

## An Analysis of Public Conflict Research Trends in Korea Using Social Network Analysis

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### Abstract

*The purpose of this study is to analyze the trend of public conflict research in Korea since 2000 using a social network analysis. The subjects of this study were theses on public conflict. After extracting keywords from 80 theses in the RISS, degree centrality, betweenness centrality, and closeness centrality were analyzed using the social network analysis method. The results showed that the conspicuous research topics were conflict management and governance to solve public conflicts, and public policy tended to be researched alongside other keywords. The most researched subject was unwelcomed facilities, which implies that in most cases, conflicts occurred and developed due to the resistance of residents to the policy promotion and the location selection of unwelcomed facilities. Furthermore, studies on unwelcomed facilities showed strong connectivity with such keywords as environment, trust, and communication, which suggests that many studies have been conducted to solve conflicts. This study will contribute to the understanding and activation of public conflict research by presenting the future development directions for public conflict research in Korea.*

**Keywords:** SNA (social network analysis), research trends, public conflict, degree centrality, closeness centrality, betweenness centrality

### 1. Introduction

Public conflict means a conflict that has been caused by values, objectives, or means that are incompatible among interested parties in the process of public policy or legislation promoted by central or local governments, which have resulted in serious socioeconomic consequences and required government intervention or involvement (Lim, 2010). Public conflicts are characterized by a large number of interested parties, complex interconnections between conflicting issues, and a challenge of identifying alternatives or solutions that are satisfactory to all the interested parties (Ha, 2007).

Public conflict is a field that is considered important by the government; therefore, it has been researched continuously in various disciplines in regards to the policy basis. However, it is difficult to determine how many studies are currently being conducted and in which specific directions.

Recently, social network analysis (SNA) has been used as a new research method to improve the limitations of previous research methods for research trends (Wasserman & Faust, 1994). SNA visualizes the structure of a network based on various connected data to understand how the data are connected to each other by finding nodes at important positions (Lee, 2013). Studies analyzing the research trends using SNA include a study

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that analyzed the research trends for the domestic and international education of gifted children (Yoon *et al.*, 2016) and a study on the research trends for career education in the field of science education (Shin, 2017). The present study aims to present a better direction for the development of public conflict research by comparing and analyzing the status of public conflict research since 2000 using SNA in order to discuss the implications of the findings.

## 2. Research Methods and Analysis

The core concepts of SNA include degree, density, degree centrality, closeness centrality, betweenness centrality, and any structural holes. Degree refers to the number of other nodes to which a node is connected. Density is the ratio of actual relations to the total possible relations. Density is generally inversely proportional to the size of a group.

The representative centralities used as a result of SNA are degree centrality, closeness centrality, and betweenness centrality. Degree centrality, which indicates the number of connected nodes, is a good measure of local centrality. Closeness centrality is a centrality measure that considers directly and indirectly connected relations where a theme keyword appears with other theme keywords together in a thesis (Lee, 2006). Due to the nature of closeness centrality, a theme keyword with a high closeness centrality has a high influence on the total knowledge map. Betweenness centrality is a centrality measure that indicates how much a theme keyword acts as a 'bridge' between two specific theme keywords that are not directly interlinked. A theme keyword with a high betweenness centrality can have the effect of linking theme keywords that have not been used together in previous studies. Therefore, when searching for new research areas or topics for interdisciplinary or convergent research, it may be effective to focus on the theme keywords with a high betweenness centrality (Park *et al.*, 2016).

### 2.1. Subjects of Study

In this study, three researchers selected 80 theses by searching the theses published in academic research information services since 2000. The numbers of theses on public conflict by year are as follows.

**Table 1. Annual Number of Theses**

Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Number of theses	1	5	8	7	3	10	10	7	6	7	8	8

As a result of searching theses published since 2000, it was found that the first thesis on public conflict was published by Doo-Hwan Kim in 2006, who investigated the factors influencing the resolution of public policy conflicts. In particular, many theses were published in 2011 and 2012. The most preferred research method of theses on public conflict was case study during this time period. Some theses used a mixture of case study and empirical research or an empirical research method based on surveys and existing data.

