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A scientometric analysis of e-participation research

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Abstract

Purpose – Due to the increasing demand for public services, as a new form of public governance, e-participation has emerged. Scholars from various disciplines have published plenty of research results on e-participation. This paper aims to reveal the research status frontiers directly by mapping knowledge domains.

Design/methodology/approach – The authors take 1,322 articles on e-participation published in Web of Science from 2001 to 2017 as research object. They then run the information visualization software CiteSpace to drill deeper into the literature data.

Findings – The study found that e-participation research has the obvious interdisciplinary feature; the author and institution cooperation networks with less internal cooperation are relatively sparse; the USA ranks first in the field of e-participation research, followed by the UK, with the other countries lagged behind; and e-participation through social media is gradually becoming the new research focus.

Originality/value – Based on the objective data and information visualization technology, the research intuitively reveals the research status and development trend of e-participation.

Keywords Social media, E-participation, Citation bursts, Co-occurrence network, Cooperation network, Time-zone

Paper type Literature review

1. Introduction

Since the 1990s, the internet has continuously brought about tremendous changes in human life. In the real world, internet has been integrated into government affairs. For example, the USA took the lead in e-government. In 1993, the Clinton Administration established the "National Performance Evaluation Committee" and proposed to improve public service through e-government. In 2016, 120 countries out of 193 member states have developed electronic decision tools (Nations, 2016).

The increasing popularity of e-participation has attracted more and more scholars to devote themselves into the e-participation research Citizens participated in environmental

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governance through GeoTools or EoC platform (Kingston *et al.*, 2000; Kingston, 2008). After the earthquake and tsunami, Onagawa in Japan implemented an online participatory mechanism (Aoki, 2017). The online and offline participation models of budget system in Guangzhou, South Korea, had different impacts on decision-making (Lim and Oh, 2016). MD Robbins conducted a web-based survey at the town of West Hartford which allowed real-time interaction, asking respondents to weigh options between service level and tax amounts to help decision makers better understand citizen preferences (Robbins *et al.*, 2008).

Patrick Dunleavy proposed the concept of digital governance, emphasizing the importance of e-government and network participation (Dunleavy *et al.*, 2006). The development of e-participation is divided into four stages, that is, the "bulletin board" stage, "partial service delivery" stage, "portal with secure operability and integral service" and "interactive democracy" stage (West, 2011). This clearly indicates that democracy and civil rights are the future trend of e-government. Some scholars use comparative research method to analyze the status of e-participation in various countries. Andrew Chadwick studied the online political operational mechanism in countries such as the USA and UK and demonstrated the impact of internet on local democracy, social movements, and elections (Chadwick, 2010). Nahleen Ahmed analyzed the status quo of e-government in the USA, UK, Singapore, Canada and other countries based on information acquisition, online services and interaction and then pointed out their respective advantages and disadvantages (Ahmed, 2006).

The e-participation creates a dialogue between the public and the government. Through studying e-participation systematically and comprehensively, we can know the ways in which government improve the form, channel and process of e-participation. Finally, it distinctly helps the government understand what the public is thinking and how to put it into practice. So, it is valuable to reveal the status and frontiers of e-participation.

To more fully and objectively grasp the status quo and refine research hotspots of e-participation research, we use CiteSpace to analyze the e-participation research literature retrieved from the Web of Science Core Collection database from 2001 to 2017.

2. Method and data collections

2.1 Method

Visual analysis of citations is an important branch of information visualization. It first processes a large amount of citation data and then uses information visualization technology to make it easier for people to find hidden patterns (Yunjing and Hanqing, 2007). To more fully grasp the development of e-participation research, we selected CiteSpace for visual analysis. CiteSpace is a multi-dimensional, time-sharing and dynamic information visualization tool developed by Professor Chen Chaomei of Drexel University in the USA. It has the analysis functions of cooperation network co-occurrence network and burst detection function which can be used to identify new research hotspots and frontiers (Yue *et al.*, 2015; Chen, 2006). With the continuous optimization of algorithms and functions, CiteSpace has been widely used in more than 60 fields such as computer science, information science, and medical science (Jie and Chaomei, 2016). We use CiteSpace to conduct data mining and econometric analysis of e-participation research for grasping the evolutionary path and future trends.

