, 2014) and NetDraw was used for data visualization (Borgatti et al., 2002).

From the collected materials, articles with more than one hundred comments were re-extracted according to criteria suggested in the previous research (Kim et al., 2016), which is a threshold for determining active participation of the public. The overview of the collected articles and comments is in Table 1.

Table 1

Summary of data collection

Source	Online News Portal(news.naver.com)
Article Selection	Articles including a word ‘gender equality’
Period	Articles: From January 1, 2012 to March 31, 2017 Comments: From January 1, 2012 to June 30, 2017
1 st round collection	3,328 articles with more than one comments among 14,584 searched articles
Selection for semantic network analysis	152 articles with more than one hundred comments and 52,836 associated comments

Figure 1. shows the number of the online news articles that cover gender equality for the last 5 years and the number of the comments of each news article. In 2016, the volume of comments increased about 1.7 times over the previous year, compared with about 1.2 times the volume of the previous year. This significant increase is due to the enforcement of the Basic Law on Gender Equality in July 2015. The year of 2016, when the number of comments was the highest, was the period when several gender equality issues were exploding in South Korea. In June 2016, a basic plan for gender equality policy was set up. At the same time, many large and small sex crime cases were reported in the news, leading to a public debate relating crimes and gender policy over online commenting.

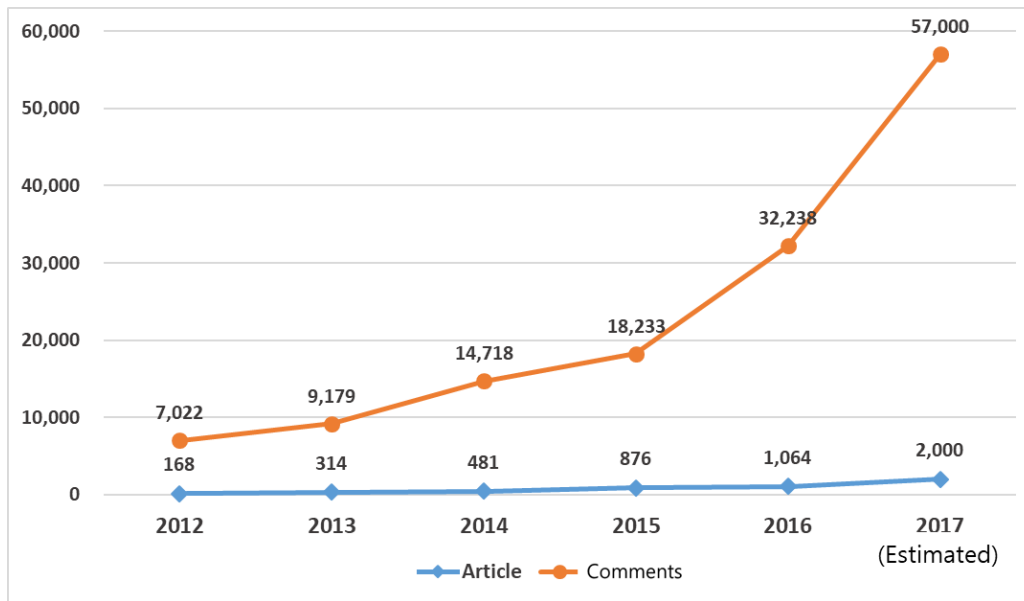


Figure 1. Number of online news articles and their comments regarding gender equality.

Analysis and Results

Public's Interest in Gender Issues.

At first, we classified collected news articles into 13 categories by their main theme to find out which theme was mostly paid attention by means of commenting online. Classifiers were drawn comprehensively from the previous study conducted by several research institutes in South Korea (Choi, 2016; Lee et al., 2016; Lee et al., 2014). Classified gender issues include gender sensitivity, status of gender equality, sexual offense, work-family balance and parenting, role division at home, economic inequality by gender, basic act on gender equality, marriage ceremony, reverse discrimination, gender and media, veteran incentives, ministry of gender equality and family, and feminism. Table 2 summarizes the contents of 13 gender issues and its order by the number of online comments.