**Table 2. Research Methods**

Research Method	Number of Cases
Case studies	62
Combination of case and empirical studies	7
Empirical studies	5
Q-methodology	2
Cross-tabulation analysis	1
Network analysis	1
Simulation	1
Frame analysis	1
Total	80

The subjects of public conflict research are an important issue in a case study and are largely divided into unwelcomed facilities and welcomed facilities as well as development and redevelopment. In particular, unwelcomed facilities was the most studied subject in public conflict research. This means that in most cases, conflicts occurred and developed due to the resistance of residents to a policy promotion and the site selection of unwelcomed facilities.

**Table 3. Objects of Conflict**

Object of conflict	Number of theses
Non-preferred facilities	47
Preferred facilities	5
Development	4
Redevelopment	13

The keywords, which are specified in the thesis by the authors to identify the main themes of their theses, were used as raw data. We analyzed the degree centrality, closeness centrality, and betweenness centrality using NetMiner4.2 to understand the roles and knowledge structure inherent in the theme keywords.

## 2.2. Social Network Analysis

The keywords specified in theses by authors to identify their main themes were used as raw data. The analysis of collected data was divided into preprocessing, network creation, analysis, and diagramming of the steps. The weight indicating the degree of connectivity between nodes in the SNA is a relative weight. This means that the higher the weight and the higher the frequency of simultaneous appearance, the higher the connectivity is between the keywords. As shown in Table 1, military facilities, governance, unwelcomed facilities, and negotiation all demonstrated a high value of connectivity with conflict management, and unwelcomed facilities had a high value of connectivity with location.

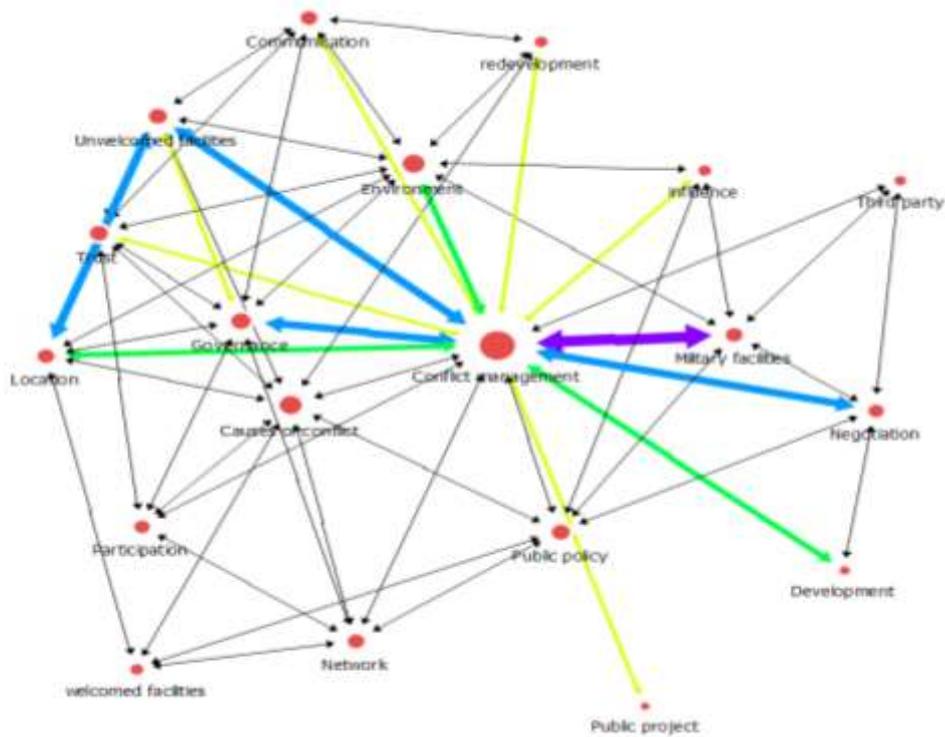
**Table 4. Weight Higher Order of the Keywords used in Public Conflict since 2000**

	node1	node2	Weight
1	Conflict management	Military facilities	5
2	Military facilities	Conflict management	5
3	Conflict management	Governance	4
4	Conflict management	Unwelcomed facilities	4
5	Conflict management	Negotiation	4
6	Governance	Conflict management	4
7	Unwelcomed facilities	Conflict management	4
8	Unwelcomed facilities	Location	4
9	Location	Unwelcomed facilities	4
10	Negotiation	Conflict management	4

Degree centrality, closeness centrality, and betweenness centrality were analyzed using the SNA in order to investigate the roles and knowledge structure inherent in the theme keywords.

