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Unpacking the black box: How to promote citizen engagement through government social media during the COVID-19 crisis

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ABSTRACT

During times of public crises, governments must act swiftly to communicate crisis information effectively and efficiently to members of the public; failure to do so will inevitably lead citizens to become fearful, uncertain and anxious in the prevailing conditions. This pioneering study systematically investigates how Chinese central government agencies used social media to promote citizen engagement during the COVID-19 crisis. Using data scraped from 'Healthy China', an official Sina Weibo account of the National Health Commission of China, we examine how citizen engagement relates to a series of theoretically relevant factors, including media richness, dialogic loop, content type and emotional valence. Results show that media richness negatively predicts citizen engagement through government social media, but dialogic loop facilitates engagement. Information relating to the latest news about the crisis and the government's handling of the event positively affects citizen engagement through government social media. Importantly, all relationships were contingent upon the emotional valence of each Weibo post.

1. Introduction

Citizen engagement during times of crisis is crucial for understanding public priorities and concerns, while minimizing mass panic, fear, and anxiety. Through engagement with the public, governments can develop citizens' understanding of their actions and self-resilience in crisis response, as well as increasing the capabilities of government agencies in processing crisis information and providing public services (Chatfield & Reddick, 2018; del Mar Gálvez-Rodríguez, Haro-de-Rosario, García-Tabuyo, & Caba-Pérez, 2019; Graham, Avery, & Park, 2015; Stark & Taylor, 2014). Citizen engagement refers to the involvement of citizens in public affairs, with the aim of building trusted relationships beyond simple information exchange. Governments that take a holistic approach to citizen engagement, embedding public participation into political activities such as public policy discussions, enhance understanding and promote transparent decision-making (Agostino & Arnaboldi, 2016; Taylor & Kent, 2014). Social media, due to its openness, dialogism, and participatory nature, offers significant benefits in delivering

synchronous and interactive communication between governments and citizens, bringing new impetus to citizen engagement (Agostino & Arnaboldi, 2016; Bonsón, Perea, & Bednárová, 2019).

Government agencies around the world have enthusiastically explored the use of social media to encourage citizen engagement in crisis management. Local government agencies in the United Kingdom used Twitter functions e.g., hashtags and mentions, to interact with the general public to realize government-public cooperation in clarifying rumors and identifying suspects during the 2011 riots (Panagiotopoulos, Bigdeli, & Sams, 2014). Indonesian government agencies used Twitter for cooperative production with citizens to deliver early warning messages during the 2012 Tsunami, improving their efficiency in public information services (Chatfield, Scholl, & Brajawidagda, 2013). In the United States, during the 2012 Hurricane Sandy crisis, government agencies used Twitter to engage citizens in public services development (Chatfield & Reddick, 2018), although they selectively engaged stakeholders, including citizens, peer government departments, and media agencies (Liu & Xu, 2019).

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Nevertheless, Citizen Engagement through Government Social Media (CEGSM), during times of crisis, is not optimistic. Firstly, most government agencies still regard social media as a complementary channel for disseminating information, rather than a tool for promoting citizen engagement (Neely & Collins, 2018; Wukich, 2016). Government agencies use their accounts to release information about updates and guidelines, but few employ participative strategies to promote citizen-government collaboration and engagement (Neely & Collins, 2018; Wukich, 2016). The two-way interactive communication through Government Social Media (GSM) stays on the surficial level, such as limited comments and inadequate dialogue (Tang, Zhang, Xu, & Vo, 2015). Secondly, government agencies may experience challenges in using social media for citizen engagement, including the digital divide, reliability and accountability, vague organizational strategies, lack of sufficient resources and formal policies, privacy, and security issues (Elbanna, Bunker, Levine, & Sleight, 2019; Harrison & Johnson, 2019). The efficiency of social media for communicating crisis information is also a cause for concern (Roy, Hasan, Sadri, & Cebrian, 2020, p. 102060).

Social media scholars have begun to examine how citizen engagement can be increased using social media during crises. Developments in automated tools and powerful computing technologies have facilitated the analysis of citizen engagement through social media during crises (Bonsón et al., 2019). Existing studies have mainly used content analysis to reveal the effects of language (Lee & Yu, 2019), content themes (Meltzer, Ștefănescu, & Ozunu, 2018; Wang, Haase, & Yang, 2020), multimedia features (Meltzer, Ștefănescu, & Ozunu, 2018; Wang et al., 2020), and message styles (Wang et al., 2020). However, none, to date, have employed moderating variables to further explain the influencing mechanisms. A pioneering study by Guo, Liu, Wu, and Zhang (2020) attempted to investigate the influencing factors of Chinese citizens' engagement on GSM accounts and the moderating role of perceived connectivity by questionnaire.

Focusing on the COVID-19 pandemic, first reported in China in December 2019, this study further explores the formation mechanism of CEGSM during public health crises. Social media research by public relations scholars has shown that the principles of dialogue communication are important determinants for online communication effects (del Mar Gálvez-Rodríguez, Sáez-Martín, García-Tabuyo, & Caba-Pérez, 2018; Wang & Yang, 2020). Previous studies on CEGSM have demonstrated that content types, multimedia features, and emotions, significantly affect citizen engagement, although with varying results (Bhattacharya, Srinivasan, & Polgreen, 2017; Bonsón et al., 2019; Lee & Xu, 2018; Rahim et al., 2019; Tang, Li, Gu, & Tan, 2019; Zavattaro, French, & Mohanty, 2015). This study employs Media Richness Theory (MRT) and Dialogic Communication Theory (DCT) to investigate the effects of media richness, dialogic loop, and content type, on Chinese citizens' engagement on the social media account of the National Health Commission of China (NHCC) during the COVID-19 crisis. More importantly, this study further investigates the moderating role of emotional valence to unravel its specific influencing mechanisms.