Table 2

Subject matters of gender issues

Category	Main topics of news	Ranking by number of	
		articles	comments
Gender sensitivity	Perceived discrimination, stereotypes, hatred between men and women	1(39)	1(10,652)
Status of gender equality	Current status of gender equality reported by related institutes	4(15)	2(6,486)
Sexual offense	Sexual abuse, harassment, dating violence	2(22)	3(6,363)
Work-family balance and parenting	Policy regarding work-family balance and parenting leave	5(13)	4(6,240)
Role conflict	Conflict over role division and working hour at home, holiday syndrome, etc.	3(15)	5(5,190)
Economic inequality by gender	Glass ceiling, gender discrimination on the job	6(11)	6(5,041)
Basic Act on Gender Equality	Policy and regulation regarding gender equality in employment and promotion	7(9)	7(2,756)
Marriage ceremony	Attitude towards marriage ceremony and cost sharing	9(6)	8(2,747)
Reverse discrimination	Reverse discrimination against men or women in various cases	8(8)	9(2,247)
Gender and media	Distorted sexual descriptions in broadcasts and advertisements	10(4)	10(1,716)
Veteran incentives	Justification of incentive system for male veterans	11(3)	11(1,340)
Ministry of Gender Equality and Family	Changes in the mane of the ministry in charge of gender equality in Korea	11(3)	12(1,058)
Feminism	All kinds of issue regarding feminism	10(4)	13(1,000)

*() indicates the number of articles and comments by subject

Figure 2. depicts the changes in ranking of categories for the last five years. The number of comments on issues related to 'gender sensitivity', 'status of gender equality', and 'sexual offense' has rapidly increasing patterns while issues related to 'reverse discrimination', 'ministry of gender equality and family', and 'veteran incentives' have significant decreasing patterns.

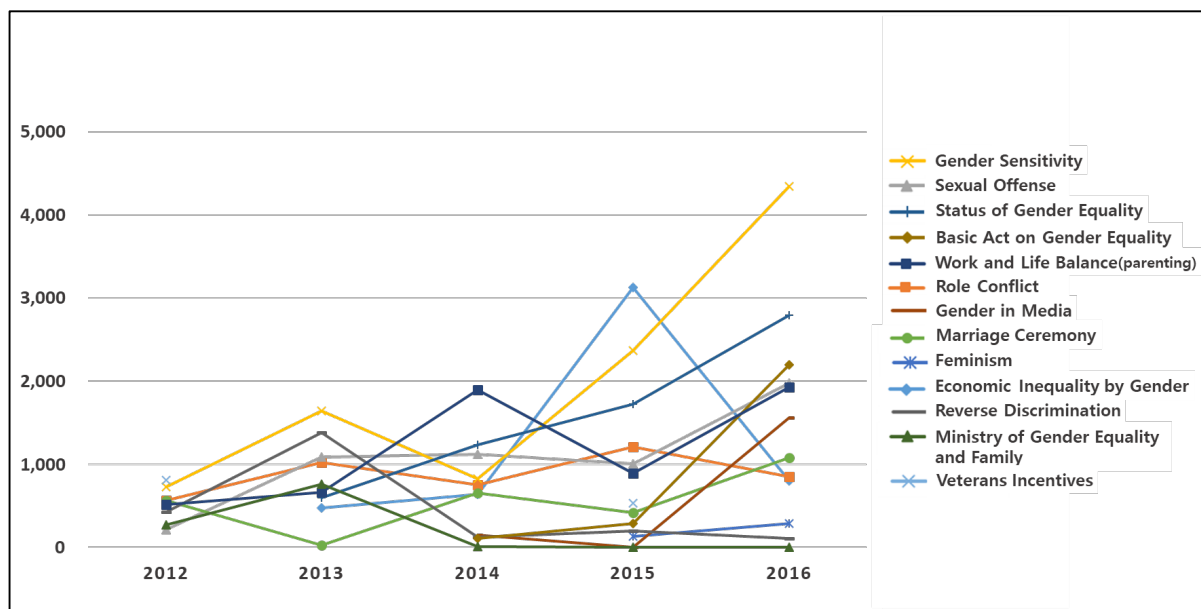


Figure 2. Yearly changes in ranking of subject matter of gender issues.

