

A Study of Thematic Hotspots and Evolution in International Online Public Opinion Over the Past Three Decades

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Abstract

Abstract: Purpose/Significance Conducts a visualized analysis of thematic hotspots and evolution in international online public opinion research over the past three decades, providing references for Chinese scholars to clarify the developmental trajectory of this field and rapidly identify its core research issues and hot topics. Research Design/Methods Retrieved 3,084 pieces of online public opinion literature from 1993-2022 via WoS, utilized VOSviewer for performance analysis and scientific mapping, and employed SciMAT to examine thematic evolution across three consecutive periods. Conclusions/Findings Created term co-occurrence maps to identify major term clusters, used co-citation of citation sources to discover influential journals, employed co-citation analysis of cited references to identify influential publications, utilized co-citation analysis of cited authors and bibliographic coupling links to determine influential authors and countries, and then used SciMAT to derive the thematic evolution across three consecutive periods. Innovation/Value Employs scientific mapping and performance analysis to conduct an in-depth dissection of existing international online public opinion studies, where scientific mapping visualizes the research structure of this field and performance analysis focuses on metrics of various aspects.

Full Text

Preamble

Research on Theme Hotspots and Evolution in International Network Public Opinion Over the Past Thirty Years

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Abstract

[Purpose/Significance] This study visually examines theme hotspots and evolution in international network public opinion research over the past three decades, providing Chinese scholars with a reference for clarifying the developmental trajectory of international network public opinion and rapidly identifying core research areas and emerging issues.

[Research Design/Methodology] We retrieved 3,084 network public opinion documents from 1993–2022 via Web of Science, employed VOSviewer for performance analysis and scientific mapping, and utilized SciMAT to examine thematic evolution across three consecutive periods.

[Conclusions/Findings] We created term co-occurrence maps to identify major term clusters, used co-citation of citation sources to identify influential journals, applied co-citation analysis of cited references to identify impactful publications, and employed co-citation analysis of cited authors and bibliographic coupling to identify influential authors and countries. SciMAT was then used to map thematic evolution across three consecutive periods.

[Innovation/Value] This study employs scientific mapping and performance analysis to deeply dissect existing international network public opinion research. Scientific mapping visualizes the field's research structure, while performance analysis focuses on indicators of various items.

Keywords: network public opinion; bibliometrics; VOSviewer; SciMAT; theme evolution; cluster analysis

Classification Number: G251

1. Introduction

From a national perspective, public opinion represents the concentrated expression of popular will, reflecting the voice of the people and expressing their aspirations. Public opinion constitutes the initial manifestation of people's cognition, attitudes, emotions, and behavioral tendencies—it can be fragmented and unsystematic, does not require majority endorsement, and represents a simple aggregation of diverse viewpoints [1]. The earliest Western proponent of the concept of “public opinion” (Opinion publique) was Rousseau of France. In many contexts, both public opinion and popular will use this term. Although academia has not reached a consensus on the definition of public opinion, there is general agreement that citizens' opinions constitute its main subject. Therefore, this paper understands public opinion as the aggregate of people's attitudes, viewpoints, and emotions toward certain events, without making fine distinctions among public opinion, consensus, and popular will. This generalized understanding aligns with the Western meaning of our search query: (TI=(public opinion)) OR TI=(public sentiment).

2. Research Tools and Data Analysis

This study employs VOSviewer and SciMAT as research tools. VOSviewer creates bibliometric networks of different items (such as keywords, authors, institutions, etc.) using various network analysis methods (including co-citation, term co-occurrence, and bibliographic coupling) [2]. SciMAT is a new open-source scientific mapping software tool developed by the University of Granada, Spain. It integrates the advantages of existing scientific mapping tools while reducing dependence on third-party software. Compared with other software, SciMAT offers several advantages: (1) it assists analysts from data collection and preprocessing to visualization and interpretation of results; (2) it combines methods for constructing most bibliometric networks, normalizes them using different similarity measures, employs clustering algorithms to construct maps, and utilizes different visualization techniques for output interpretation; (3) it features powerful preprocessing functions to clean raw data; and (4) based on bibliometric methods, it scientifically analyzes literature data according to h-index, hg-index, and q2-index to construct scientific maps that enable researchers to quickly identify clusters and evolution areas of interest [3].

We selected the Web of Science Core Collection (hereinafter WOS) as our database, with the search query (TI=(public opinion)) OR TI=(public sentiment), document type limited to articles, and time span from 1993 to 2022. The search was conducted on December 15, 2022. We used WOS filtering functions to exclude articles from irrelevant categories such as soil science, mechanics, and physics. This process yielded 3,084 records, from which we exported “full records and cited references” for analysis using SciMAT and VOSviewer.