2.2 Data collection

Integration of information and communication technologies (ICTs) into various fields of government affairs has been a topic of discussion. E-government refers to the use of ICTs to improve public service delivery, and that e-democracy is the follow-up phase of e-government

which refers to the use of ICTs to increase the participation degree of democratic governance (Gunter, 2006). E-government is initiated by government, whereas e-democracy involves multiple stakeholder initiatives (Gowda and Gupta, 2010). Therefore, e-government is the first step toward online democratic participation (Ingram and Smith, 1993). However, some scholars have divided the development of the e-government into four phases, namely, the "bulletin board" stage, "partial service delivery" stage, "portal with secure operability and integral services" and "interaction democratic" stage (West, 2011). We can see that only the fourth stage of "interactive democracy" includes citizens' participation. Therefore, e-government has a broader meaning than e-democracy. Then e-participation refers to support democratic decision-making by promoting deliberation between government and citizens through ICTs (Macintosh, 2004). J Millard criticized the definition and argued a more "administrative" perspective should be adopted, noting that e-participation is not only limited to the use of ICTs for democratic decision-making but also involves a series of processes that do not directly involve democratic decision-making but still use ICTs for participation (Millard, 2009). In this sense, e-participation belongs to the fourth stage of e-government.

However, many previous literature reviews on e-participation did not take into account the importance of participation resulting that e-government is equated with e-participation when be used in searching literatures (Zolotov *et al.*, 2018; Rodríguez-Bolívar *et al.*, 2018). Considering the inclusion relation between e-government and e-participation, we integrate e-government with participation; that is to equate "e-government AND participation" with "e-participation." Besides, many literature reviews did not take "citizen engagement" into consideration. However, we find that the literature with retrievable field containing "citizen engagement", not including keywords such as "e-government", "e-participation" and "e-democracy," is still related to the online deliberation between government and citizens (Medaglia and Zhu, 2017; Tettey, 2017; Ertiö and Bhagwatwar, 2017). Therefore, to ensure the authority of retrieved literatures and high recall ratio of the search query as much as possible, the following retrieval type (Table I) is adopted.

The data were retrieved from the Web of Science Core Collection database. Each data record mainly includes authors, title, abstract, keywords and citations. In consideration of the fact that the literatures published in 2018 have not yet been fully included in WoS, we

Keywords 1	Keywords 2	Keywords 3	Keywords 4
E-participation	E-governance AND participation	Citizen engagement AND internet	E-democracy
Electronic-participation	Electronic-governance AND participation	Citizen engagement AND social media	Electronic-democracy
	E-government AND participation	Citizen engagement AND information system	Democracy AND internet
	Electronic-government AND participation	Citizen engagement AND digital	Democracy AND social media
			Democracy AND information system
			Democracy AND digital

Notes: TS = ("e-participation" OR "electronic-participation" OR ("e-governance" AND participation) OR ("electronic-governance" AND participation) OR ("e-government" AND participation) OR ("electronic-government" AND participation) OR "e-democracy" OR "electronic-democracy" OR (democracy AND (internet OR social media OR "information system" OR digital)) OR ("citizen engagement" AND ("social media" OR digital OR internet OR information system")))

Table I.
Characteristics of advanced search

chose December 31, 2017, as the deadline. Time span was set "from 2001 to 2017". The language type was "English" and the document type was "ARTICLE". Based on the advanced search function of WoS, the retrieval type was continuously optimized and adjusted according to the search results. We obtained 1,367 literatures studies through the initial retrieval. After the non-related literatures including forms such as "i.e. participation" were removed 1,322 document data were finally obtained.

3. Basic distribution analysis

3.1 The number of annual publications distribution analysis

The number of annual publications is an important index for measuring the development of scientific research, as it reflects, to a certain extent, the changes in knowledge quantity. Therefore, the distribution of annual publications (Figure 1) can form a preliminary understanding of e-participation research. It can be seen that in 2014, the number of publications increases rapidly indicating e-participation began to receive high attention from academia. However, the number of publications remains nearly constant since 2015. This manifests that the scholars' research focus has stabilized, so it is necessary to summarize the previous research hotspots and then find breakthroughs to prepare for further research. On the whole, the number of publications has grown steadily from 15 in 2001 to 156 in 2017.