2. Literature review

2.1. GSM and crisis management

Crisis are situations in which social, institutional, and organizational interests are directly threatened, leading to the need for immediate action and uncertain results (Rosenthal, Hart, & Kouzmin, 1991). Crisis events include natural and technical disasters, terrorist attacks, international conflicts, nuclear threats, civil unrest, and global pandemics (Pan & Meng, 2016; Rosenthal et al., 1991). Effective crisis management requires timely communication and coordination between government agencies and stakeholders (Elbanna et al., 2019; Reddy et al., 2009); however, crises are often dynamic and complex, which causes many difficulties, such as extensive bureaucracy, policy-related constraints,

and lack of resources (Harrison & Johnson, 2019; Panagiotopoulos et al., 2014; Reddy et al., 2009). ICTs are one effective method for dealing with these challenges (Reddy et al., 2009). Social media has emerged as an important medium for governments and citizens to capture and explain crisis situations, make public decisions, and take action accordingly (Panagiotopoulos, Barnett, Bigdeli, & Sams, 2016). Government agencies in various countries have used social media to perform crisis communication and management (Chatfield & Reddick, 2018).

During crises, government agencies have historically used social media to release information, observe public behaviors and opinions, control and quash rumors, facilitate crowdsourcing and cooperation, build social cohesion, mobilize resource flows, and promote academic research (Alexander, 2014; Tang et al., 2015; Zhang, Fan, Yao, Hu, & Mostafavi, 2019). For instance, Wukich (2016) identified that US state agencies use official social media accounts to release information at different stages of a disasters, disseminating messages about early warnings, guidance and government action, losses, infrastructure closure and opening, resource supply and coordination, misinformation correction, volunteer fundraising, education, training, opinions and comments. Information provisions through GSM further contribute to organizational resilience in crisis management (Kim, Jung, & Chilton, 2016).

On the other hand, citizen engagement on GSM enables the public to extend their knowledge of the crisis, understand their responsibilities, perform self-organized assistance activities, and realize how to collaborate with others (del Mar Gálvez-Rodríguez et al., 2019; Graham et al., 2015; Zhang et al., 2019). This, in turn, increases their social capital and self-resilience in crisis response (Jurgens & Helsloot, 2018). Jurgens and Helsloot (2018) further explained the promoting effect of social media on citizen self-resilience. First, social media platforms allow citizens to search and share reliable information. Second, social media can enhance citizens' abilities in understanding present situations and solving problems collaboratively due to its powerful capacity of inter-connectivity.

2.2. Citizen engagement through government social media

Over the past decade, governments use of social media has shifted from distribution of propaganda to transparent communication and engagement with the general public (Bonsón et al., 2019). Existing literature has primarily investigated the influencing factors of CEGSM under normal circumstances.

Firstly, most studies have evaluated CEGSM using quantitative indicators of social media platforms, such as the number of shares or retweets, likes and comments. Bonsón and Ratkai (2013) put forward the index of stakeholder engagement through social media, which attracted widespread concern. They argued that the social media engagement index is the sum of *popularity, commitment and virality* (Bonsón & Ratkai, 2013). The three dimensions are respectively calculated by indicators such as the number of likes, followers, shares, reposts and total posts (Bonsón & Ratkai, 2013); this citizen engagement index has been widely used in follow-up studies (Agostino & Arnaboldi, 2016; Bonsón & Bednárová, 2018; Bonsón et al., 2019; Bonsón, Royo, & Ratkai, 2015; Bonsón, Royo, & Ratkai, 2017; del Mar Gálvez-Rodríguez et al., 2019; Denктаş-Şakar and Sürücü, 2018). Some studies directly consider comments, likes and shares as the three dimensions of social media engagement (Brubaker & Wilson, 2018; Kim & Yang, 2017). There are also studies that use the sum of likes, comments and shares to measure citizen engagement (Jiang & Beaudoin, 2016).

Secondly, scholars have extensively studied the influences of content type (Bhattacharya et al., 2017; Bonsón et al., 2015, 2019; Bonsón & Bednárová, 2018; Lee & Xu, 2018; Rahim et al., 2019; Tang et al., 2019), multimedia feature (Bhattacharya et al., 2017; Bonsón et al., 2015, 2019; Lee & Xu, 2018; Rahim et al., 2019), emotions (Bhattacharya et al., 2017; Haro-de-Rosario, Sáez-Martín, & delCarmen Caba-Pérez, 2018; Tang et al., 2019; Zavattaro et al., 2015), and environmental factors (Bonsón & Bednárová, 2018; Bonsón et al., 2017; Bonsón et al.,

2019; del Mar Gálvez-Rodríguez et al., 2018; Haro-de-Rosario et al., 2018) on CEGSM. Only one study by del Mar Gálvez-Rodríguez et al. (2018) employed the DCT to investigate citizen engagement through the Facebook accounts of local Latin American governments; their results confirmed that *the generation of new visits, dialogic loop and information of interest to stakeholders*, which belongs to the principles of DCT, promotes citizen engagement (the weighted statistics of likes, shares, comments and posts). However, no studies have revealed the specific influencing mechanism by considering moderating variables. Thirdly, almost all studies fail to develop research hypotheses and models against well-established theories, except for the research of Gálvez-Rodríguez et al. (2018).

This study aims to narrow this existing gap by utilizing the MRT and DCT to reveal how the NHCC promoted citizen engagement through official social media accounts and which mechanisms were used. Further, this study not only investigates the effects of media richness, dialogic loop, and content type on CEGSM, but also explores the moderating role of emotional valence.

