Knowledge Gain in Environmental Policy Agenda on Government Social Media:
A Citizen-Government Collaboration Perspective

Fang Wan, Guangdong University of Finance and Economics, China

Xi Zhou, Guangdong University of Finance and Economics, China*

Guoqin Zhao, Central University of Finance and Economics, China

ABSTRACT

This study examines the impact of government social media accounts (GSMAs) on public engagement in policy agendas. Data were collected from two similar GSMAs in policy fields and analyzed using Granger causality test and text analysis. The results show that the quality of information interaction has a positive impact on public engagement, and more direct ways of disseminating information result in a greater positive impact. The study highlights the importance of avoiding irrelevant information and managing the information conveyed through GSMAs. The results also suggest that citizens prefer more accessible and open environments for exchanging information, and governments should consider these preferences when communicating with the public. This study provides insights into the strategic use of GSMAs in promoting policy agendas and the role of information quality and relevance in promoting public engagement.

KEYWORDS

e-Government, Social Media, Information Exchange, Collaboration, Knowledge Management, Policy Agenda

INTRODUCTION

To fully understand the real value of external social media applications (e.g. Facebook, WeChat) for governments, it is necessary to evaluate and articulate the impacts of social media in the digital government domain (Sivarajah et al., 2015). Social media directors in the US federal government highlighted that they do not actively measure what type of impact their social media activities have (Mergel, 2013). In Canadian and US local governments' social media programmes, the measurement was sporadic and primarily intended for operational use by communications (Evans et al., 2018). By contrast, China has an official ranking of its government social media, released by Sina Weibo, that considers the size of the audience and the frequency of interactive behaviour of each Weibo account (Sina Weibo, 2019). This official ranking tends to emphasise the information exchange function of government social media accounts (GSMAs).

*Corresponding Author

However, information exchange does not fully reflect the ability of GSMAs to influence the effectiveness of policy agendas, because the influence detected may more greatly be attributed to the influence of the policy agenda than that of GSMAs. The '*2016 Zhengwu Zhishu · Weibo Yingxiangli Baogao* (2016 Government Index · Weibo Power List)' jointly issued by People's Daily and Sina Weibo revealed that the Weibo accounts of the public security bureau, traffic police unit, and meteorological bureau were among the top government units on the power list. In addition to the operational efficiency of these units, the results are also possibly related to the issue attributes of the policy agenda. The willingness of the public to interact with the government differs according to the government's specific policy agenda. Policy agendas that are well-understood and closely related to the public's life experiences tend to have the most influence. As public security, traffic, and weather are directly related to the lives of the public, the government departments associated with these subjects are more likely to engage in active information exchanges with the public (Mccombs & Shaw, 1972; Soroka, 2002; Wan & Zhou, 2019). Some studies have also revealed that even when publishing the same agenda, releases with different content (Wanta et al., 2004; Cohen et al., 2017) or formats (Gruzd et al., 2018) are likely to produce different cognitive transformation results. These studies have demonstrated that the theme, content, and format of the policy agenda could, therefore, affect public behaviour.

At the macro level, social media usage in e-government can promote the efficiency of public services((Moreno Enguix et al., 2019; Nam, 2019), while e-government development is also influenced by national culture (Kumar et al., 2021), such as power distance(Vakeel & Panigrahi, 2018). At the micro level, GSMAs as platforms for public knowledge sharing and interaction, the knowledge exchange between its participants is influenced by their knowledge distance(S. Luo et al., 2015). In government-led agendas, high knowledge distance means a high knowledge threshold and makes it difficult to expand public engagement. High knowledge distance also means the low quality of information interaction, which makes interaction bring less useful information and knowledge, thus reducing the effect of public participation (Qi et al., 2021). However, if the task goal is single and clear, the higher the knowledge acquisition effort of the participating individuals, the more creative the interaction in high knowledge distance will be (Acar & van den Ende, 2016), to improve the quality of information interaction. Therefore, in a policy area with high knowledge distance, it could be more efficient for GSMAs to improve the quality of information interaction than to increase the frequency of information exchange.

Western governments tended to "follow, not lead" the discussion of policy issues on social media (Barberá et al., 2019). In this situation, improving the quality of information interaction may be a more practical option than expanding the already sufficient public engagement. In China, government-led media have long dominated most online agenda setting(Y. Luo, 2014; Su & Xiao, 2021), and government social media are used to a low extent and in non-dialogical ways (Medaglia & Zhu, 2017). However, in some less sensitive political areas, such as environmental governance (Kay et al., 2015), family planning policy (Deng et al., 2021), Chinese local governments are also willing to know what the public thinks and have created many social media accounts in recent years to share more discussion space with the public. Nevertheless, the knowledge gap will not disappear immediately. When public engagement on social media is insufficient, it often means that the public has a high knowledge distance (Li & Cho, 2021).

Based on the preceding discussion, this paper attempts to answer the following research questions:

RQ1: What effect do the levels of information reception have on public knowledge in policy areas with limited engagement?

RQ2: What relationships exist between content topics and engagement in the context of a high knowledge distance policy area?

Taking the official WeChat account run by the Urban Management Commission of Guangzhou as a context, the expected contribution of this study can be briefly introduced in the following ways: 1. verifying the association between different levels of information reception and collaboration in GSMAs; 2. presenting findings showing that specific content topics and their presentation are both critical in encouraging public engagement in GSMAs; 3. enriching the literature with a focus on policy agenda of limited engagement in China.

RESEARCH BACKGROUND

Agenda-Setting Theory and Policy Agenda in China

Agenda-setting theory suggests that news media can strongly influence public awareness and concern about an issue(Mccombs & Shaw, 1972). By concentrating on certain topics and not others, news media can shape views about issue importance among the general public and government policymakers(Cook et al., 1983). Thus, agenda-setting is a process in which the public agenda interacts with the policy agenda. The public turns their concerns into actionable government priorities. Government policymakers use their expertise and information advantage to communicate the importance of particular issues to the public to gain their support. More generally, the key agenda-setting role of the media may be the promotion of social consensus on what the agenda is (Mccombs & Shaw, 2006).