3.1 Publication Trends

Analyzing publication volume trends provides an excellent means to assess research dynamics and future development trajectories in a field. From 1993 to 2022, international publications in the network public opinion field grew rapidly, with a maximum range of 289 articles. Specifically, Figure 1 [Figure 1: see original paper] shows that until 2009, only a few studies on network public opinion were published annually. During the first period (1993–2009), publication volume suddenly doubled by 1998, likely related to the popularization of computers and the continuous development of social media. The average annual publication volume during this period was 51 articles. In the second period (2010–2017), publication volume tended toward stable development, with an average of 119 articles per year. In the third period (2018–2022), publication volume grew rapidly again, reaching an average of 252 articles annually, and surpassing 300 for the first time in 2021 with a peak of 329 articles. These publication trends demonstrate vigorous development in international network public opinion research over the past three decades, reaching its zenith in 2021.

3.2 Term Co-occurrence Analysis

We employed term co-occurrence analysis to identify major thematic clusters, each composed of several frequently occurring terms. Setting a minimum threshold of 25 keywords produced the analysis output shown in Figure 2 [Figure 2: see original paper]. In this figure, node size and link thickness directly represent term frequency and connection strength. The following terms demonstrated prominence in both frequency and connectivity: public opinion, attitudes, support, impact, social media, and perceptions. The high frequency and connectivity of “public opinion” is unsurprising, as it was included in our search terms. Figure 2 reveals five major thematic clusters focusing on: (1) social media and sentiment analysis in national social life (purple cluster); (2) perceptions and knowledge (green cluster); (3) public opinion and preferences (blue cluster); (4) impact and information (red cluster); and (5) attitudes and support (yellow cluster).

The **purple cluster**, with the fewest terms, emphasizes the mediating role of social networks. Related terms include social media, sentiment analysis, Twitter, and COVID-19. Anstead’s case study of the 2010 UK general election concluded that using social media as a tool for understanding and explaining public opinion was beginning to enter mainstream media discourse [4]. Chang employed non-probability sampling through online questionnaires to survey American college students, finding that opinion leadership tends to increase Twitter users’ political engagement and providing new perspectives on opinion leadership’s role in social media environments [5]. Kwon utilized early rumor research as a theoretical framework for Twitter public opinion text analysis, conducting content and semantic network analysis of Twitter messages disseminated during the 2013 Korean saber-rattling period. The study concluded that online rumor analysis helps understand the interaction between society’s collective memory and current situational uncertainty in forming public opinion and sentiment [6]. Zhang et al. used data from Dutch Twitter users and longitudinal survey respondents to quantify spatiotemporal variations in public opinion and public sensitivity to important events, demonstrating consistency between Twitter data analysis and survey methods in describing overall positions on social distancing and temporal trends [7].

The **green cluster** focuses on perceptions and views of public opinion, with related terms including perceptions, knowledge, trust, and views. Scheufele et al. studied perceptions of public opinion distribution and its impact on public opinion expression using data from the 1996 U.S. national election, outlining influences on political participation and public opinion expression research [8]. Chew et al. used an information monitoring system to conduct content analysis of H1N1-related tweets, enabling health authorities to respond to public concerns through real-time content analysis of public opinion [9]. David analyzed unique data from the peak of Israel’s 2011 summer protests, demonstrating that perceptions of public opinion and media use indeed influenced the development of the 2011 social movement, providing empirical insights into how perceptions

of public opinion and media use affect political behavior [10].

The **blue cluster** emphasizes dynamic changes in democratic opinion, with related terms including public opinion, preferences, democracy, and dynamics. Rodolfo studied two images of Mexican public opinion, showing that while Mexican voters have rational political preferences, Mexican political views are incoherent, thus questioning the rationality of Mexican political opinion preferences [11]. Timothy et al. summarized methods for analyzing the significance of immigration preferences or poll data, comparing public opinion salience with news coverage data to conclude that features related to anti-immigration preferences differ from those associated with high salience [12].

The **red cluster** focuses on the impact of media information, with related terms including impact, information, media, and behavior. Agnone tested hypotheses regarding the impact of protests and public opinion on U.S. environmental legislation passage, introducing a policy impact model that found public opinion's influence on policy extends beyond its independent effects [13]. Wang et al. collected questionnaire data from construction enterprises in China's Chengdu-Chongqing economic circle to study the influence mechanism of environmental public opinion pressure on corporate green innovation behavior, finding that environmental public opinion pressure significantly and positively affects green innovation behavior, while environmental regulation also enhances corporate sensitivity to environmental public opinion pressure, thereby strengthening the relationship between pressure and innovation behavior [14].