3.2 Journal distribution analysis

Journal analysis provides guidance for scholars to select platforms for data collection and publishing their research. The 1,322 selected studies are distributed in 447 core academic journals. Overall, the distribution of research literature is scattered. However, as can be seen from Table II, there are 20 academic journals with a total of ten or more publications which add up to 472, accounting for 35.7 per cent of the total. Among them, "Government Information Quarterly" tops the list with 88 publications, manifesting the journal greatly favors the subject of e-participation. "Information Communication Society" and "New Media Society" have issued more than 50 articles. In addition, journals with an impact factor greater than 2 account for 50 per cent of the 20 journals which proves there is a high possibility of publishing research papers on e-participation in high-level journals. It also proves that high-level research scholars and journals have begun to pay attention to e-participation, thus reflecting a certain degree of maturity in this field. In addition, the journals marked with *** and ** in the table are core magazines to which researchers should refer.

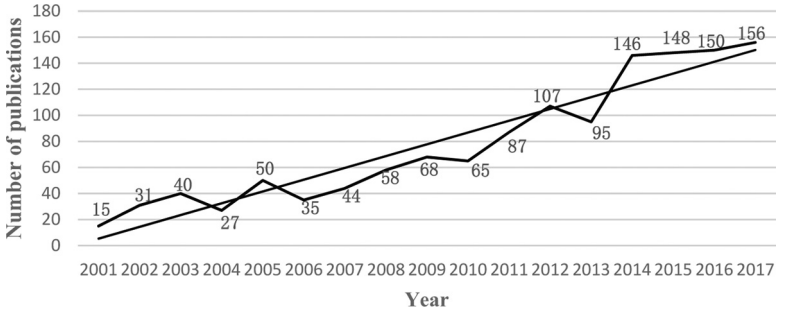

Figure 1.
Number of publications in e-participation area from 2001 to 2017

Rank	Journal title	Count	(%)	IF 2016
1	*Government Information Quarterly****	88	6.70	4.09
2	*Information Communication Society***	53	4.00	2.692
3	*New Media Society****	51	3.90	4.18
4	*International Journal of Communication**	30	2.30	1.498
5	*Javnost-the Public*	27	2.00	0.413
6	*Social Science Computer Review*	24	1.80	2.293
7	*Electronic Government Proceedings*	22	1.70	0.402
8	*Media Culture Society**	20	1.50	1.128
9	*Telematics and Informatics****	19	1.40	3.398
10	*International Journal of Press-Politics**	17	1.30	1.523
11	*Information Society**	15	1.13	1.558
12	*Computers in Human Behavior****	13	0.98	3.435
13	*Journalism**	13	0.98	1.484
14	*Political Communication***	13	0.98	2.467
15	*Public Administration Review****	13	0.98	3.473
16	*Electronic Government Proceedings*	12	0.91	0.402
17	*American Behavioral Scientist**	11	0.83	1.311
18	*Journal of Communication****	11	0.83	3.914
19	*Communication Research****	10	0.76	3.021
20	*European Journal of Communication**	10	0.76	1.408

Table II.
The top 20 journals in e-participation area

Notes: The *** in the table indicates that journals with an impact factor greater than 3 are the most important; ** indicates that journals with an impact factor greater than 2 are very important; * indicates that journals with an impact factor greater than 1 are important

3.3 Subject distribution analysis

Table III shows that e-participation research is interdisciplinary. The "Communication" discipline has the largest publication number, accounting for 30.33 per cent of the total which demonstrates e-participation mainly involves the interaction between government and citizens. "Information Science Library Science" ranks second with 259 publications, and "Computer Science" ranks fourth with 174 publications, indicating the importance of information technology in the field of e-participation. "Government Law" ranks third and "Public Administration" ranks sixth, both with the publication number more than 100. "Sociology" and "Social Sciences Other Topics" rank fifth and seventh, respectively, mainly because of the universality of sociological studies, including micro-level social actions and human interactions, as well as macro-level social systems and structures. The number of