Changes in Subject Matter of Gender Issues.

To fulfill research objectives and answer research questions, the text data for commenting was split into two sets by the year 2015, when the Gender Equality Framework Act was enforced in South Korea. There were 19,186 comments on news articles from 2012 to 2014 (hereafter Period 1) and 33,649 comments from 2015 to June 2017 (hereafter Period 2). Since the number of comments in Period 2 is greater than Period 1, the normalized network index values were used for comparison. Word rankings for each period were also compared with normalized index values.

To populate a semantic network, 255 words which occurrence frequency is more than 150 were selected as corresponding nodes. Similar words are replaced with a unified word. For example, household chores, housework, and housekeeping are counted individually but substituted for housework. In the semantic network diagram, nodes (points) represent words, and the size of nodes is applied by the Bonacich Centrality, which indicates the degree of influence of specific nodes on other nodes.

To extract subject matters of gender issues, we employed block modeling (Breiger et al., 1975) and CONCOR (CONvergence of iterated CORrelations) analysis, this method has been used in

various studies that derive highly relevant issue clusters by analyzing the connection relationships between words in text data (Cho et al., 2012; Jun & Chung, 2016). It is useful not only for grouping keywords with similar context but also for figuring out a relationship between groups (see lines, positions, and colors of keywords in Figures 3-1 and 3-2).

In Figures 3-1 and 3-2, the color of a node indicates an issue group among similar subjects, and a node in the center in the same color is a leading word with contextual importance. The direction of the arrow in the link (line) indicates a logical posterior relationship, and as the thicker the link is, the stronger the connection strength is.

In the two periods, ‘female’, ‘man’, ‘work’, ‘army’, ‘marriage’, ‘money’, ‘Korea’, ‘civil servant’, ‘equality’, ‘discrimination’, ‘duty’, ‘reality’, and ‘overtime work’ are commonly most influential in the network. Applying these words to the issue classification (Table 2), these words are closely related to gender sensitivity, economic inequality by gender, marriage ceremony, and veteran incentives.