In recent years of China, the emerging Internet medium such as Weibo and Weixin reshaped unprecedentedly the Chinese society by empowering the public in terms of public information sharing, information communication, political discourse, and the expression of opinions. The government cannot simply propagate its policies but has to communicate with the public on the content of policies. On the other hand, the marketization in economic development forces the government to establish partnerships with individuals, enterprises, and NGOs in more public affairs (Liu & Chan, 2018). As a result, the interaction of the various stakeholders in the policy agenda will go beyond the exchange of information. It will include more action-oriented cooperation, such as rumour management(Wukich & Mergel, 2016), and public services co-produced using government data(Wang & Medaglia, 2017).

Policy-Relevant Knowledge and Social Media

Following existing researches (Kingdon & Thurber, 2011; Yanovitzky & Weber, 2019), we define "policy-relevant knowledge" as information that policy actors use to: (a) understand the scope, nature, causes and consequences of a particular public problem; (b) evaluate and choose among feasible policy alternatives to addressing the problem; and (c) assess the degree to which a particular solution is politically feasible to pursue. Past research has shown that if individuals do not understand policy-relevant knowledge, then they may make decisions that they would not have made had they been fully informed about their consequences(Mastrobuoni, 2011; Chetty & Saez, 2013). Government typically attempt to reduce the detrimental impact of low information through public information campaigns (Henry & Gordon, 2003).

Knowledge management is a key influencing factor of the level of e-government adoption (Glyptis et al., 2020) and can be defined as 'the organizational process for acquiring, organizing, and communicating both tacit and explicit knowledge so that others may use the knowledge to be more effective and productive' (Gray, 2000). Notably, the use of social media in governments has become a major trend in e-government, and social media in governments can be understood as the main platform for governments to interact with citizens (Criado et al., 2013; Firmstone & Coleman, 2015). Social media enables the creation of content, which allows government to communicate with citizens and to educate them. Thus interaction between government and citizens on social media can be a way to promote policy innovation (Zheng & Zheng, 2014; Loukis et al., 2016) or improve government decision-making information (Finn, 2011; Alizadeh et al., 2019). In the context of our

study, we focus on social media platforms providing government with the possibility to inform citizens about policy-relevant knowledge.

Content Engagement and Collaboration

Engagement can be a synonym for the interaction with content. This kind of interaction is often reflected in the form of dialogue, such as comments, private messages, and likes. In government social media, these interactions help the government demonstrate transparency and enhance public confidence in local governance(Williams et al., 2018).

Unlike interaction, the focus of collaboration is not to conduct dialogue through online content, but to continue to develop previous content or related knowledge away from the government information platform. Moreover, Mergel (Mergel, 2013) sees collaboration as cross-boundary action, which means a higher level of engagement in a reciprocated relationship by allowing the audiences to directly engage with government content and co-create government innovations. In a collaboration process, citizens are proactively contributing their own content, download videos and documents to work with the content on third party sites or contribute to and even start conversations (Panagiotopoulos et al., 2014). Thus, knowledge gain does not merely depend on information exchange between government and citizens in social media platform, collaboration within citizens may also play a role.

Taken together, the existing literature provides strong evidence that information exchange plays a key role in increasing citizens' knowledge and participation. In most studies, citizens have been assumed to be proactive, that is, willing to pay attention to relevant issues and actively participate in discussions. Under pressure from the public, governments should listen to and respond to citizens' inquiries. In other words, the information exchange between a government and its citizens is simplified as a government absorbs citizens' ideas, which means that citizens dominate the knowledge management in social media and the government merely follows their views and knowledge to promote policy-making. However, if citizens are not active in a policy agenda because of the lack of knowledge, can information released by GSMAs promote public knowledge and thus collaboration? We know little about it, and this study seeks to address this gap in our knowledge. Moreover, prior research has typically used cross-sectional data generated by questionnaires, interview transcripts, or social media applications, which can measure the static state of government social media influence at a certain time. This study attempts to add a time dimension to the data to measure the dynamic change of the influence of GSMAs and verifies whether the influence of GSMAs is significant in an inactive policy agenda by applying time series analysis.

HYPOTHESIS DEVELOPMENT

Frequency and Quality of Information Exchange and Behavior Outcome

Issue salience frequently refers to the relative importance attached to an issue in relation to others. There is a significant correlation between issue salience and public knowledge, and increased salience of one issue was accompanied by increased knowledge of its possible causes and solutions(Weaver, 1991). Following prior research, Internet information seeking is the behavioral consequence of issue awareness and salience, and its trends provide valid and reliable measures of the policy agenda (Scharkow & Vogelgesang, 2011; Ripberger, 2011). It can be concluded that the increase of public knowledge improves their perception of the salience of one issue, which, in turn, affects their search behavior.

Theoretically, it can be assumed that all information released by government, which refers to newspapers, TV, social media, etc., will promote public knowledge. Specifically, if information issued by GSMAs triggers changes in individuals' search behaviors, GSMAs could be considered as having an influence on promoting public knowledge in the policy agenda; otherwise, GSMAs are considered as not having a corresponding influence.

As outlined earlier, improving the quality of information interaction may be a more practical option than expanding the already sufficient public engagement. We assume that the higher the extent to which citizens receive information, the more knowledge the public gain. In order to test whether the extent to which the public receives information affects their knowledge acquisition, we distinguish between access to information and reading information and propose the following two hypotheses respectively:

H1: Public knowledge increased when citizens have access to information released by GSMAs.
H2: Public knowledge increased when citizens have read information released by GSMAs.

Content Characteristics and Communication Effect

Furthermore, according to existing research, content characteristics, such as the topic, the timing, the expression and the position, can affect content engagement(Zhang et al., 2017; Heiss & Mfuatthes, 2019; Schreiner et al., 2021). Thus, We assume that a topic that is presented in an indirect way, such as posted at random times or mixed with other topics, will result in a lower scale of public engagement due to the added information sifting process, even if the topic is of interest to people. Then, the third hypothesis as follow:

H3: The positive effect of government information on public knowledge is suppressed in GSMAs with an indirect communication

METHODOLOGY

Research Design

We select two similar GSMAs in policy fields with specific knowledge thresholds, and collect all the information and interaction data they posted during a specific time period, as well as search data related to policy knowledge. It is necessary to collect different interaction data to distinguish between access to information and reading information to verify Hypotheses 1 and 2. In addition, to verify Hypothesis 3, it is also important to ensure that GSMAs in these two policy fields have significant differences in the way they release information. Then, specific data is selected to operationalize the related concepts. Based on this, the Granger causality test is used to examine the relationship between the variables in the relevant time series and text analysis is used to confirm what kind of information has a more positive impact on public knowledge. Finally, the differences in information delivery between the governmental social media in the two policy fields are compared to determine whether they result in different outcomes.