The **yellow cluster** emphasizes public attitudes toward and support for policies, with related terms including attitudes, support, and politics. Maguire et al. examined the dimensional structure of public attitudes toward crime policy, hypothesizing and testing a multidimensional conceptualization of crime policy attitudes across seven countries, demonstrating that public opinion is multidimensional in all cases [15].

3.3 Most Influential Journals

According to Van Eck and Waltman, co-citation represents the link between two documents cited by the same publication [16]. We used "co-citation of citation sources" to identify the relative importance of different journals in the field's development, with a threshold of at least 140 citations per source. The results show high correspondence between the clusters in Figure 2's term co-occurrence map and Figure 3's co-citation analysis of citation sources. As shown in Figure 3 [Figure 3: see original paper], journals such as *American Political Science Review*, *American Journal of Political Science*, *Public Opinion Quarterly*, *Journal of Politics*, *Nature Communications*, and *British Journal of Political Science* demonstrate substantial influence. The red cluster primarily concerns media information impact issues, showing strong associations with communication, library science, and statistics, with relevant journals including *Public Library of Science*, *Nature Communications*, and *Physica A: Statistical Mechanics and its*

Applications. The green cluster addresses issues related to public opinion and politics, appearing in journals such as *Public Opinion Quarterly*, *American Journal of Political Science*, and *Journal of Politics*. The yellow cluster focuses on social public opinion and policy attitudes, concentrating in journals like *Journal of Personality and Social Psychology* and *Political Psychology*. The purple and blue clusters are closely related, both covering political issues and concentrating in journals such as *American Political Science Review* and *British Journal of Political Science*.

3.4 Most Influential Publications

We used co-citation analysis of cited references to identify the most influential publications, with a citation threshold of 25. The analysis results are shown in Figure 4 [Figure 4: see original paper]. The findings indicate that works by Zaller, Page, and Erikson have substantial influence, with these clusters corresponding well to those introduced previously. The results show that publications in the red and yellow clusters focus primarily on media information and public opinion attitudes, mainly represented by Zaller, Entman, Chong, and Nelson. Other clusters also contain influential publications, with Soroka, Erikson, and Page conducting research on public opinion perception issues.

3.5 Most Influential Authors and Countries

We employed co-citation analysis of cited authors to identify the most influential scholars. Figure 5 [Figure 5: see original paper] presents analysis results for authors with at least 65 citations each. The following authors have significantly influenced international network public opinion research: Druckman, Iyengar, Page, Wlezien, and Zaller. The cluster analysis in Figure 5 shows some similarities but also differences from previous sections. Distinguished authors in the red cluster primarily focus on media information impact research, including Zaller, Druckman, Iyengar, and Converse. Distinguished authors in the green and yellow clusters concentrate on research regarding public opinion's influence on policy, including Page, Wlezien, Inglehart, and Gibson. The purple cluster is closely related to both red and yellow clusters, indicating these authors' research connects media information impact with public opinion's political influence, with notable scholars including Holsti and Berinsky. The blue cluster represents research using computers to analyze public sentiment, with key authors Lippmann and Scheufele.

We used bibliographic coupling to identify which countries (based on author institutional addresses) have greater influence on the field's development. Here, we employed country-of-affiliation coupling, a type of bibliographic coupling where links exist between items that cite the same document [16]. Figure 6 [Figure 6: see original paper] shows bibliographic coupling analysis results for countries with at least five publications. As shown in Figure 6, research in international network public opinion primarily originates from the United States,

China, United Kingdom, Germany, Netherlands, and Australia. This indicates that research in this field is centered on developed countries such as the United States, with China being one of the few developing countries demonstrating significant influence. The analysis reveals that existing international network public opinion research heavily relies on developed countries in Europe and America, which maintain close connections, indicating frequent collaborative projects and numerous co-publications.

4.1 Topic Structure

We used SciMAT to examine the topic structure and evolution of international network public opinion research. The strategic diagram is one of SciMAT's outputs, providing information about each period's thematic structure. Strategic diagrams classify topics into four categories: "motor themes," "basic and transversal themes," "highly developed and isolated themes," and "emerging or declining themes" [17]. Figure 7 [Figure 7: see original paper] presents strategic diagrams for the three research phases, where node size is proportional to the number of articles associated with each theme.