### 2.2.1. Degree Centrality Analysis

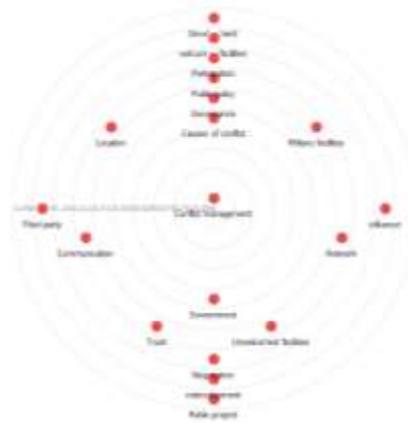
In the SNA, degree centrality indicates how much the theme keywords related to other theme keywords. Degree centrality is a measure of the degree to which a node is located at the center of a network. The larger the value, the more intertwined with other nodes and the more central role that the keyword plays in the network. A keyword with a high degree centrality is used frequently in conjunction with other keywords in the thesis, and this means that the keyword is used frequently as a research theme (Ko *et al.*, 2013). Degree centrality analysis showed that conflict management had the highest degree centrality and was at the center. Besides that, environment, conflict factors, governance, trust, and unwelcomed facilities also appeared. Figure 1 shows the results of the degree centrality analysis of the theme keywords.



**Figure 1. Degree Centrality of Theme Keywords in the Field of Public Conflict since 2000**

**Table 4. Degree Centrality of Theme Keywords in the Field of Public Conflict since 2000**

	In-Degree Centrality	Out-Degree Centrality
Conflict management	0.944444	0.944444
Environment	0.5	0.5
Causes of conflict	0.5	0.5
Governance	0.444444	0.444444
Trust	0.388889	0.388889
Unwelcomed facilities	0.388889	0.388889
Public policy	0.388889	0.388889
Location	0.333333	0.333333
Communication	0.333333	0.333333
Network	0.333333	0.333333
Military facilities	0.333333	0.333333
Negotiation	0.277778	0.277778
Participation	0.277778	0.277778
Urban development	0.222222	0.222222
influence	0.222222	0.222222
welcomed facilities	0.222222	0.222222
Third party	0.166667	0.166667
Development	0.111111	0.111111
Public project	0.055556	0.055556



**Figure 2. Degree Centrality Concentric Map of Theme Keywords in the Field of Public Conflict since 2000**

### 2.2.2. Betweenness Centrality Analysis

Betweenness centrality, a concept proposed by Freeman (1977), is a measure of the position of a node between other nodes in a network. The betweenness centrality is high if a node is located on the shortest path between various nodes or if it connects different groups. In the network of keywords related to public conflict, conflict management had the highest betweenness centrality. In general, degree centrality is proportional to the betweenness centrality to some degree, but the nodes that show a difference between degree centrality and betweenness centrality are likely to play a special role in the network. In the present study, public policy showed a distinct difference between degree centrality and betweenness centrality. Because betweenness centrality indicates how conspicuous the network bridge's role is, if a specific theme keyword is more open to other theme keywords, its betweenness centrality can be greater than the degree centrality. In other words, a public policy whose betweenness centrality is greater than degree centrality means that it is being studied in conjunction with other theme keywords.

**Table 5. Betweenness Centrality of Theme Keywords in the Field of Public Conflict since 2000**

	Node Betweenness Centrality
Conflict management	0.462834
Causes of conflict	0.064359
Public policy	0.051139
Environment	0.050376
Governance	0.024282
Location	0.02351
Network	0.019925
Military facilities	0.017429
Negotiation	0.014379
Trust	0.010616
Unwelcomed facilities	0.00816
Communication	0.005447
Welcomed facilities	0.003813
Redevelopment	0.003535
Participation	0.002723
Influence	0.002179



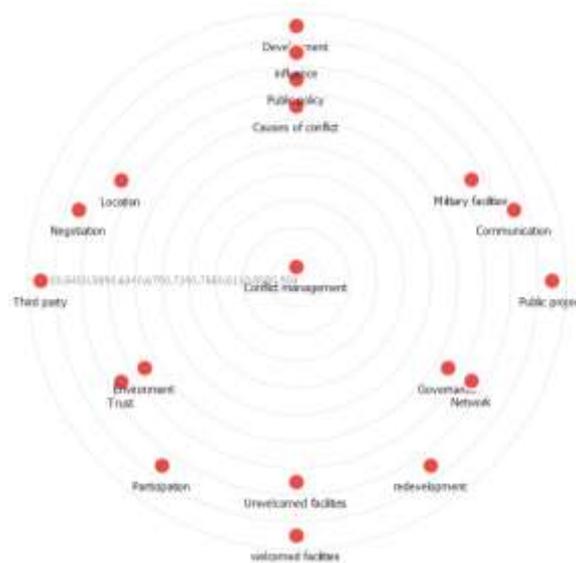
**Figure 3. Betweenness Centrality Concentric Map of Theme Keywords in the Field of Public Conflict since 2000**