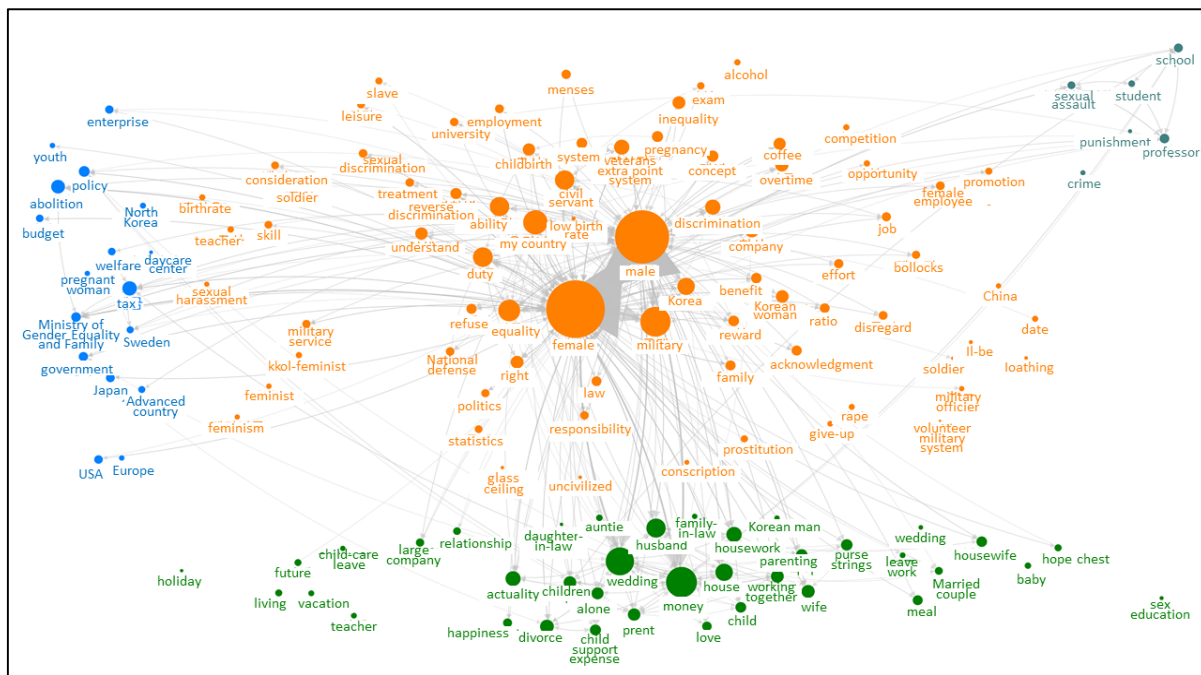


Figure 3. Semantic Network for Period 1(2012-2014)

comparing the normalized Bonacich Centrality, which indicates the degree of influence of specific nodes on other nodes. Index values, the word ranking was lower (208th) in Period 1, but moved to the higher rank(26th) in Period 2. That is, social conflicts over work-family balance and role conflict over parenting are causing emerging issues on birth rate, feminism and hatred of opposite gender, which were individually positioned and had relatively weak influence in Period 1.