Rank	Subject categories	Publication no.	(%)
1	Communication	401	30.33
2	Information Science Library Science	259	19.59
3	Government Law	200	15.13
4	Computer Science	174	13.16
5	Sociology	130	9.83
6	Public Administration	115	8.70
7	Social Sciences Other Topics	92	6.96
8	Business Economics	89	6.73
9	Area Studies	43	3.25
10	Psychology	37	2.80

Table III.
The top ten highly cited subject categories in e-participation area

"Area Studies" reaches 43, indicating that different regions may have different forms and development degrees of e-participation, thus attracting the attention of scholars in this field. In particular, it is worth noting that "Business Economics" and "Psychology" have entered the top ten, demonstrating that e-participation also involves the macro-development of business economy and micro-psychological factors. Therefore, e-participation research is an interdisciplinary field and it is extremely significant to strengthen the communication and cooperation among scholars in various fields.

4. Keywords analysis

4.1 Analyze the time-zone of keywords

The time that the node was first cited determines its time-zone position, making time-zone map take the evolution of knowledge as its core content (Yue, 2014; Jie and Chaomei, 2016). By plotting the time zone of keywords, we can obtain the dynamic process of the e-participation research from overall to each part (see Figure 2). In 2001, "democracy" has emerged as a keyword, indicating that the play of democratic nature through internet dates back to 2001 at the latest. In 2002, "communication" appeared, implying e-participation's main purpose is to facilitate communication between government and citizens. In 2003, "United States" appeared, which means that the USA takes the top spot in the field of e-participation. In contrast, "China" as a keyword began to appear in 2011. "E-government" first appeared in 2005, whereas "e-participation" appeared in 2008, further proving that e-participation belongs to the "interactive democracy" stage of e-government. In 2010, "social media" appeared for the first time as a keyword, indicating that the public has begun to participate in government administration through social media. Immediately thereafter, "Facebook" appeared in 2012 and "Twitter" began to appear in 2013.

4.2 Co-occurrence network and citation bursts of keywords

Keywords, as the core and entry point of an article, concisely summarize the research content. Combining Table IV and Figure 3, we find "democracy" cited 388 times is the largest node in the network, followed by "internet" cited 369 times and "social media" cited 196 times. But none of their centrality values enter the top ten. "Communication" with the centrality value of 0.07 is in the middle of the network which indicates the main purpose of e-participation is to strengthen the communication and continuously increase the degree of public participation in social governance. Then "United States," "community," "trust" and

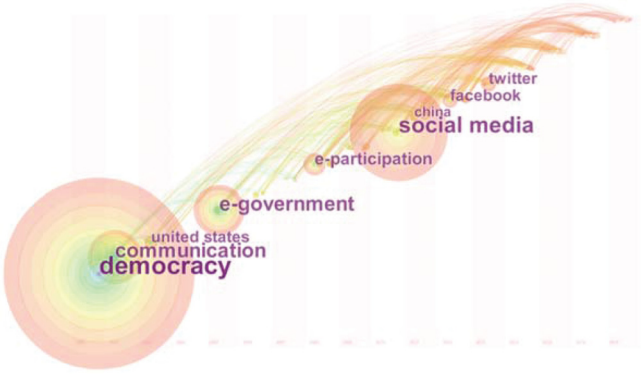

Figure 2.
The time-zone of keywords in e-participation area

"civil society" have a centrality value of 0.06, reflecting their important role in e-participation research.