The Cases

WeChat is the most active social meida in China, with monthly active accounts of at least 1.15 billion. In Guangzhou, government WeChat accounts have emerged as a means for communication in Waste sorting. Since 2014, the Urban Management Commission of Guangzhou launched a dedicated WeChat account named Guangzhou Laji Fenlei (Waste Sorting in Guangzhou, WSG) aimed not only to ensure the sufficient, smooth, and clear communication of the information but also to develop a strong educational front. The goal was to subtly change people's inherent ideas and behaviors through popularizing knowledge. On the other hand, Waste sorting has not been fully applied in Guangzhou until 2018. Hence, in the absence of sufficient advertising and preparation, citizens lacked an understanding of the waste sorting procedure and relevant experiences (such as the standards, processes, and models of sorting, resulting in a high threshold for developing public knowledge. This high threshold reduced the public's willingness to participate in the agenda. Therefore,

the promotion of the agenda took shape in one-way communication from the government to citizens rather than two-way, interactive communications between the government and citizens, which means a low information exchange level among the waste sorting agenda in Guangzhou.

Investigating and removing illegal constructions is one of the major responsibilities of the Urban Management Commission of Guangzhou. Hence, introducing policies related to investigating and removing illegal constructions and providing a platform to receive public complaints were the primary key functions of the 'Guangzhou Chengguan (Urban Management Commission of Guangzhou, UMCG).' Unlike the waste sorting agenda, the agenda of the investigation and removal of illegal constructions was promoted through the official WeChat account of the Urban Management Commission of Guangzhou rather than a dedicated account designed for the agenda. However, both agendas were the responsibility of the Urban Management Commission of Guangzhou, and both were government-led agendas. Because of the above similarities, the comparative analysis of these two agendas controlled for the likely impact from the responsible government and the nature of the agenda on the influence of GSMAs, making the results more valid.

Data and Measurement

The number of clicks and likes of all related articles released by GSMAs prior to November 9, 2017, was determined using a web crawler and these were introduced as the proxy variable for the information citizens receive from GSMAs. The numbers of clicks and likes represent different levels of information reception. Specifically, the clicks a given article receives only represent the accumulated number that people have clicked the article's link, even if the individual has not read the entire article. However, since the 'like' button is usually at the end of an article, clicking 'like' requires the individual to scroll down to the bottom of the article, which means people who 'liked' a artcle may read more content than those who only clicked the article's link. Thus, we use the number of clicks as the proxy variable for access to information and the number of likes as the proxy variable for information reading.

Baidu search index results with the keyword 'Laji Fenlei (waste sorting)' and region 'Guangzhou' were introduced as the proxy variable for public knowledge on waste sorting. In addition, in order to better encapsulate the dynamic relationship between the variables, the unit of the time series used for the Granger causality test was 'day'. This time series contained relatively high-frequency data (with nearly 1,300 samples per time series) and could minimize the potential false causality caused by observation frequency.

Compared to waste sorting, which was a new concept, the investigation and removal of illegal constructions were easier for the public to understand without having to search for corresponding information and policies. Therefore, instead of using search behavior as a proxy variable for public knowledge, this study used application information comprising the number of complaints related to illegal constructions published by the official website of the Urban Management Commission of Guangzhou, cause these complaints can be regarded as a concrete action after absorbing the government information.

Granger Causality Test

To verify the significance of such a relationship, we adopted the Granger causality test, which tests the relationship between time series and identifies interactive influences between time series. Furthermore, in order to examine the impact of such differences in the operation of GSMAs on their ability to promote the corresponding agenda, this study applied the Granger Causality test to examine the influence of the UMCG in the investigation and removal of illegal constructions and compared the results with the Granger Causality test results of the WSG.

Textual Analysis

Granger has stated that the Granger causality test only reflects the confidence in hypothesis causality from a statistical perspective (Granger, 1988). Therefore, this study used textual analysis to examine

the link between content differences and information interactions to further verify the results of the Granger causality test. This process was divided into the following steps: 1. The researchers read through all the articles released by WSG and divided the topic into four main categories: news and updates, values and ideas, behavior guidance, and other interactions. News and updates refer to the introduction of the activities organized by the government and cooperating organizations to implement the agenda and the corresponding achievements. Values and ideas refer to the advocacy-oriented introduction of the agenda that aimed to enhance public understanding. Behavioral guidance refers to educational information on agenda-related knowledge and skills used to implement the agenda. Other interactions refer to other interactive activities organized by WSG. 2. Subcategories were then determined within each main category and coding was performed. First, the researchers identified subcategories through repeated communication and collaboration with corresponding parties. Next, the researchers selected 10% of the total sample and conducted coding for each subcategory. Then, Cohen's Kappa coefficient was used to test the reliability of the coding. The result showed that k = 0.871, indicating that the coding was reliable for further use. 3. The acquired coding was then applied to the entire sample. In addition, the articles were divided into highly liked and less liked articles on the basis of the number of likes they received. Given that the average number of likes per article during the research period was 3, this study defined articles with four likes or more as 'highly liked' and articles with less than four likes as 'less liked'. The absolute and relative frequencies of the coding were then calculated and compared.