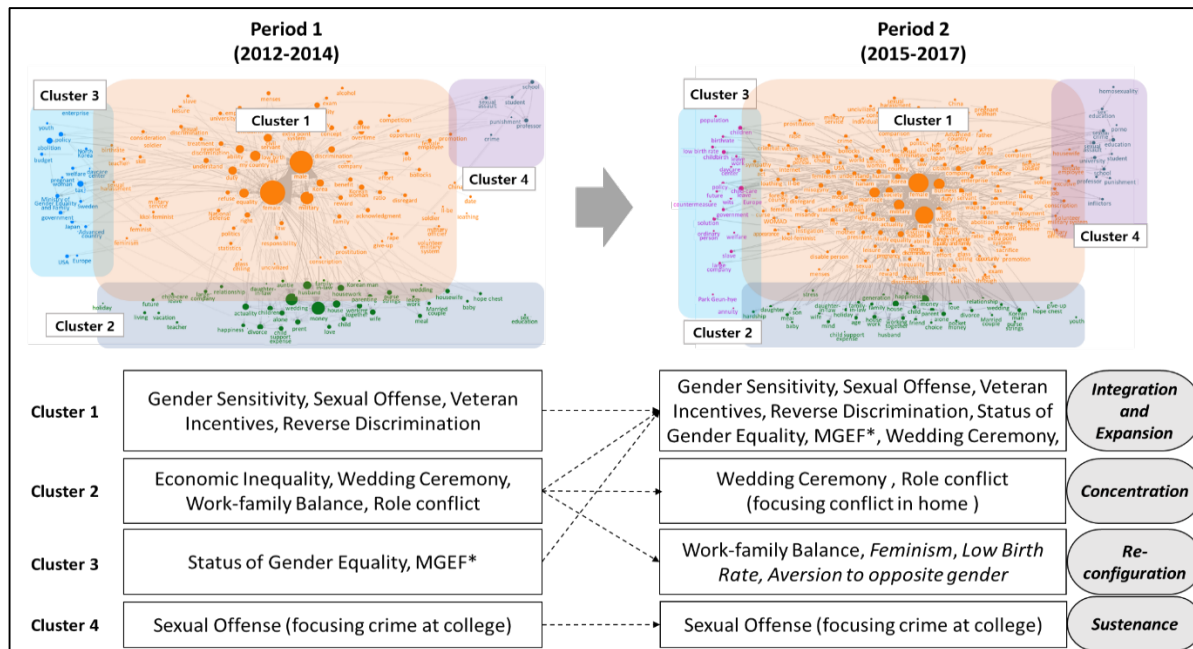


Figure 5. Patterns of Issue Changes

To get a more in-depth insight, we overviewed the top 100 representative words in order of their influence for each period based on the Bonacich Centrality. The words included in top 100 in Period 1 but were pushed out of the top 100 in Period 2 includes ‘child support expense’, ‘coffee’, ‘purse strings’, ‘veterans’ incentive’, ‘compensation’, ‘menses’, ‘salary’, ‘wife’, ‘housewife’, ‘father’, ‘professor’, ‘Ministry of Gender Equality and Family’, ‘girls at work’, ‘getting accepted’, ‘welfare’, ‘budget’ ‘household chores’, ‘mother’, ‘couple’, ‘divorce’. Contrariwise, the word entered into the top 100 ranking in Period 2 are ‘parenting leave’, ‘feminism’, ‘glass ceiling’, ‘holiday’, ‘hatred’, ‘the Korean men’, ‘soldier’, ‘the daily best’, ‘crime’, ‘female soldier’, ‘sexual harassment’, ‘draft’, ‘education’, ‘victim’, ‘manager’, ‘instigation’, ‘job’, ‘company’, ‘dating’, ‘sexual’, ‘feminist’, ‘low birth’. Specifically, ‘parental leave’, ‘feminism’ and ‘glass ceiling’ are notable words with dramatic rise from outside top 100 ranking. Applying these newly emerging words to the issue clusters in the semantic network for Period 2, we identified four types of issue dynamics (see Figure 4). The first type is *integration and expansion*. Cluster 1 in Period 2 shows that gender sensitivity related issues combined with gender policy related issues in Period 1 and the size of the issue has grown. The second type is *concentration*, which is the case of cluster 2 in Period 1 being focused in Period 2. The third type is *reconfiguration*, which is similar to the first

type but has difference in that small issues are assembled to become a novel and unexpected issue. The fourth type is *sustenance*, which is the case of cluster 4 in both periods, indicates that the issue is sustained with minor topic changes. According to this taxonomy, emerging phenomena to be noticed for the future gender issues can be found in the first and third types. Detailed description follows by focusing on these two emerging issues.

From Equal Role to Equal Opportunity.

The representative keywords for emerging issues in cluster 1 of Period 2 are ‘parental leave’ and ‘glass ceiling’. It is mentioned that the policy to encourage parental leave in Korea is still not freely available to every woman. Moreover, words such as ‘parental leave for men’, ‘temporary job’, ‘promotion’ are being related to the discussion, thus extending the issue towards the disadvantages to both men and women who get back to work after parental leave. The ‘glass ceiling’ means an invisible barrier in an organization that prevents the promotion of minorities and women to high ranking positions. Related words in the semantic network include ‘military service’, ‘breadwinner’, ‘overtime work’, ‘job’, ‘sexual discrimination’, ‘more hard-working’, ‘gender equality’, ‘allocation’. This means that gender conflicts arise surrounding equal opportunity policy by insisting on reverse discrimination between men and women. At the center of the controversy is the veteran incentive system for men in opposition to the female allocation policy when hiring young employees in the public sector.

Feminism and Hatred of Opposite Gender.