The central node analysis can explore the key works, whereas burst detection is more suitable for detecting emerging trends and sudden changes in subject development (Chaomei *et al.*, 2009; Jie and Chaomei, 2016). Citation burst refers to the sudden increase of keyword in the literature. The citation bursts are sorted by starting time (Table IV). From 2009 to 2011, "web" and "media" began to emerge, indicating the government increasingly uses media and network to provide social governance channels for citizens. In 2012, "service" began to appear, which means that the level of e-participation has developed from simple information informing to the provision of complaint channels and consulting services. Between 2015 and 2017, keywords such as "journalism", "deliberation" and "twitter" emerged, showing that in the era of big data, forwarding news and deliberation network on Twitter have become research priorities In addition, "web" and "media" lasted only a short time, indicating they did not receive continued attention from researchers. The likely reason is that scholars have begun to focus on more detailed research scenarios such as "Twitter", rather than "Web" and "media" whose meanings are too broad. It can be found that most of hot topics in social media are related to hard news (Lawrence *et al.*, 2013). About 63 per cent of users get news from social media (Newman *et al.*, 2015). Journalists speed up the flow of information and break the elite monopoly on agenda-setting, mobilizing citizen participation and political participation through social media platforms (Hermida *et al.*, 2014). In addition, media agencies mainly use twitter as information source and brand promotion channels (Lasorsa *et al.*, 2012).

Table IV.
The top ten keywords with the largest citation counts, centrality and the latest citation bursts in e-participation area

Keywords	Citation counts	Keywords	Centrality	Bursts	Begin	End	Strength
Democracy	388	Communication	0.07	Twitter	2015	2017	2.967
Internet	369	United states	0.06	Deliberation	2015	2017	4.0135
Social media	196	Community	0.06	Journalism	2015	2017	4.5522
Participation	181	Trust	0.06	Service	2012	2013	4.5515
Media	120	Civil society	0.06	Website	2011	2012	3.383
Communication	119	E-government	0.05	Opinion	2010	2013	3.285
E-government	111	News	0.05	Web 2.0	2010	2013	3.816
Information	105	Policy	0.05	Media	2009	2010	3.0586
E-democracy	90	Deliberative Democracy	0.05	Mass media	2009	2012	3.9222
political participation	85	Management	0.05	Web site	2009	2011	4.0679

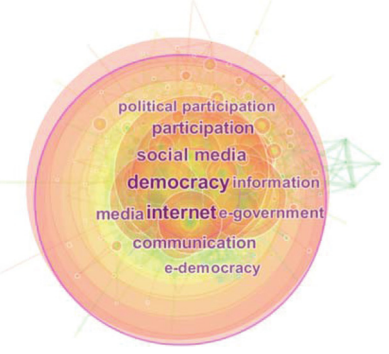

Figure 3.
Co-occurrence network of keywords in e-participation area

Therefore, through keyword analysis, we find that the main purpose of e-participation is to promote communication and strengthen the level of democratic governance; the USA is more advanced in e-participation and thus receives research scholars' attention and the citizens have begun to participate in government administration through social media, especially Twitter.

5. Authors, institutions and countries analysis

5.1 The author cooperation network analysis

The author's co-signature is a common phenomenon in academia. As shown in Figure 4, the network with a density of 0.0109 has 14 teams. In e-participation research, only some cooperative networks represented by Ernst N, Buchel F, Esser F, Engelser S have formed, whereas most scholars are still in their own state of war. The members collaborate mainly due to the colleagues or teacher-student relationships. In the long run, as benign cooperation and interaction will help improve the overall academic level, it is necessary to further strengthen the construction of academic teams. In addition, we found that the Bolivar MPR and Royo S nodes are the largest, reflecting that the two authors have the greatest influence on e-participation research.

5.2 The institution cooperation network analysis

The institution cooperation network has a total of six teams with a density of 0.0054, which is smaller than the author cooperation network (Figure 5). There is almost no connection among most institutions except an obvious cooperation subnet (Figure 6). It can be found that the institutions in the subnet are almost all famous universities in the USA. In addition to the close cooperation cluster formed within the USA, the entire cooperation network is relatively sparse.