RESULTS

Case of the WSG

Since its launch to November 9, 2017, the WSG had issued 660 articles with an average of fewer than four articles per week. The average number of clicks per article was approximately 155, and the average likes per article were approximately 3. The trends of weekly clicks and likes are shown in Figure 1. According to relevant research reports, the 50 most influential WeChat public accounts in China in 2015 had an average weekly issuance of 37 articles, as well as an average of more than

Figure 1. Weekly clicks and likes of WSG
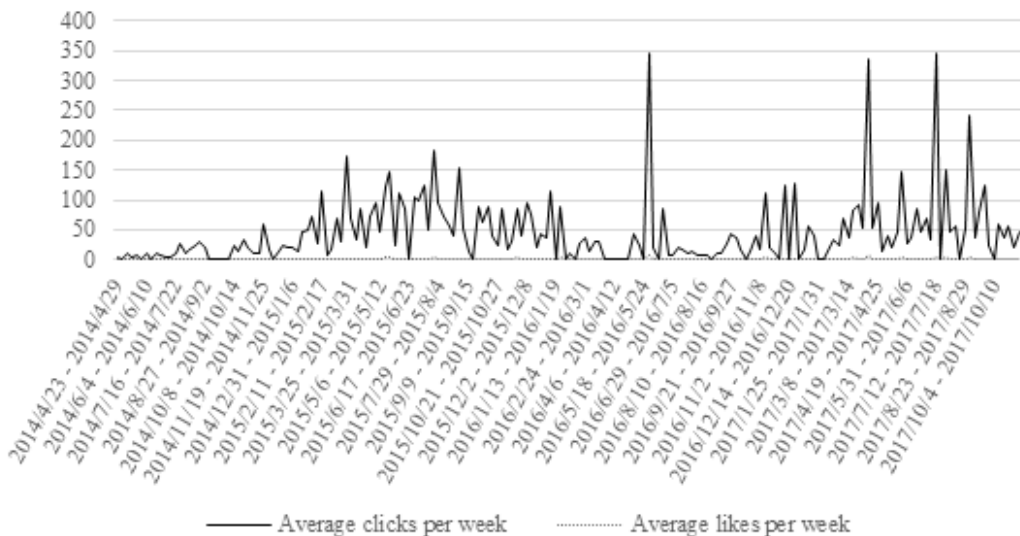
260,000 clicks and approximately 1,250 likes per article (Kantar, 2016). Comparatively, the level of information exchange regarding waste sorting appeared to be much lower.

Figure 2 illustrates the relatively low information exchange level of WSG. The question lies in whether this low-level information exchange could still affects the promotion of the specific agenda. In order to answer this question, the results of the Baidu Index with the keyword 'waste sorting' during the same period were collected; the weekly Baidu search index is presented in Figure 2. The Granger causality between the daily clicks and likes of WSG and the daily Baidu search index were examined.

First, the Augmented Dickey–Fuller test was applied to evaluate the stationarity of the daily clicks (DC), likes (DL), and Baidu Index (DI). The results showed that the time series were smaller than the corresponding critical values ($p < 0.01$), indicating that the time series were stationary and satisfied the requirements of the Granger causality test. Next, the Akaike information criterion (AIC) was employed to select the optimal lag length for the Granger causality tests between DC, DL, and DI. A 9th-order model was selected. Moreover, in order to better determine the trends of the relations, the 8th-order and 10th-order were also introduced into the models.

The results are exhibited in Tables 1 and 2. As is shown in Table 1, none of the results were significant ($p > 0.1$), indicating that DC was not the Granger causality of DI and DI was not the

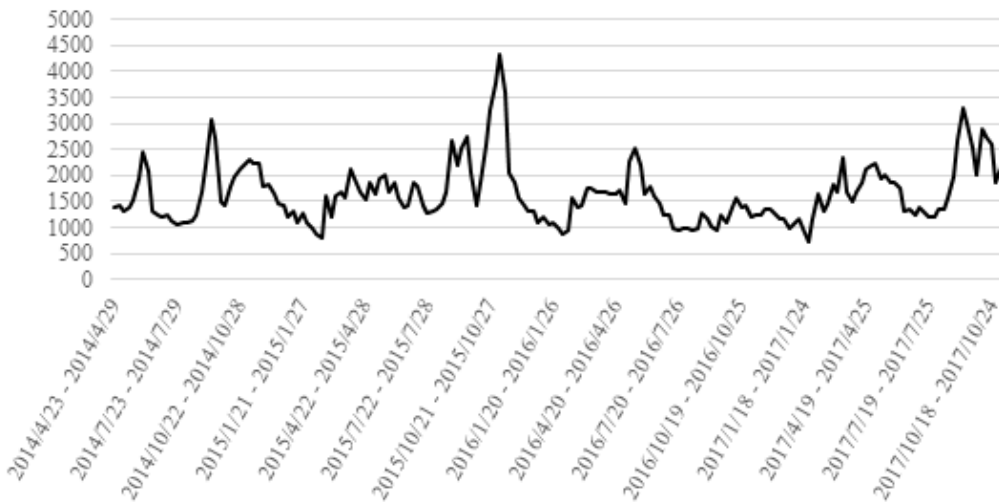Figure 2. Weekly baidu search index with 'waste sorting' used as a keyword

Table 1. Granger causality test results between daily clicks and daily baidu index

Hypothesis	Lag Phases	F	P (10%)	Conclusions
DC is not the Granger-cause for DI	8	1.09315	0.3651	H1 is not supported
DI is not the Granger-cause for DC		1.38610	0.1979	
DC is not the Granger-cause for DI	9	0.97462	0.4592	H1 is not supported
DI is not the Granger-cause for DC		1.281290	0.2423	
DC is not the Granger-cause for DI	10	0.90692	0.5259	H1 is not supported
DI is not the Granger-cause for DC		1.14301	0.3261	

Table 2. Granger causality test results between daily likes and daily baidu index

Hypothesis	Lag Phases	F	P (10%)	Conclusions
DL is not the Granger-cause for DI	8	2.13453	0.0301	H2 is supported
DI is not the Granger-cause for DL		0.99578	0.4374	
DL is not the Granger-cause for DI	9	1.86580	0.0532	H2 is supported
DI is not the Granger-cause for DL		0.99143	0.4450	
DL is not the Granger-cause for DI	10	1.66488	0.0839	H2 is supported
DI is not the Granger-cause for DL		0.88919	0.5427	

Granger causality of DI. Therefore, no apparent relationship was identified between the daily clicks of WSG and the number of daily searches for waste sorting. Table 2 shows that the null hypothesis that DL did not represent the Granger causality of DI was rejected ($p < 0.1$), while the null hypothesis that DI did not represent the Granger causality of DL was accepted. These findings suggested that the daily likes of WSG were a satisfactory estimator of the changes in the number of daily searches for waste sorting.