3. Theoretical foundations and hypotheses

3.1. Theoretical foundations

3.1.1. Media richness theory

MRT, put forward by Daft and Lengel (1986), advocates that communication media has differentiated capacities in facilitating understanding. Media richness refers to the potential information load of communication media, emphasizing the abilities of promoting shared meanings (Daft & Lengel, 1986). The judgment criteria of media richness include feedback timeliness, multiple clues, language diversity, and personal focus (Daft, Lengel, & Trevino, 1987). Daft et al. (1987) further illustrated the four types of media richness from top to bottom, namely: face-to-face communication, telephone, written documents, and unprocessed documents. The theory emphasizes that higher media richness is not always better; this depends on the specific content of organizational task (Daft et al., 1987). In other words, the best effects can be obtained when the media richness matches the task. Nowadays, developments new media technology enables people to create, communicate, and use multimedia content more easily. Content posted on social media is usually presented in plain text, pictures or videos, while their media richness varies from low to high (Denktaş-Şakar and Sürücü, 2018; Yue, Thelen, Robinson, & Men, 2019). Due to word limit, Twitter users usually extend what they want to express by including complementary material, such as images or videos (Lee & Xu, 2018).

3.1.2. Dialogic communication theory

The DCT originated, proposed by Kent and Taylor (1998), is used to study organizational communication on websites. In recent years, the theory has been applied to studies on citizen engagement on social media. Dialogic communication refers to the negotiated interchange of ideas and opinions (Wirtz & Zimbres, 2018). Dialogue often follows two principles, namely: the realization of mutual satisfaction, and the creation of common meaning (Wirtz & Zimbres, 2018). Kent and Taylor (1998) stated that dialogic communication must follow five principles to achieve success: (1) *Dialogic loop*, meaning that the organization which posts content to social can stimulate public dialogue, providing the dialogue channel for the public and responding to public feedback in a timely manner; (2) *Usefulness of Information*, meaning that the contributing organization should provide useful content for visitors, creating both organizational benefits and public benefits; (3) *Generation of Return Visits*, which emphasizes not only the strategy used to refresh daily content, but also the public question patterns and online forums; (4) *Intuitiveness/Ease of the Interface*, emphasizing that the design and structure of websites must be convenient for users to search and find information; and (5) *Rule of Conservation of Visitors*, emphasizing that we should attach importance to website visitors and limit the amount of

external links and advertisement. The DCT and its five principles have been used to study social media mediated communication since 2009 (Wirtz & Zimbres, 2018). Rybalko and Seltzer (2010) first used the DCT to investigate how Fortune 500 Companies use Twitter to stimulate stakeholder engagement.

3.2. Research hypotheses and model

3.2.1. Media richness and CEGSM

Existing studies regarding the relationship between media richness and citizen engagement through social media have focused predominantly on the specific dimension of citizen engagement (likes, shares or retweets, and comments), but the results reported are controversial. Although most studies support the assumption that multimedia content receives more likes (Bhattacharya et al., 2017; Bonsón et al., 2019; Brubaker & Wilson, 2018; Ji, Chen, Tao, & Li, 2019; Lee & Xu, 2018) and shares (Bonsón et al., 2019; Brubaker & Wilson, 2018; Ji et al., 2019; Kim & Yang, 2017; Lee & Xu, 2018; Xu & Zhang, 2018; Yue et al., 2019), some have also confirmed the positive effect of plain text. For example, Lee and Xu (2018) analyzed 1575 tweets from the official Twitter accounts of Donald Trump and Bill Clinton during the 2016 US president election. They found that plain text tweets by Trump's account were most popular with tweets including pictures having no effect on the number of likes and shares received. In addition, videos were observed to have no influence on shares, but greatly reduced the number of likes (Lee & Xu, 2018). Visual text had no impact on the number of shares, but decreased the number of likes significantly (Lee & Xu, 2018). The authors inferred that people seem more interested in the unpredictable and instant messages compared with the visual elements of Twitter (Lee & Xu, 2018). Xu and Zhang (2018) analyzed 13,322 tweets about #MH370, the Malaysia Airlines Flight 370 disaster, and found that the number of words contained in each post influenced the number of shares significantly. Research into 50 Facebook accounts of local governments in Western Europe showed that pictures were most likely to promote citizen engagement (calculated by the number of followers, likes, retweets, and posts), followed by plain text (Bonsón et al., 2015).

Visual media, such as pictures and videos, are observed to trigger emotions more easily than plain text, grasping user attention and improving citizen engagement (Guidry et al., 2019, pp. 1–9). However, the influence of pictures and videos on overall citizen engagement and its three dimensions remain debated. Some studies support the premise that pictures increase the number of comments received (Ji et al., 2019), while others find that they reduce comments (Kim & Yang, 2017). Rahim et al. (2019) analyzed 2132 photos posted on the Malaysian Health Department official Facebook page confirming that pictures had no significant effect on citizen engagement rates (calculated by likes, comments and shares). Contrarily, Rahim et al. (2019) found that videos improved citizen engagement rates, but there are other studies that argue that videos cause no effect (Denktaş-Şakar and Sürücü, 2018). There is more controversy about the impact of videos on the three dimensions of citizen engagement. Kim and Yang (2017) analyzed 600 posts on 20 Facebook accounts owned by companies and found that videos had no influence on the number of likes and comments, but did increase the number shares. However, Ji et al. (2019) found that videos increased likes and shares, while comments decreased. The analysis of Facebook posts of the top 20 respectful and controversial companies indicated that videos will increase shares but have no influence on the number likes and comments (Kim & Yang, 2017). Moreover, Chung (2017) used content analysis to analyze 1018 tweets relating to Breast Cancer Awareness Month, and confirmed that the negative impact of videos on shares was not significant.