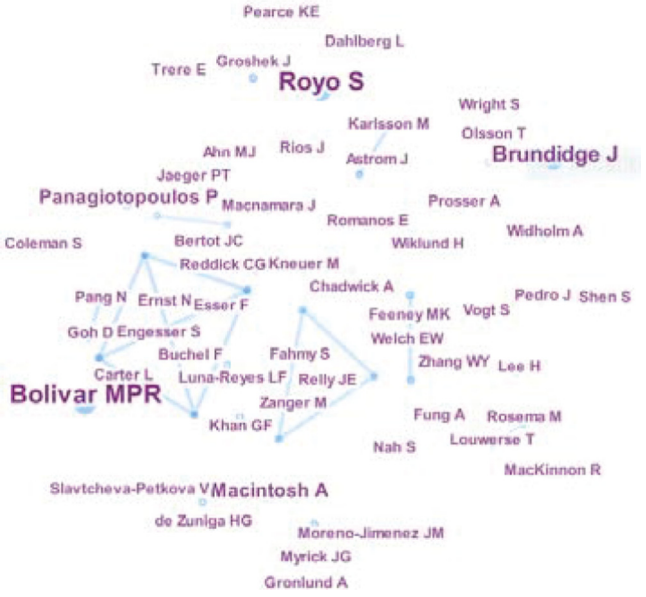

Figure 4.
Cooperation network of authors contributed to e-participation area

Figure 5.
Cooperation network of institutions engaged in e-participation area

Figure 6.
The largest subnet cooperation network of institutions engaged in e-participation area

5.3 The country time zone map and cooperation network analysis

5.3.1 Country time zone map analysis. As is shown in Figure 7, the USA has conducted e-participation research in 2001. Since then, many developed countries have accelerated the pace of e-participation research such as The Netherlands, Sweden and Italy. However, compared with developed countries, developing countries such as China, Brazil, Mexico, Turkey and Poland appeared relatively later. This indicates that developed countries give the developing countries a lead in e-participation.

5.3.2 Country cooperation network analysis. The density of country cooperation network is 0.123. From Figure 8 and Table V, it can be found that the USA is located at the core of the