The above results suggested that in terms of the agenda of waste sorting, the number of likes rather than the number of clicks an article receives was the cause of the changes in individuals' search behaviors, which means individual perception of the salience of one issue depends on not whether he or she has access to the information, but whether he or she has read it. In addition, as 'liking a publication is a behavior that expresses a positive attitude towards a given subject' (Gan, 2017), the number of likes an article receives reflects the degree of the public's recognition of the corresponding subject. Higher recognition of an information item leads to higher acceptance of that information, which may cause individuals willing to search for more relevant information. On the basis of the above findings, although the WSG was not highly popular and the release of articles was not frequent, it still effectively effected citizens' knowledge search behavior with limited information exchange.

In order to further investigate the specific topic that attracts individuals' recognition and interest, this study adopted a textual analysis method. The results of the textual analysis are exhibited in Table 3. Since the sample used in the analysis was the entire population of the samples during the research period, there was no difference between the observed samples and the total samples. Therefore, a test for probability statistics was not necessary. As is shown in the table, there were significant differences between the subjects of highly liked and less liked articles. The majority of the highly liked articles included news and updates, particularly voluntary activities such as the promotion of the agenda organized by the government and participation by residents. Articles on behavioral guidance and other interactions were less liked; cases from other provinces and countries received minimal likes. However, no apparent differences were found between the number of highly liked and less liked articles on values and ideas.

In general, the majority of articles released by WSG were news- and update-related information regarding the implementation of the waste sorting agenda (mainly the achievements of the local government), values and ideas (mainly sharing of viewpoints), and behavioral guidance (mainly experience from other provinces and countries). Contrary to the expectations of the researchers, the results showed that the public was more concerned with the collective activities of the governments and cooperating organizations than with the experience and knowledge that were more directly related to individuals' own lives. These findings may be attributed to the characteristics of the waste sorting agenda. Specifically, since the agenda was only launched a short number of years prior to the study, the government still played a leading role in its implementation. The public generally lacked sufficient understanding and experience of the agenda; therefore, although the case studies and procedural introductions were more related to the actual implementation of waste sorting, there was less interest

Table 3. Textual analysis results and comparison between highly liked and less-liked articles

Category		Absolute Frequency		Relative Frequency (%)		
Main Category	**Subcategory**	**Highly Liked Total Absolute Frequency = 165**	**Less Liked Total Absolute Frequency = 465**	**Highly Liked Overall Relative Frequency = 25%**	**Less Liked Overall Relative Frequency = 75%**	**Examples of Synonym Set**
News and Updates	Local Achievements	55	127	30	70	Research meetings, community achievements
	Volunteer Activities	51	23	69	31	Residents' participation, voluntary promotion
Values and Ideas	Sharing of Viewpoints	26	111	19	81	Theories, expert interviews
	Policy Interpretation	7	28	20	80	Interpretations of laws and regulations, related policies
	Individual Stories	4	12	25	75	Sanitation workers, scholars, senior citizens
Behavior Guidance	Common Knowledge and Skills	12	57	17	83	Production, recycling, know-how
	Experience of Other Places	7	120	6	94	Singapore, other countries
Other Interaction	Business Promotions	3	17	15	85	Voting and rewarding, holiday greetings

Note: The relative frequency was calculated by dividing the frequency of highly liked and less liked articles per subcategory by the total number of articles belonging to that subcategory. Examples of the synonym sets were themes extracted from the original article.

in them. In addition, because of the lack of intrinsic motivation for active change, individuals are more willing to adjust their behavior according to external, collective action and institutional design. Hence, news and updates regarding the behavior of the government and corresponding organizations have become the interest of the public.

Case of the UMCG

The case of Guangzhou's waste sorting agenda showed that, in the context of government-led waste sorting, the popularity of the GSMAs was not a necessary factor in the effectiveness of the implementation of the agenda and in promoting public knowledge. However, this discovery only supports the idea that extensive information exchange was not a necessary condition for GSMAs to exert influence. The specific mechanism behind the realization of GSMAs' influence with limited information exchange remains unexplained. In order to overcome this limitation, this study selected another case, which had a similar but not an identical background, for comparative analysis. The goal was to further determine the relationship between the operation of GSMAs and their influence.

During the observation period (March 13, 2015, and August 1, 2018), the number of articles released by UMCG was 398, and the average number of likes was 7. Similar to the articles discussing waste sorting, the articles and likes were small in number. Since March 6, 2017, the UMCG began to release articles related to the investigation and removal of illegal constructions, and by August 1, 2018, 33 articles had been released, accounting for approximately 10% of the total number of articles during the period. Besides, the release time of the articles was not evenly distributed (Figure 3). Given that the WSG was a dedicated account, the relevance of the articles to the waste sorting agenda was almost 100% and the release of the articles was relatively regular and stable.

The Granger Causality test was adopted to analyze the relationship between the likes received by the corresponding articles released by UMCG (DZ) and the number of corresponding complaints (TS) received during the same period (from March 6, 2017, to August 1, 2018). Both time series passed the augmented Dickey-Fuller (ADF) test, and the results of the Akaike information criterion (AIC) tests showed that the optimal lag length was within the first order. Moreover, in order to ensure the quality of the results, a second order was also introduced into the model. The results of the Granger Causality test are shown in Table 4. The results suggested that no apparent causal relationship existed between DZ and TS ($p > 0.1$).

The UMCG provided a channel through which the public could submit complaints related to illegal constructions; thus, the relationship between the UMCG and the agenda could be seen as a model of

Figure 3. The number of likes received by articles related to the investigation and removal of illegal constructions and corresponding complaints received by the UMCG
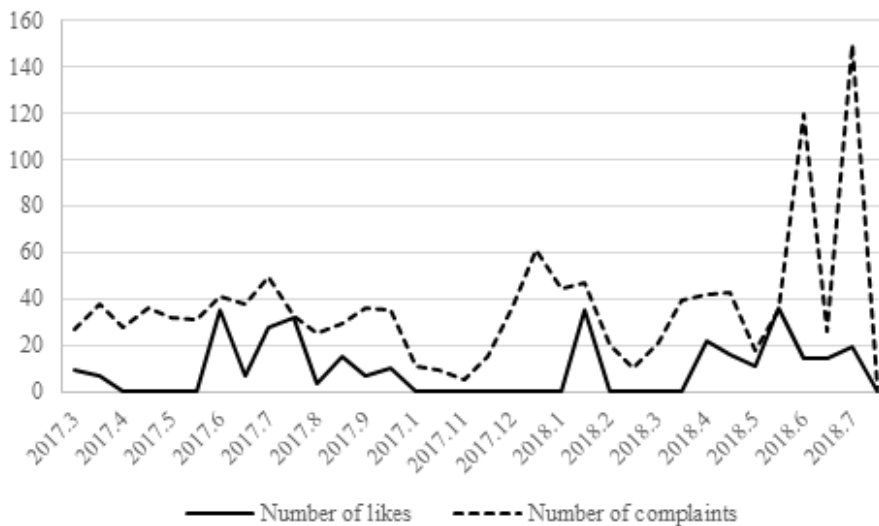