In summary, combined with the following three points, this study argues that media richness will negatively impact citizen engagement on GSM: (1) Citizens are more concerned with whether GSM information can satisfy their needs and reduce uncertainty during times of crisis. Hong, Fu, Wu, and Frias-Martinez (2018) identified that citizens living

in different areas of Maryland, USA, had different information demands during natural disasters, while the degree of matching between demand and supply determined the online communication effects between government and citizens. During crises, citizens turn to leaders and expect governments to provide prompt and accurate information (Bakker, van Bommel, Kerstholt, & Giebels, 2019). Xie, Qiao, Shao, and Chen (2017) analyzed citizens' information sharing behaviors on Sina Weibo in the context of Chinese public crises; they found that citizens were most interested in receiving information about the government's handling of the crisis and its developments. Therefore, according to the Elaboration Likelihood Model (Petty & Cacioppo, 1986, pp. 141–172), individuals are more prone to adopt the central path pattern to deal with information, which is focused on the message's content rather than peripheral clues, such as pictures or videos. (2) Compared with text-only posts, content that includes pictures or videos tend to have fewer words, which often impairs the completeness of information clues (Xu & Zhang, 2018). Existing evidence supports the assumption that long sentences can obtain more shares (Xu & Zhang, 2018). In addition, although multimedia content can provide supplemental information, citizens must pay greater effort due to the limitation of microblog platform technologies. Further, citizens are required to conduct extra procedures, including a greater number of clicks (Chung, 2017; Denктаş-Şakar and Sürücü, 2018). (3) According to the MRT, media richness should be matched with specific contexts and tasks to achieve the best effects; if the application of high media richness is not matched with the tasks, poor results will be reached (Daft et al., 1987; Daft & Lengel, 1986).

H1. Media richness negatively predicts CEGSM.

3.2.2. Dialogic loop and CEGSM

Dialogic loop is a core element of DCT. Dialogic loop infers that organizations must raise questions to stimulate public dialogue on social media, while providing the channel for the public to respond and share feedback. Social media engagement is often viewed as an organization's interaction with stakeholders through official social media accounts (Taylor & Kent, 2014). Engagement is a state of interaction that represents the relationship, providing and receiving between the organization and citizens (Taylor & Kent, 2014). It intends to promote mutual understanding, shared decision making and co-creation (Taylor & Kent, 2014). The public's enthusiasm for interaction is reflected in their investment of time and energy beyond requirements, to actively share and respond to content posted by organizations (Men, Tsai, Chen, & Ji, 2018). Therefore, the extent to which an organization's social media accounts implement the dialogic loop is an important account factor that affects citizen engagement.

Existing literature has focused on the implementing degree of Dialogic Communication Principles or the theoretical explanation of the dialogue, which lacks empirical investigation into the relationship between Dialogic Communication Principle and social media engagement (Men et al., 2018). Specific to the influence of dialogic loop on social media engagement, previous studies are disputable. del Mar Gálvez-Rodríguez et al. (2018) showed that dialogic loop will significantly improve citizen engagement (calculated by likes, comments, shares and posts). Men et al. (2018) analyzed 658 posts from 24 CEO Facebook accounts and found that dialogic loop increased the number of likes, shares and comments. Nevertheless, Yue et al. (2019) found that dialogic loop reduced the number of shares and likes on Twitter.

H2. Dialogic loop positively influences CEGSM.

3.2.3. Content type and CEGSM

The differentiated effect of content type on social media engagement has been confirmed to varying degrees. Bonsón et al. (2015) analyzed the Facebook accounts of 75 Western Europe local governments, which combined content about transportation and household, stimulating citizen engagement. Bonsón and Bednárová (2018) analyzed the YouTube accounts of 29 Western Europe local governments and identified that

videos relating to citizen protection, city marketing, cultural activities, and sports were more prone to achieving high playback rates, however videos about households received less attention. Bonsón et al. (2019) also analyzed 345,960 tweets of 28 Andalusian government Twitter accounts and established that tweets relating to sports, culture and city marketing, received greater citizen engagement (calculated by comments, shares and likes). Similarly, one study analyzed 1532 Facebook posts from 30 international logistic companies identifying that posts about celebration enhance stakeholder engagement rates (calculated by shares, likes and comments), but that posts about industrial information receive less engagement (Denктаş-Şakar and Sürücü, 2018). Regarding health communication, Chung (2017) analyzed 1018 tweets about Breast Cancer Awareness Month confirming that content about organizational propaganda decreased the number of shares, but other content had little effect. Analysis of 2123 posts from the Malaysian Health Department demonstrated that content related to health education and risk communication improved citizen engagement (calculated by likes, comments and shares), but that posts about organizational propaganda had no effect on engagement (Rahim et al., 2019).

Despite the aforementioned, existing literature lacks research into how different content types affect CEGSM during public health crises. According to the Use and Gratification Theory, active audiences use different media exposure based on personal needs due to environmental and personal reasons (Katz, Blumler, & Gurevitch, 1973). Personal satisfaction with media will directly determine their subsequent media usage (Katz et al., 1973). Audiences usually have different individual needs during public health crises. Wang, Wang, Ye, Zhu, and Lee (2016) analyzed 706,835 posts relating to the 2012 Beijing Rainstorm and found that information about transportation, weather, loss, and rescue was most relied upon. Xie et al. (2017) found that during public crisis events, the most needed information was the disposition of the government. They further divided information requirements into three types, namely, supervising the government, seeking for truth, and caring for self-interest. The study also confirmed that information requirements which supervise the government will actively influence the sharing behaviors. Therefore, we propose the following hypothesis:

H3. Content type will have significantly differentiated effects on CEGSM.