Phase 1 (1993-2009): As shown in Figure 7, this phase featured six major themes: "public opinion," "public," "attitudes," "democracy," "evaluation," and "community." The limited number of themes reflects the field's nascent stage. Motor themes during this period were "democracy" and "community," focusing on political democracy and community public opinion research, with Hindman examining the interaction between democracy and community [18]. Basic and transversal themes were "attitudes" and "evaluation," addressing public attitudes and policy evaluation research, such as Vogel et al.'s study on public opinion evaluation of juvenile capital punishment policies [19]. No highly developed and isolated themes existed yet, but "attitudes" and "public opinion" showed trends toward becoming highly developed and isolated themes. Emerging or declining themes were "public opinion" and "public," which had substantial literature, indicating they were emerging themes gradually developing toward highly developed status.

Phase 2 (2010-2017): As shown in Figure 7, the field's key themes diversified during this period. The four motor themes were "homosexuality," "behavior," "public opinion polls," and "social networks," addressing public opinion surveys and individual behavior research based on social networks. Gaidys distinguished attitudes toward public opinion from public opinion polls, discussed poll functions, presented main directions of poll criticism, and examined freedom in publishing poll results and the globalization of public opinion research [20]. Lee tested how online comments and poll results affect public acceptance of others' online comments, attitudes toward companies, and willingness to voice opinions on social media, finding that these effects interact with individuals' prior attitudes toward companies [21]. Basic and transversal themes included "policy," "environment," "perception," and "conflict of interest," with numerous studies examining public perceptions and discussions of government policies.

Phase 3 (2018–2022): During this phase, publication volume increased substantially, with more themes emerging, indicating the field’s expanding knowledge base. Motor themes included “public opinion,” “neural networks,” “questionnaire surveys,” and “opinion dynamics,” with development primarily centered on integrating themes around “public opinion,” which became the research focus and closely related to previous themes of “public opinion” and “public opinion polls.” Maeda reviewed the history of public opinion polling since 1945, arguing that methodological changes enabled newspapers to conduct and report polls quickly and frequently, strengthening the connection between approval ratings and ongoing political processes [22]. Chen et al. identified key factors influencing network public opinion formation, introduced information intensity to describe how external information characteristics affect formation, and analyzed individual education level, individual stubbornness, and initial individual opinions to describe internal factors’ influence, thereby constructing a model. Simulation experiments revealed the impact of internal and external factors on network public opinion formation processes [23]. “Public opinion” moved to the highly developed and isolated theme quadrant during this phase, indicating that after a period of development, this theme had matured and transitioned from emerging to highly developed status.

4.2 Conceptual Evolution

We used keyword overlay maps (Figure 8 [Figure 8: see original paper]) and thematic evolution maps (Figure 9 [Figure 9: see original paper]) to interpret the field’s conceptual evolution. As shown in Figure 8, the number of keywords increased over time (numbers inside circles), consistent with our previous discussion about the expanding knowledge base. Across the three consecutive phases, the number of shared keywords increased from 41 to 74, indicating a certain degree of integration in keywords used across periods. Themes continuously disappeared (outward arrows) and emerged (inward arrows), demonstrating the field’s ongoing development. Figure 9 supports our previous conclusion that research on public opinion and democracy has received increased attention, constituting the field’s main continuous thematic area.

Conclusion

International network public opinion research has produced substantial literature over the past three decades. This paper’s primary objective was to conduct bibliometric analysis of international research from the past thirty years using text mining and scientific mapping tools. By mapping existing literature and providing performance analysis, this study complements related research and explores the field’s overall conceptual evolution.

Bibliometric analysis and scientific mapping using VOSviewer identified five major thematic clusters. The primary cluster focuses on public opinion research, while the other four clusters emphasize research on public opinion perceptions,

media information impact, public attitudes toward policies, and social networks' mediating role in public opinion. VOSviewer analysis also provided information on influential journals, authors, and countries associated with these five clusters. This analysis found that while international network public opinion research shows close connections among countries, the field' s research is concentrated primarily among developed countries in Europe and America. Future research should strengthen collaborative efforts with developing countries.

Regarding conceptual evolution, SciMAT analysis across three sub-periods (1993-2009, 2010-2017, and 2018-2022) indicates that themes related to “public,” “public opinion,” “democracy,” and “attitudes” persisted throughout the entire research period. Over time, the field' s knowledge base continuously expanded, with increasing emphasis on the importance of public opinion research. These results show some similarity to VOSviewer analysis findings.

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Note: Figure translations are in progress. See original paper for figures.

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