Table 4. Granger causality test results between the likes and complaints

Hypothesis	Lag Order	F	P (10%)	Conclusions
DZ is not the Granger-cause of TS	1	2.18426	0.1499	H3 is supported
TS is not the Granger-cause for DZ		0.00062	0.9803	
DZ is not the Granger-cause of TS	2	1.13168	0.3373	H3 is supported
TS is not the Granger-cause for DZ		1.49630	0.2419	

'Internet + Government Service.' The articles released by the UMCG served as an introduction and advocation of the corresponding service. The empirical results revealed that there was no significant causal relationship between the articles released by the UMCG and the complaints received by the government unit. Therefore, the UMCG did not exert its expected role of promoting the agenda of investigating and removing illegal constructions.

FINDINGS

To explore how information interaction influences public engagement, this paper crawls the data on the official WeChat account run by the Urban Management Commission of Guangzhou for the Granger causality test and textual analysis. Two main findings are verified.

Firstly, the quality rather than the quantity of information interaction positively influence public engagement in policy agenda. In contrast to previous studies that focused primarily on the frequency of information interactions, this research is more concerned with the quality of information interaction. The empirical results show that high-quality information interactions can lead to more autonomous knowledge-seeking behaviour by the public, which implies that government-led policy agendas need to emphasize the higher the extent to which citizens receive information rather than more people receive information.

Secondly, more direct ways of disseminating information, such as dedicated official accounts for specific issues, appropriate content topics and predictable publication cycles, will positively impact public engagement. The empirical results show that the articles related to investigating and removing illegal constructions released by the UMCG were relatively more popular than those released by the WSG. Nonetheless, the influence of the articles released by the WSG appeared to be more significant. The reason for this difference could be the differentiated operation model. Since WSG was created specifically to communicate information related to the waste sorting agenda, the communication was more direct, and information screening was not needed. However, investigating and removing illegal constructions was just one of the many topics communicated by the UMCG. The variety of the information communicated by the account may increase the information exchange with the public. It also distracted the public from focusing and participating in a specific agenda. In addition, the release of information related to investigating and removing illegal constructions was not regular, making the communication of the agenda intermittent. These interruptions in communications made it difficult for the public to maintain sustained attention to the agenda and ultimately weakened the influence of the GSMAs on promoting the agenda.

DISCUSSION

Theretical Implications

This study makes a theoretical contribution to a renewed understanding of the relationship between public participation and information interaction in policy agendas. In previous study(Jiang et al., 2021), both the quantity and quality of information interactions have been identified as important factors in enhancing public participation in policy agendas. Building on this, this study further confirms that for policy agendas with high knowledge thresholds, improving the quality rather than the quantity of information interactions is more effective to public participation. Furthermore, in line with existing research (De Widt & Panagiotopoulos, 2018; Alizadeh et al., 2019), public participation in policy agendas has evolved from a simple one-way or two-way information exchange to a more complex multi-party interaction. This study suggests that public engagement in policy agendas is not limited to information interactions in government social media, and that promoting mutual exchanges between users is also a way of demonstrating the influence of the agenda.

Managerial Implications

This study provides a contrasting perspective on GSMAs operations to the previous research by Mergel (2013), which suggested that higher levels of citizen participation require attracting unlikely audiences. Instead, this research highlights the importance of improving the quality of relationships with already engaged citizens by providing high-quality information and direct communication of policy agendas. To achieve this, management should create dedicated communication channels, such as official accounts for specific issues or policy agendas, that provide citizens with relevant and useful information and establish clear channels of communication. They should also select appropriate content topics that align with policy agendas, establish predictable publication cycles to create consistency and reliability in communication, and avoid overwhelming citizens with irrelevant information. Finally, to maintain citizens' attention and foster long-term engagement, management should ensure regular and sustained communication by establishing a communication schedule and avoiding interruptions. By implementing these managerial implications, GSMAs operations can improve public engagement and increase citizen participation in policy agendas.

CONCLUSION

This study explored that the information released by GSMAs can affect public knowledge in a relatively silent way, which means a low information exchange level does not hinder the influence of GSMAs on the promotion of policy agenda. It seems that GSMAs have the function of 'attention amplifier' in knowledge management. As long as citizens 'liked' an article, they could be more willing to search for relevant knowledge on the application of search engines. In addition, since a high information exchange level is not the only way for GSMAs to demonstrate their influence in knowledge management, GSMAs can be used as an additional channel for promoting new agendas. Besides, consistent with previous research (Schreiner et al., 2021), this case study of the WSG found that the article topic is the key to content engagement in GSMAs. As a result, the conclusions of this paper are not limited to China, any government agencies in other countries can learn from it.

ACKNOWLEDGMENT

REFERENCES

Acar, O. A., & van den Ende, J. (2016). Knowledge Distance, Cognitive-Search Processes, and Creativity: The Making of Winning Solutions in Science Contests. *Psychological Science*, *27*(5), 692–699. doi:10.1177/0956797616634665 PMID:27016241

Alizadeh, T., Sarkar, S., & Burgoyne, S. (2019). Capturing citizen voice online: Enabling smart participatory local government. *Cities (London, England)*, *95*, 102400. doi:10.1016/j.cities.2019.102400

Barberá, P., Casas, A., Nagler, J., Egan, P. J., Bonneau, R., Jost, J. T., & Tucker, J. A.BARBERÁ. (2019). Who Leads? Who Follows? Measuring Issue Attention and Agenda Setting by Legislators and the Mass Public Using Social Media Data. *The American Political Science Review*, *113*(4), 883–901. doi:10.1017/S0003055419000352 PMID:33303996