3.2.4. The moderating role of emotional valence

Emotions are important determinants of information sharing and relationship practice, which determine an individual's desire to seek, dispose and share information (Zavattaro et al., 2015). Corporate social media usually delivers posts with emotion to attract audience attention and facilitate conversations and a sense of online community (Ji et al., 2019). According to the Social Sharing of Emotion Theory, people who experience emotions are often eager to share and talk more urgently (Rimé, 2009). Emotion will trigger *the social sharing of emotion*: individuals will openly talk about the specific environment where the emotional event occurred and their own feelings and emotional response with others, or they will share their own emotions by way of letters, journals and other indirect methods (Rimé, 2009). Individuals can regulate their own emotional status through emotional sharing (Rimé, 2009). When individuals are exposed to emotional content on social media, they are likely to share their emotions and this further promotes their engagement behaviors, such as sharing, liking and commenting (Ji et al., 2019; So et al., 2016). Previous studies have agreed that emotional posts facilitate citizens' social media engagement behaviors (Ji et al., 2019; Keib, Himelboim, & Han, 2018; Kivran-Swaine & Naaman, 2011; So et al., 2016). For example, Ji et al. (2019) found that posts with emotions promoted citizen social media engagement behaviors, including likes, shares and comments.

Emotional valence involves positive and negative emotion in a personal information experience (Ji et al., 2019). Existing literature supports the motion that emotional valence has a significant influence on

citizen engagement, but conclusions are debated. [Zavattaro et al. \(2015\)](#) indicated that government agencies like to release posts with positive emotions to encourage citizen engagement, and that citizens prefer to interact with government Twitter accounts which deliver posts containing positive emotion. [Tang et al. \(2019\)](#) analyzed 97,205 records from 30 provincial police micro-blogs and found that content with positive emotions was more likely to be shared, while posts containing negative emotions decreased the amount of sharing. [Xu and Zhang \(2018\)](#) demonstrated that tweets with positive emotions can increase the level of retweets, but content showing anger reduced those retweets. Regarding the three dimensions of citizen engagement, the effects of positive emotions are often different. [Ji et al. \(2019\)](#) concluded that positive emotion increases likes and comments, but reduces the number of shares. However, other studies have revealed that both positive and negative emotions promote news sharing on Facebook and Twitter, but that positive emotions outweigh negative emotions ([Trilling, Tolochko, & Burscher, 2017](#)). Current research argues that the impact of emotional valence on social media engagement depends on the specific communication environment, and that citizens will avoid risks by sharing negative contents under uncertainty and risky situations ([Ji et al., 2019](#)).

Few pioneering studies have noted the potential of emotions in moderating the relationship between content type and retweet behavior. [Keib et al. \(2018\)](#) analyzed 1872 tweets about #BlackLivesMatter and found that content relating to policy and action with more emotional expression was most likely to be retweeted. However, content about group without emotion was less likely to be retweeted; thus, it is argued that:

H4. Emotional valence will moderate the effects of media richness, dialogic loop, and content type on CEGSM.

To conclude, this study proposes the theoretical model shown in [Fig. 1](#).

4. Method

4.1. COVID-19 crisis

In December 2019, hospitals in Wuhan, Hubei province, China, identified unknown cases of pneumonia, which were later confirmed to

be an acute respiratory disease caused by a new type of coronavirus. On February 11, 2020, the World Health Organization (WHO) renamed this disease, COVID-19. This study took the COVID-19 crisis as a case due to its nature of being a global pandemic and grave threat to human life and health. According to the report released by WHO on the March 23, 2020, the number of confirmed cases of COVID-19 amounted to 332,930 globally with more than 190 countries/territories/areas being affected. The number of deaths has surpassed 14,500.

After the outbreak of COVID-19, Chinese government agencies took action to deal with the crisis, including the deployment of social media. Citizens were asked to self-quarantine with government social media accounts being one of the most important sources of crisis-related information at the time. This study focuses on the official Sina Weibo account ‘Healthy China’ of the NHCC. There are two reasons for this: first, Sina Weibo is one of the most popular social media platforms in China and has the first series of government social media accounts with considerable followers. The ‘Healthy China’ account has powerful influence over netizens with more than 5.54 million followers. Second, ‘Healthy China’ has played an irreplaceable role in crisis communication compared to other social media channels in China. The account started to post messages about COVID-19 from January 14, 2020 and the total number of posts aggregated to 1411 by the time of March 5, 2020.

4.2. Data Collection

Data in this study was collected from the ‘Healthy China’ Sina Weibo account of the NHCC. This account delivered the first post about COVID-2019 on January 14, 2020. We used a web-scraping tool to collect all posts during the period of 14 January to March 5, 2020. For each post, we captured information on: text content, number of likes, number of reposts, and number of comments. Meanwhile, the URLs of the pictures or videos uploaded were also captured, if available, to determine the media type (i.e., whether or not the account was actively using pictures or videos). After collecting the initial data, the “#topic#” and “@somebody” of each post was identified and extracted accordingly. A total of 1441 posts were obtained, with 1411 being pertinent to COVID-2019 by manual check.