The representative keywords for emerging issues in cluster 3 of Period 2 are ‘feminism’ and ‘hatred of opposite gender’. ‘Feminism’ is generally regarded as a code of conduct in which women advocate and practice for women’s rights against male-centered social and political world. However, at least in online comments over gender issues, it is being used in distorted terms to denounce female groups that insist only on the interests of women. Related word in the semantic network includes ‘women’, ‘men’, ‘feminist’, ‘megal’ (abbreviation for Megalian, a website for women’s rights in Korea), ‘Korea’, ‘society’, ‘daily best’, ‘job’, ‘policy’, ‘Korean man’, ‘Womad’(Another male aversion website that promotes female supremacy, derived from Megalia.com), ‘equality’, ‘discrimination’, ‘rights’, ‘hated’, ‘curse’. This semantic structure reveals that there is increasing mutual slander and ridicule between men and women over the discussion on feminism and feminist behavior and at the same time the government’s promotion of gender equality policies is intensifying the debate.

Gender conflicts in the form of hatred of opposite gender intensified in Period 2 by exchanging coined words as a mirroring tactic. Since the website Megalian.com began operating in 2015, a new type of feminism was embodied to promote gender equality and humorously bash misogyny. ‘Han-nam’(Korean men), ‘Han-nam choong’(wormlike Korean men), ‘Yeo-heom’(misogyny), ‘Nam-hyum’ (misandry), ‘Megal’, ‘Womad’, ‘Hell-Josun’ (infernal Korea), ‘Womad’ are representative words included in Top 100 words in Period 2. In this analysis, some of the refined words were collected and analyzed. In reality, swear words and sexual slang are widely used in online commenting. Note here that the words related to feminism, gender conflict, and mirroring

were located separately in Period 1 not forming an issue group, but in Period 2, all these words were gathered close to cluster 3 and the connection with the gender policy issue was strengthened. It means that complaints about government policy also played a role in increasing mirroring and gender conflicts.

Discussion

The key findings and implications from our analysis results are related to the previously suggested research questions. Implications for policy practitioners are to be discussed with Research Question 1. Our findings revealed that the public concern shifted from 'status and role inequality' to 'opportunity inequality' between men and women. Nowadays in South Korea, gender conflict needs to be understood as a competitive landscape for limited economic gain. This argument is based on the realistic group conflict theory (Sheriff, 1966) which assumes that conflicts between groups arise when there is competition for limited resources. In the present analysis, online gender conflict was triggered by policies that caused controversy over opportunity inequality, such as the veteran incentive system, while employment market was limited due to the recent recession. This demonstrates that the direction of gender policy does not satisfy both men and women demanding opportunity equality. Thus, despite the policy effort to improve gender consciousness, gender conflict has been intensifying through online media, which is unintentional resultant effect. Previous research also supports this idea that the Korean Act of Gender Equality and its subsequent policy measures do not provide solution on how to realize 'opportunity equality' (Shin, 2016).

Theoretical implications are related to Research Question 2. This study revealed, through big data analysis, that the initial hatred of opposite sex peers is amplified by means of online mirroring, in conjunction with a new policy, resultantly increasing gender conflict again. The dynamic interaction between public agenda framed by traditional news media and public reaction by means of social media becomes an important topic in communication and political science (e.g. Russell Neuman et al., 2014; Guo & Vargo, 2015; Vargo & Guo, 2017). Our results enrich this research field by providing relevant analysis method and ample evidence in South Korea. In terms of methodology, this study suggested a temporal semantic network analysis to detect emerging social issues and their changes over time. As empirical evidence, we finally generalized four types of issue change patterns, i.e. *integration and expansion*, *concentration*, *reconfiguration*, and *sustaining*.

Big data in online media provides a reliable source of information for horizon scanning and detecting emerging social issues. However, estimating the weight of emerging issues found through horizon scans and linking them to policy decisions requires a systematic evaluation process (Garnett et al., 2016). The temporal semantic network analysis method attempted in this study can simultaneously track issue changes and their intensity, providing quantitative and qualitative evidence for policy decisions. Also, previous methodologies for future signal detection (e.g. Yoon, 2010; Park & Kim, 2015; Lee & Park, 2018) may be more powerful when temporal semantic network analysis complement to understand the process of issue integration, expansion,

focusing, maintaining, and diminishing. The aforementioned typology and methodology would be useful in interpreting and tracing social issues in other contexts.