**2.2.3. Closeness Centrality Analysis**

Closeness centrality indicates how close a node is to the center in a network. It is a representative measure of the overall centrality of a node and can be measured by the closeness or distance to other nodes. A node with the smallest sum, which would result from the shortest distances, is obviously the node at the center. The closeness centrality analysis can determine which keyword has the largest general impact across the network. The keyword with the highest closeness centrality is located at the shortest distance from all other keywords and can be regarded as a keyword having a high degree of influence. The analysis results showed that conflict management was the keyword with the highest closeness centrality. Besides that, environment, conflict factor, governance, and trust all showed high closeness centralities. In other words, these keywords were closest to the other nodes in the network.

**Table 5. Closeness Centrality of Theme Keywords in the Field of Public Conflict since 2000**

	In-Closeness	Out-Closeness
<b>Conflict management</b>	0.947368	0.947368
<b>Environment</b>	0.666667	0.666667
<b>Causes of conflict</b>	0.666667	0.666667
<b>Governance</b>	0.642857	0.642857
<b>Trust</b>	0.62069	0.62069
<b>Unwelcomed facilities</b>	0.62069	0.62069
<b>Public policy</b>	0.62069	0.62069
<b>Location</b>	0.6	0.6
<b>Network</b>	0.6	0.6
<b>Military facilities</b>	0.6	0.6
<b>Negotiation</b>	0.580645	0.580645
<b>Participation</b>	0.580645	0.580645
<b>Communication</b>	0.580645	0.580645
<b>Redevelopment</b>	0.5625	0.5625
<b>Influence</b>	0.5625	0.5625
<b>Third party</b>	0.529412	0.529412
<b>Development</b>	0.514286	0.514286
<b>Welcomed facilities</b>	0.5	0.5
<b>Public project</b>	0.5	0.5



**Figure 4. Closeness Centrality Concentric Map of Theme Keywords in the Field of Public Conflict since 2000**

### 3. Conclusion

The purpose of this study is to examine the flow of knowledge structure and knowledge mapping in the field of public conflict since 2000. The results of the study are as follows. For the research methods of public conflict, 62 of the 80 theses used the case study method. They investigated specific cases and suggested solutions for conflict management based on those cases. On the other hand, quantitative research to secure objectivity according to the characteristics of common cases were also conducted occasionally.

The subjects of the public conflict research in the 80 theses were unwelcomed facilities and redevelopment cases based on the order of frequency. This result suggests that there are many public conflicts that result from unwelcomed facilities, such as radioactive waste sites, nuclear power plants, the Miryang Transmission Tower, the Jeju naval facility, and thermal power plants.

The top keywords were conflict management and governance to resolve public conflicts. Keywords related to the conflict factors used to understand the nature of conflict also appeared. In addition, as there were many case studies, the keywords corresponding to the types of cases, such as location, environment, development, and redevelopment, were also used in combination. Meanwhile, public policy demonstrated a low degree centrality but a high betweenness centrality. This suggests that public policy is researched in conjunction with other keywords because betweenness centrality is a measure of how conspicuous the bridge role of a node is within a network. In other words, public policy is being researched in combination with a wide range of fields that goes beyond the research scope of public policy.

The limitations of this study and suggestions for future research are as follows. First, there are many theses on a single case of public conflict. Therefore, in order to achieve objectivity, quantitative studies using various research methods, such as multi-case comparative research and empirical research, are needed. Second, many studies focused on redevelopment and development and the location of unwelcomed facilities, such as nuclear power plants and radioactive waste sites, which are developed through government policy. Therefore, in order to solve complex and diverse public problems, conflict cases in various fields should be considered as research subjects.

As a trend analysis study centered on theses only, this study may have limitations in regards to public conflict research. Thus, future studies should use various forms of research materials to provide additional data for public conflict research.

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