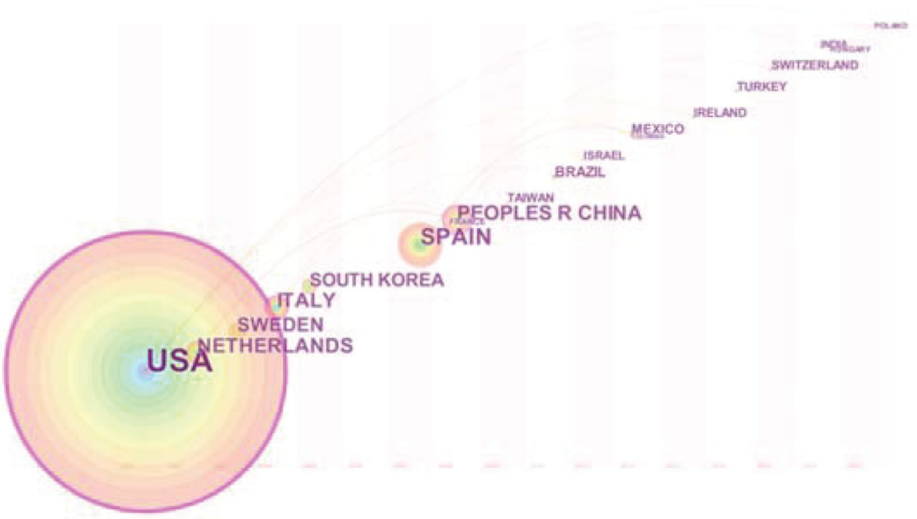

Figure 7.
The time zones of countries engaged in e-participation area

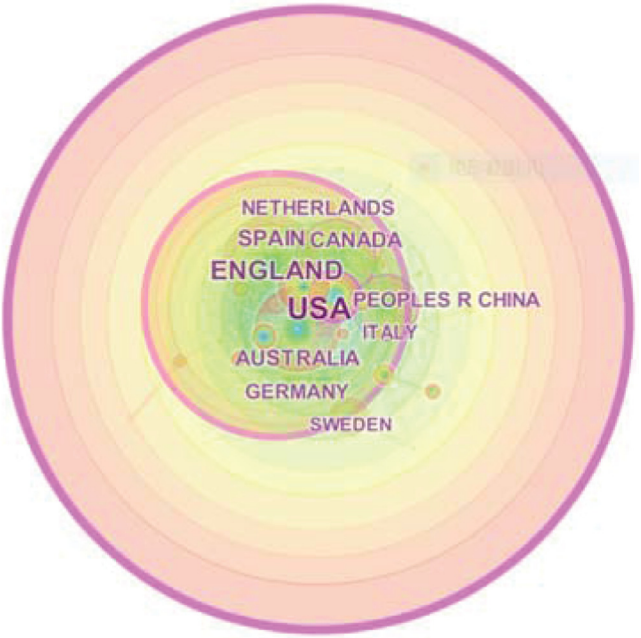

Figure 8.
Cooperation network of countries engaged in e-participation area

network, with the highest citation frequency and centrality value, indicating the USA is in the lead. England ranks second in terms of cited times and centrality. Although ranking third and seventh respectively in terms of cited times and centrality, Spain still occupies a critical position. However, some countries do not appear in both top-ten lists simultaneously,

namely, Australia and Germany, South Africa and Ireland which means they have less influence in the e-participation field.

6. Conclusions

Different from previous literature review, we focus on "participation", excluding many articles on the initial stage of e-government, and thus making the results more specific and explicable. In addition, CiteSpace is used to vividly and comprehensively demonstrate the development trend of e-participation research. We also find that "e-participation" has become the most frequently used concept in recent years compared with "e-government", "e-democracy" and other similar terms. Therefore, it provides reference for the selection of terminology.

The basic distribution reveals that e-participation has aroused wide attention of scholars. Author and institution cooperation networks with less internal cooperation are sparse. The USA ranks first in the field of e-participation. As other countries started late, it is necessary to speed up the e-participation process. Through keywords analysis, we found that "social media" with 196 cited times appeared for the first time as a keyword in 2010, followed by "Facebook" and "twitter" appearing in 2012 and 2013 successively. Simultaneously "Twitter" is a burst term that has emerged in recent years. Therefore, e-participation through social media is gradually becoming the research focus.

This paper has several limitations. First, there is a lack of uniform standards for visual analysis. We can conduct further studies by knowledge domains map (Chen *et al.*, 2008). However, there is no unified conclusion on how to evaluate the validity of the results (Chen *et al.*, 2010). Second, the literature data are incomplete. Although we have considered the related topics as comprehensively as possible, it is still inevitable to leave out some literatures. In view of the two limitations, it is necessary to develop a unified standard for visual analysis and include related literatures as much as possible by continually adding keywords and optimizing retrieval type.

The emergence of social media has lowered the threshold of citizen participation (Rauchfleisch and Schäfer, 2015). For example, the Twitter has become a place where members can share community awareness (Gruzd *et al.*, 2011). Besides, it has been used by social movement organizations and activists for political mobilization (Ausserhofer and Maireder, 2013). Weibo offers Internet users an opportunity to express their views on political consequences (Song *et al.*, 2016). Therefore, in recent years, researchers have mainly focused on the expression of emotions and reason, proximity mechanism and implementation effects in social media. For expression of emotions and reason, it mainly focuses on analyzing the reasons for the formation of homogenous groups and probing into

Table V.
The top ten countries with the largest citation counts and centrality in e-participation area

Country	Citation counts	Country	Centrality
USA	439	USA	0.61
England	188	England	0.40
Spain	77	Italy	0.18
Australia	69	Canada	0.14
Canada	62	Peoples R China	0.12
Peoples R China	46	The Netherlands	0.09
Germany	43	Spain	0.08
The Netherlands	43	South Africa	0.08
Italy	39	Ireland	0.08
Sweden	36	Sweden	0.07

the level of interaction between emotions and reason: to judge the feasibility of considering social media as a deliberation forum. For proximity mechanism, groups from different countries or provinces may form their own local network, naturally with heterogeneous characteristics. However, due to the popularity of social media, whether this heterogeneity has been impacted is still unclear. For the implementation effects, it is necessary to further explore the ways and levels of interaction between elite members and citizens. Finally, follow-up studies should focus more on methods selection to go deeper into the process of e-participation.

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