Conclusion

The aspects of gender conflicts can be different depending on the geographical, legal, political, and cultural background. However, the role of the new media such as online commenting in encouraging gender conflicts and hatred are becoming the center of attention. The results of this analysis provide policy implications not only in South Korea, but also in other Asian countries in similar techno-social situations. Although one cannot prevent the occurrence of social conflicts, evidence-based political solutions and management of gender conflicts will be implementable if systematic data collection and scientific interpretation of the sphere (e.g. online media) are performed. Further research effort is needed to develop more sophisticated analysis tools for public capabilities to anticipate and respond to social conflicts involving not only gender issues but other political, regional, and intergroup issues.

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Acknowledgements

All Korean articles can be searched using their English title and name of the journals in one of the following Korean research database or Google Scholar

- DBpia(www.dbpia.co.kr)
- KISS(kiss.kstudy.com)
- RISS(www.riss.kr/index.do)
- KoreaScience(www.koreascience.or.kr)

Appendix

Overview of Methodology to Detect Emerging Issue

Previous Methodology

- Possible emerging issue can be observed by keyword frequency of appearance, which is measured by the combination of Degree of Visibility(DoV) and Degree of Diffusion(DoD) (Yoon, 2012)

$$DoV_{ij} = \left(\frac{TF_{ij}}{NN_j}\right) \times \{1 - tw \times (n - j)\} \quad DoD_{ij} = \left(\frac{DF_{ij}}{NN_j}\right) \times \{1 - tw \times (n - j)\}$$

- TF_{ij} is the total occurrence frequency of a keyword i in the period j , NN_j is the total number of news articles in the period j , n is the number of periods (p.12547).
- DF_{ij} is the number of the document frequency of keyword i in the period j , NN_j is the total number of news articles in the period j , n is the number of periods, and tw is a time-weight (p.12548).
- Keyword emergence map (KEM) using TF(X axis) and DoV(Y axis), and Keyword issue map (KIM) using DF(X axis) and DoD(Y axis) are populated based on median or mean value (Yoon, 2012)
- Emerging Issues are identified based on keywords in each quadrant (Yoon, 2012; Park & Kim 2015)
- Interpretation help find inherent meaning beyond keywords group (Lee & Park, 2018)