Chetty, R., & Saez, E. (2013). Teaching the Tax Code: Earnings Responses to an Experiment with EITC Recipients. *American Economic Journal. Applied Economics*, *5*(1), 1–31. doi:10.1257/app.5.1.1

Cohen, S., Mamakou, X. J., & Karatzimas, S. (2017). IT-enhanced popular reports : Analyzing citizen preferences. *Government Information Quarterly*, *34*(2), 283–295. doi:10.1016/j.giq.2017.04.003

Cook, F. L., Tyler, T. R., Goetz, E. G., Gordon, M. T., Protess, D., Leff, D. R., & Molotch, H. L.COOK. (1983). Media and Agenda Setting: Effects on the Public, Interest Group Leaders, Policy Makers, and Policy. *Public Opinion Quarterly*, *47*(1), 16–35. doi:10.1086/268764 PMID:10261275

Criado, J. I., Sandoval-Almazan, R., & Gil-Garcia, J. R. (2013). Government innovation through social media. *Government Information Quarterly*, *30*(4), 319–326. doi:10.1016/j.giq.2013.10.003

De Widt, D., & Panagiotopoulos, P. (2018). Informal networking in the public sector: Mapping local government debates in a period of austerity. *Government Information Quarterly*, *35*(3), 375–388. doi:10.1016/j.giq.2018.05.004

Deng, W., Hsu, J.-H., Löfgren, K., & Cho, W. (2021). Who is leading China's family planning policy discourse in Weibo? A social media text mining analysis. *Policy and Internet*, poi3.264. Advance online publication. doi:10.1002/poi3.264

Evans, L., Franks, P., & Chen, H. M. (2018). Voices in the cloud: Social media and trust in Canadian and US local governments. *Records Management Journal*, *28*(1), 18–46. doi:10.1108/RMJ-11-2016-0041

Finn, J. (2011). Collaborative knowledge construction in digital environments: Politics, policy, and communities. *Government Information Quarterly - GOVT INFORM QUART, 28*, 409–415. 10.1016/j.giq.2010.10.004

Firmstone, J., & Coleman, S. (2015). Public engagement in local government: The voice and influence of citizens in online communicative spaces. *Information Communication and Society*, *18*(6), 680–695. doi:10.1080/1369118X.2014.986180

Gan, C. (2017). Understanding WeChat users' liking behavior: An empirical study in China. *Computers in Human Behavior*, *68*, 30–39. doi:10.1016/j.chb.2016.11.002

Glyptis, L., Christofi, M., Vrontis, D., Del Giudice, M., Dimitriou, S., & Michael, P. (2020). E-Government implementation challenges in small countries: The project manager's perspective. *Technological Forecasting and Social Change*, *152*, 119880. https://doi.org/https://doi.org/10.1016/j.techfore.2019.119880. doi:10.1016/j.techfore.2019.119880

Granger, C. W. J. (1988). Some recent development in a concept of causality. *Journal of Econometrics*, *39*(1–2), 199–211. doi:10.1016/0304-4076(88)90045-0

Gray, P. (2000). *Knowledge Management Overview* (RITO Working Paper).

Gruzd, A., Lannigan, J., & Quigley, K. (2018). Examining government cross-platform engagement in social media : Instagram vs Twitter and the big lift project. *Government Information Quarterly*, *35*(4), 579–587. doi:10.1016/j.giq.2018.09.005

Henry, G. T., & Gordon, C. S. (2003). Driving less for better air: Impacts of a public information campaign. *Journal of Policy Analysis and Management*, *22*(1), 45–63. https://doi.org/https://doi.org/10.1002/pam.10095. doi:10.1002/pam.10095

Jiang, T., Wang, Y., Lin, T., & Shangguan, L. (2021). Evaluating Chinese government WeChat official accounts in public service delivery: A user-centered approach. *Government Information Quarterly*, *38*(1), 101548. https://doi.org/https://doi.org/10.1016/j.giq.2020.101548. doi:10.1016/j.giq.2020.101548

Kantar. (2016). *China Social Media Impact Report 2017*. Kantar.

Kay, S., Zhao, B., & Sui, D. (2015). Can Social Media Clear the Air? A Case Study of the Air Pollution Problem in Chinese Cities. *The Professional Geographer*, *67*(3), 351–363. doi:10.1080/00330124.2014.970838

Kingdon, J. W., & Thurber, J. A. (2011). *Agendas, alternatives, and public policies*. Longman.

Kumar, S., Baishya, K., Sreen, N., Sadarangani, P. H., & Samalia, H. V. (2021). Impact of National Culture on E-Government Development: A Longitudinal Study. [JGIM]. *Journal of Global Information Management*, *29*(2), 1–22. doi:10.4018/JGIM.2021030101

Li, W., & Cho, H. (2021). The knowledge gap on social media: Examining roles of engagement and networks. *New Media & Society*, *146144482110094*. doi:10.1177/14614448211009488

Liu, Y., & Chan, R. H. (2018). The Framework of Crisis-Induced Agenda Setting in China. *Asia & the Pacific Policy Studies*, *5*(1), 18–33. doi:10.1002/app5.220

Loukis, E., Charalabidis, Y., & Androutsopoulou, A. (2016). Promoting Open Innovation in the Public Sector Through Social Media Monitoring. *Government Information Quarterly*, *34*(1), 99–109. doi:10.1016/j.giq.2016.09.004

Luo, S., Du, Y., Liu, P., Xuan, Z., & Wang, Y. (2015). A study on coevolutionary dynamics of knowledge diffusion and social network structure. *Expert Systems with Applications*, *42*(7), 3619–3633. doi:10.1016/j.eswa.2014.12.038

Luo, Y. (2014). The Internet and Agenda Setting in China: The Influence of Online Public Opinion on Media Coverage and Government Policy. *International Journal of Communication*, *8*, 1289–1312.