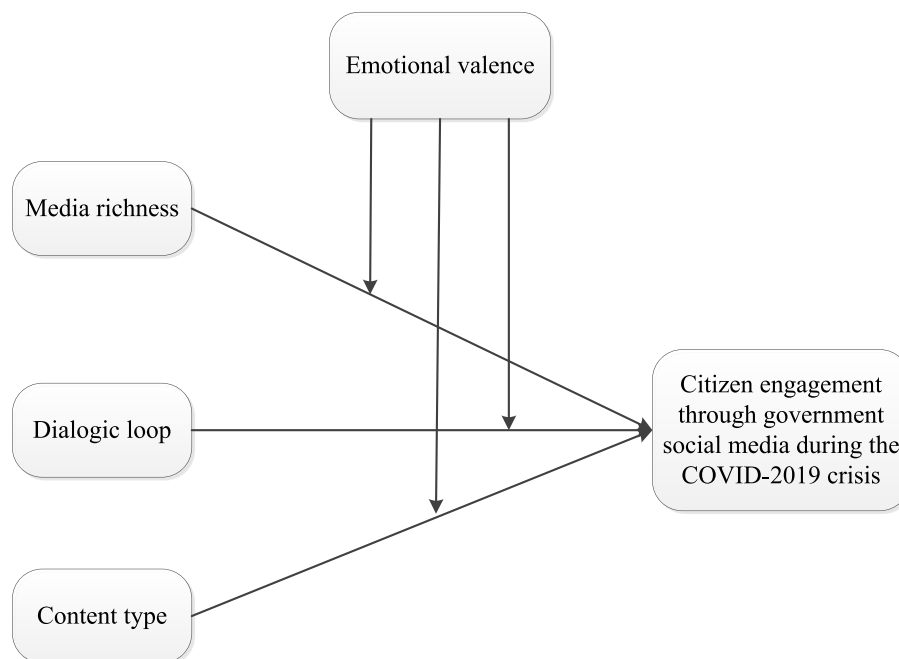


Fig. 1. The theoretical model of CEGSM.

4.3. Operationalization of variables

CEGSM. Based on previous research (Brubaker & Wilson, 2018; Jiang & Beaudoin, 2016; Kim & Yang, 2017), CEGSM is composed of the number of likes, reposts, and comments of each Weibo account. Following the practice of Jiang and Beaudoin (2016), CEGSM is measured by the sum of three components.

Media richness. With reference to the measurement provided by Ji et al. (2019) and Yue et al. (2019), this study divides MR into three levels according to the complexity of the media type being used. The three levels ascending with the media richness are: plain text, pictures or GIFs (picture + others or GIF + others), and video (video + others). Text-only content is marked as low media richness, while pictures or GIFs are marked as moderate media richness, and videos are marked as high media richness. Low, moderate and high media richness is coded as 1, 2, and 3, respectively.

Dialogic loop. Dialogic loop is an important indicator of dialogic communication in DCT, which is used to evaluate the dialogic communication level on a website (Kent & Taylor, 1998; Kent, Taylor, & White, 2003). In their initial measurement, four items were adopted: “opportunity for user-response”, “opportunity to vote on issues”, “survey to voice opinion on issues” and “offers regular information”. Each of these items is coded either 1 or 0, with 1 being a positive response, and the aggregation of the four items creating the dialogic loop (Kent et al., 2003). Since 2009, based on Kent et al.’s (2003) work, later researchers have adjusted these indicators to fit the context of emerging social media platforms, such as Facebook and Twitter (Wirtz & Zimbres, 2018). However, there are no unified measurements as of yet (Wirtz & Zimbres, 2018). In this study, the selection of measurements focus on the research applied DCT in social media (del Mar Gálvez-Rodríguez et al., 2018; Kim, Chun, Kwak, & Nam, 2014; Men et al., 2018; Rybalko & Seltzer, 2010; Wang & Yang, 2020; Yue et al., 2019). Five items are used including “the use of hashtags”, “the provision of surveys or votes for users to express opinions”, “the use of @ function”, “responding to a question”, and “posting a question”. Similarly, each of the items is coded either 1 or 0, with 1 being a positive response, and the level of dialogic loop being the sum of the five items.

Content type. Based on the study of Xie et al. (2017), the most demanding information for descending order during public crisis is the government disposal, the latest progress of the incident, the cause of the incident, the impact or damage caused by the incident, and the relationship between the incident and individual self-interests. In addition, Sturges (1994) emphasized the importance of providing information that guides the public in crisis communication. In summary, this research classifies the content types into: latest news about the COVID-19 crisis, information about the government’s handling of the crisis, guidance for stakeholders, and appreciation to front-line emergency services. The code book has been shown in Table 1.

Emotional valence. The emotional valence of each post was calculated based on the Sentiment Lexicon with python. Firstly, each post was separated word-by-word using Jieba database. The word separation divided the content into three categories: sentimental words, negative words, and degree adverbs. Through the calling interface of sentimental words list service provided by BosonNLP, and a machine learning mechanism, the value of sentimental words was determined and the final value was confirmed using a weighted method. Finally, each post was assigned to a weighted emotional valence within the range of 0–1.0 denotes extreme negative emotion, and 1 denotes extreme positive emotion.

4.4. Inter-coder reliability and data analysis

This study employed two postgraduate students to conduct the coding work. First, we provided 2 h training for the two coders to establish the coding norms. To examine inter-reliability, the coders randomly and independently coded 15% of the sample. The results were

Table 1
Content category of posts and example posts.

Categories	Example posts
latest news about the COVID-19 crisis	#Health release# As of 24:00 on February 25, a total of 29,745 discharged patients have been cured across the country, of which 11,793 have been discharged from Wuhan and 20,912 have been discharged from Hubei.
appreciation to front-line emergency services	#How beautiful are you # 【#Tribute to the most beautiful retrograder# posters of the “pandemic” moment series】 Medical workers shouldered the mission, faced the difficulties, and worked day and night in the most dangerous positions to form a solid line of defense. @Baoding First Central Hospital.
guidance for stakeholders	#Health science# 【Please see here, the new baby’s COVID-19 Protection Strategy is coming】 The family has children’s attention to it!#Healthy China Initiative 2020#
information about the government’s handling of the crisis	#Health release# 【Several measures on improving the working conditions of frontline medical staff and earnestly caring about their physical and mental health】 Several measures on improving the working conditions of frontline medical staff and earnestly caring about their physical and mental health.

as follows: The Kappa value with “media richness”, “the use of hashtags”, “the use of @ function”, and “the provision of surveys or votes for users to express opinions” was 1; the Kappa value for the content category was 0.94, then for “responding to a question” was 0.92, and for “posting a question” was 0.93. The results showed that the inter-reliabilities were high enough and acceptable.