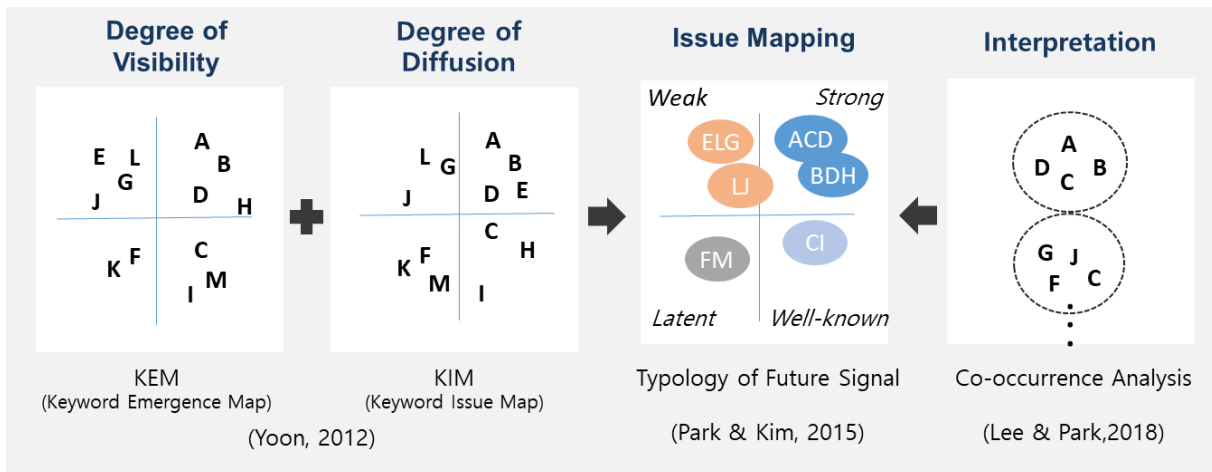


Figure 6. Previous method to detect emerging issue from big data (modified from Lee & Park (2018)).

Note. Lee & Park (2018) referenced the classification of Park & Kim (2015), however citation was unintentionally omitted in their manuscript due to technical mistake during editorial process.

Methodology in the Present Study

- CONCOR (CONvergence of iterated CORrelations) analysis, one of the clustering method, was used to identify contexts from large amount of text and visualize them.
- Block modeling analysis ties nodes with similar equivalence within a network and identifies them as a block (Breiger et all, 1975). By identifying the relationship between the blocks, it seeks to analyze the position of each node within the network. It divides the networks through correlation (Pearson Correlation) until the patterns within the network cannot be divided any more. If each block shares a specific group of words, it will also be part of a specific subject. Each block will therefore be part of a certain issue.
- After separation of the whole network over a specific event at certain time, block modeling a nalysis for each period was performed again to track the changes in the position of nodes, thus, changes in the block structure
- Emerging issues and their relationships are identified based on the change of the blocks. The change patterns are named according to the nature of the cluster and keywords within
 - This method focuses more on the dynamics of the relationship among issues, that is, integration and expansion, concentration, re-configuration, and sustenance

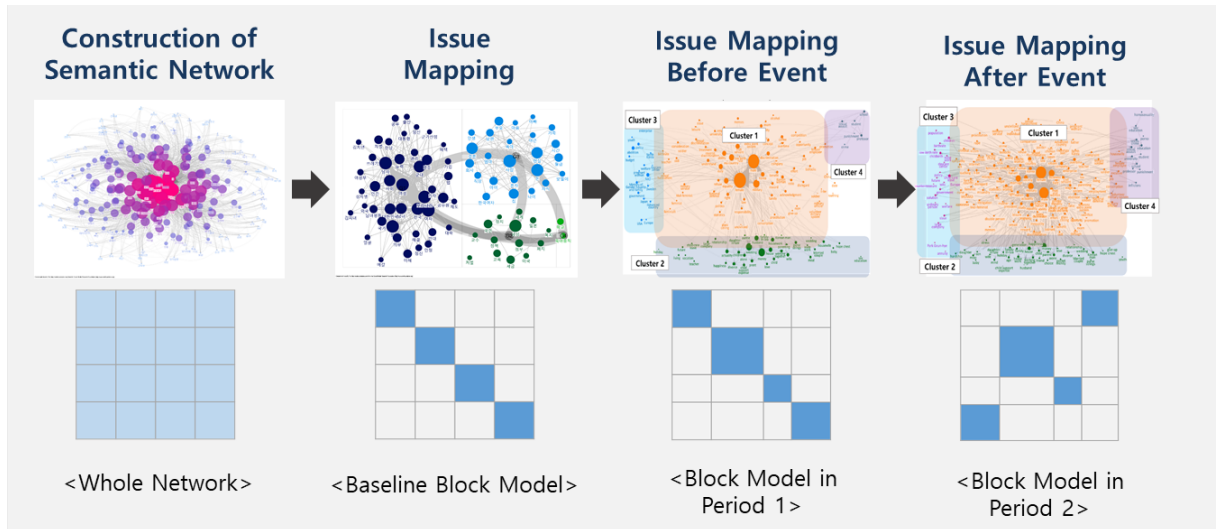


Figure 7. Analysis Method in this paper to detect emerging issues and their changes.



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