Mastrobuoni, G. (2011). The role of information for retirement behavior: Evidence based on the stepwise introduction of the Social Security Statement. *Journal of Public Economics*, *95*(7), 913–925. doi:10.1016/j.jpubeco.2011.01.003

Mccombs, M., & Shaw, D. (1972). The Agenda-Setting Function of Mass Media. *Public Opinion Quarterly*, *36*(2), 176–187. doi:10.1086/267990

Mccombs, M., & Shaw, D. (2006). The Evolution of Agenda-Setting Research: Twenty-Five Years in the Marketplace of Ideas. *Journal of Communication*, *43*(2), 58–67. doi:10.1111/j.1460-2466.1993.tb01262.x

McCombs, M. E., & Shaw, D. L. (1972). THE AGENDA-SETTING FUNCTION OF MASS MEDIA*. *Public Opinion Quarterly*, *36*(2), 176–187. doi:10.1086/267990

Medaglia, R., & Zhu, D. (2017). Public deliberation on government-managed social media: A study on Weibo users in China. *Government Information Quarterly*, *34*(3), 533–544. doi:10.1016/j.giq.2017.05.003

Mergel, I. (2013). A framework for interpreting social media interactions in the public sector ☆. *Government Information Quarterly*, *30*(4), 327–334. doi:10.1016/j.giq.2013.05.015

Moreno Enguix, M., Lorente-Bayona, L. V., & Gras-Gil, E. (2019). Can E-Government Serve as a Tool for Public Authorities to Manage Public Resources More Efficiently? *Journal of Global Information Management*, *27*(2), 122–135. doi:10.4018/JGIM.2019040107

Nam, T. (2019). Does E-Government Raise Effectiveness and Efficiency?: Examining the Cross-National Effect. [JGIM]. *Journal of Global Information Management*, *27*(3), 120–138. doi:10.4018/JGIM.2019070107

Panagiotopoulos, P., Ziaee Bigdeli, A., & Sams, S. (2014). Citizen-Government Collaboration on Social Media: The Case of Twitter in the 2011 Riots in England. *Government Information Quarterly*, *31*(3), 349–357. Advance online publication. doi:10.1016/j.giq.2013.10.014

Qi, G., Hou, L., Chen, J., Liang, Y., & Zhang, Q. (2021). How Does User Social Network Improve Innovation Outcomes on a Virtual Innovation Platform?: Evidence From LEGO Ideas Platform. [JGIM]. *Journal of Global Information Management*, *29*(3), 188–211. doi:10.4018/JGIM.2021050108

Ripberger, J. T. (2011). Capturing Curiosity: Using Internet Search Trends to Measure Public Attentiveness. *Policy Studies Journal: the Journal of the Policy Studies Organization*, *39*(2), 239–259. doi:10.1111/j.1541-0072.2011.00406.x

Scharkow, M., & Vogelgesang, J. (2011). Measuring the Public Agenda using Search Engine Queries. *International Journal of Public Opinion Research*, *23*(1), 104–113. doi:10.1093/ijpor/edq048

Schreiner, M., Fischer, T., & Riedl, R. (2021). Impact of content characteristics and emotion on behavioral engagement in social media: Literature review and research agenda. *Electronic Commerce Research*, *21*(2), 329–345. doi:10.1007/s10660-019-09353-8

Sivarajah, U., Irani, Z., & Weerakkody, V. (2015). Evaluating the use and impact of Web 2. 0 technologies in local government. *Government Information Quarterly*, *32*(4), 473–487. doi:10.1016/j.giq.2015.06.004

Soroka, S. (2002). Issue Attributes and Agenda-Setting by Media, the Public, and Policymakers in Canada. *International Journal for Quality in Health Care*, *14*(3), 264–285. doi:10.1093/ijpor/14.3.264

Su, Y., & Xiao, X. (2021). From WeChat to "We set": Exploring the intermedia agenda-setting effects across WeChat public accounts, party newspaper and metropolitan newspapers in China. *Chinese Journal of Communication*, *14*(3), 278–296. doi:10.1080/17544750.2020.1839777

Vakeel, K. A., & Panigrahi, P. K. (2018). Social Media Usage in E-Government: Mediating Role of Government Participation. [JGIM]. *Journal of Global Information Management*, *26*(1), 1–19. doi:10.4018/JGIM.2018010101

Wan, F., & Zhou, X. (2019). *A Framework for Measuring the Influence of Government Social Media Accounts*. IEEE. 10.1109/MLBDBI48998.2019.00012

Wang, C., & Medaglia, R. (2017). Governments' social media use for external collaboration. *Transforming Government: People. Transforming Government*, *11*(4), 572–595. doi:10.1108/TG-02-2017-0009

Wanta, W., Golan, G., & Lee, C. (2004). Agenda setting and international news: Media influence on public perceptions of foreign nations. *Journalism & Mass Communication Quarterly*, *81*(2), 364–377. doi:10.1177/107769900408100209

Weaver, D. (1991). Issue Salience And Public Opinion: Are There Consequences Of Agenda-Setting? *International Journal of Public Opinion Research*, *3*(1), 53–68. doi:10.1093/ijpor/3.1.53

Weibo, S. (2019). *government social media accounts power list*. Weibo. https://gov.weibo.com/rank/index/index

Williams, C., Fedorowicz, J., Kavanaugh, A., Mentzer, K., Thatcher, J., & Xu, J. (2018). Leveraging social media to achieve a community policing agenda. *Government Information Quarterly*, *35*(2), 210–222. doi:10.1016/j.giq.2018.03.001

Wukich, C., & Mergel, I. (2016). Reusing social media information in government. *Government Information Quarterly*, *33*(2), 305–312. doi:10.1016/j.giq.2016.01.011

Yanovitzky, I., & Weber, M. S. (2019). News Media as Knowledge Brokers in Public Policymaking Processes. *Communication Theory*, *29*(2), 191–212. doi:10.1093/ct/qty023

Zhang, Y., Moe, W. W., & Schweidel, D. A. (2017). Modeling the role of message content and influencers in social media rebroadcasting. *International Journal of Research in Marketing*, *34*(1), 100–119. https://doi.org/https://doi.org/10.1016/j.ijresmar.2016.07.003. doi:10.1016/j.ijresmar.2016.07.003

Zheng, L., & Zheng, T. (2014). Innovation through social media in the public sector: Information and interactions. *Government Information Quarterly*, *31*(SUPPL.1), S106–S117. doi:10.1016/j.giq.2014.01.011

Fang Wan is a professor at the School of Public Administration, Guangdong University of Finance and Economics

Guoqin Zhao is Associate Professor of Economics at the Institute of Finance & Economics, Central University of Finance & Economics (CUFE), Beijing, China.