Given that the level of citizen engagement is based on count data and the distribution of citizen engagement is over-dispersed ($M = 5935.03$, $SD = 47,591.08$, $Skewness = 10.52$, $Kurtosis = 122.21$), the assumption of normal distribution was violated. To deal with the over-dispersed count data, negative binomial regression is more appropriate to be applied when the conditional variance exceeds the conditional mean (Hilbe, 2011). Using negative binomial regression analysis, we estimated the impact of media richness, dialogic loop, and content type on citizen engagement. Then, we explored whether the influence is contingent upon the emotional valence of each post. All analyses were conducted using STATA version 15.0.

5. Results

5.1. Descriptive analysis

The 1411 posts collected showed a huge variation in the level of citizen engagement, with 44.4 percent of posts having less than 100 citizen engagement, while 21 posts were engaged with over 100,000 times. Among all the posts, 480 (34%) were related to the appreciation of front-line emergency services, followed by providing guidance to stakeholders (30.2%, $n = 426$), as well as information about the government’s handling of the COVID-19 crisis (28.7%, $n = 405$). Latest news about the pandemic was only presented in 100 (7.1%) posts. On average, latest news received the highest level of citizen engagement ($M = 73,324.24$, $SD = 1516.56$) while guidance and appreciative information received the least, 331.39 and 360.36, respectively (Fig. 2). Of the dialogic features analyzed, hashtag (96.95%, $n = 1368$) was the most frequently used tool, followed by the raising of questions (24.45%, $n = 345$). Other dialogic features, such as the mention function @, are less likely to be used for enhancing interaction. For media richness, nearly 43 percent of posts ($n = 606$) used photos to deliver information, while 442 posts were only presented in the form of plain text. Videos (25.7%, $n = 363$) appeared least in all posts. Furthermore, the emotional valence of the posts was positive on average ($M = 0.77$, $SD = 0.20$).

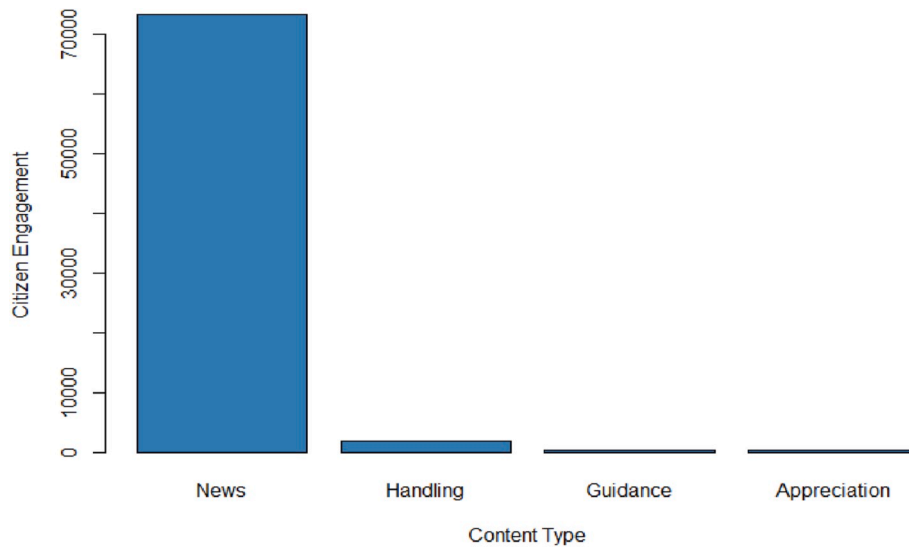


Fig. 2. Average volume of citizen engagement grouped by content type.

5.2. Hypotheses test

Table 2 shows the results of our negative binomial regression model predicting CEGSM during the COVID-19 crisis. H1 posited that posts with high levels of media richness are less likely to attract citizen engagement. As model 1 show, media richness is significantly negatively associated with the level of CEGSM. The Incident Rate Ratio (IRR) value shows that a one-unit increase in the level of media richness would lead to a decrease in the level of CEGSM by a factor of 0.59. Thus, H1 was supported.

H2 proposed that posts presented with multiple dialogic features tended to acquire more CEGSM. The IRR value showed that a one-unit increase in the level of dialogic loop would lead to an increase in the level of CEGSM by a factor of 1.35. In other words, a one-unit increase in the level dialogic loop would result in a 35% increase in CEGSM; thus, H2 was supported.

H3 argued that the level of citizen engagement is contingent upon the content type. Given that content type is a categorical variable, appreciative information was treated as the reference group. Under the

negative binomial regression model, latest news relating to the COVID-19 crisis (IRR = 248.24, $p < 0.001$) and government handling information (IRR = 4.23, $p < 0.001$) positively predicted the citizen engagement volume. That means, in comparison to appreciative information, latest news would lead to a 24,724% increase in the level of CEGSM, while government handling information results in a 323% increase. However, the relationship between guidance for stakeholders and CEGSM is not significant. Thus, H3 was partially supported.

H4 hypothesized that emotional valence will moderate the effects of media richness, dialogic loop, and content type on CEGSM. We explored the conditional influences of the predicting variables by entering emotional valence and interaction variables into the negative binomial regression model. As model 2 shows (Table 2), the two-way interaction between media richness and emotional valence was a significant predictor of CEGSM (IRR = 10.06, $p < 0.01$). Fig. 3 indicates that a post with high levels of richness is more likely to attract CEGSM when containing positive emotion. In contrast, when the post is negative, the higher media richness is, the lower CEGSM elicited. Emotion valence also moderates the relationship between dialogic loop and citizen engagement (IRR = 19.50, $p < 0.001$). As Fig. 4 shows, dialogic loop is negatively associated with CEGSM when the post contains negative emotions. Fig. 5 illustrates that the engagement gap between posts with positive emotion and negative emotion only significantly exists in information relating to latest news. For other types of information, emotional valence has a weak or no effect on CEGSM. In general, emotional valence plays a moderate role in the relationship between media richness, dialogic loop, content type and CEGSM.

Table 2 Predicting citizen engagement through government social media.

	Model 1		Model 2	
	IRR	SE	IRR	SE
(Intercept)	621.60***	108.72	449.80***	74.72
Main effect				
Media Richness	0.59***	0.04	0.74***	0.05
Dialogic Loop	1.35**	0.14	1.38***	0.13
Content Type (reference group: appreciation)				
News	248.24**	42.80	87.24*	25.21
Handling	4.23***	0.46	2.59**	0.28
Guidance	1.11	0.14	0.97	0.12
Interaction effect				
Emotional Valence			1.27	0.61
EV* Media Richness			10.06**	3.77
EV * Dialogic Loop			40.39***	19.50
EV* Content Type (reference group: appreciation)				
News			0.04*	0.05
Handling			0.00	0.00
Guidance			0.07	0.05
Log likelihood	-10,224.83		-10087.44	
Pseudo R ² (%)	7.34		8.59	
N	1411		1411	

Note: IRR: Incident Rate Ratio; SE: Standard Error; EV: Emotional Valence; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

6. Discussion

6.1. Summary of findings

This paper is one of the first of its kind to investigate how government agencies' in China deployed social media for citizen engagement during the COVID-19 crisis. To achieve this, we systematically examined the impact of media richness, dialogic loop, and content type on citizen engagement through government social media based on MRT and DCT. More importantly, we introduced emotional valence as the moderating variable to unravel the underlying mechanism.

This study found that media richness was negatively associated with CEGSM, which is consistent with Lee and Xu's (2018) finding that plain text can create greater citizen engagement under uncertainties. Their research into Donald Trump's Twitter account showed that the

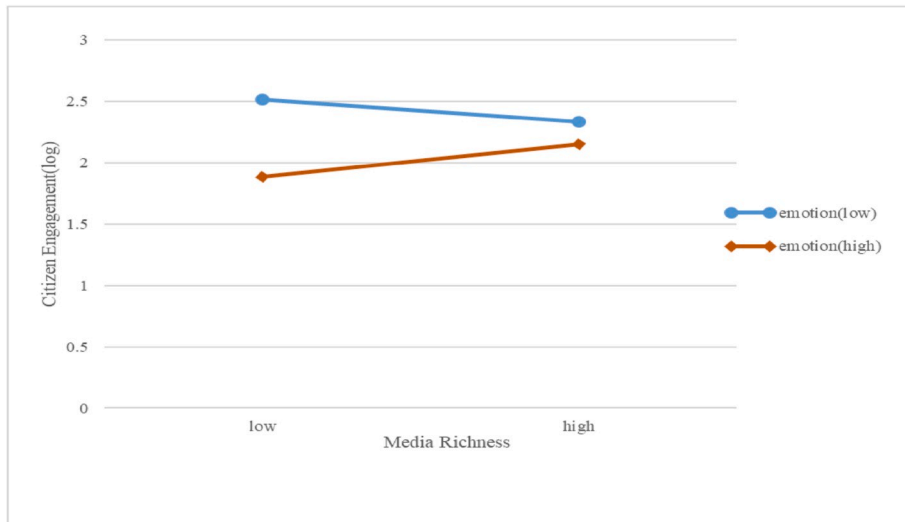


Fig. 3. Two-way interaction between media richness and emotional valence in predicting CEGSM.

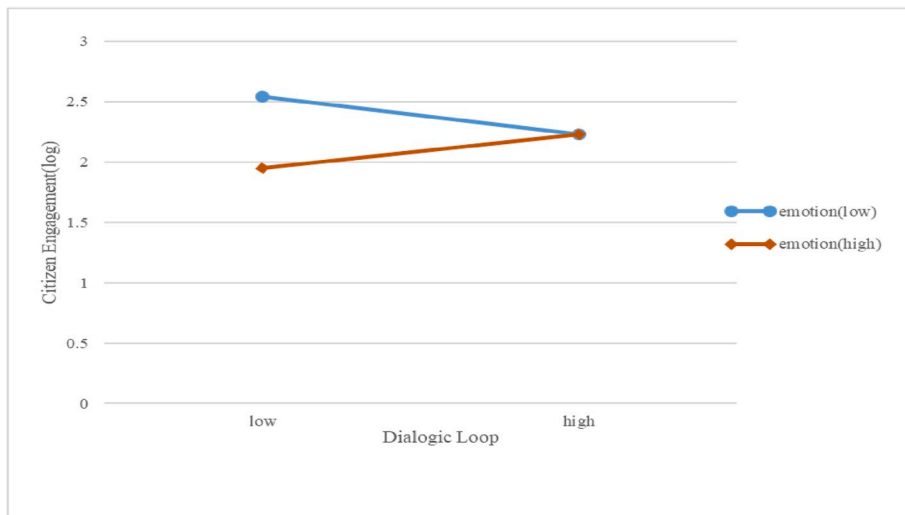


Fig. 4. Two-way interaction between dialogic loop and emotional valence in predicting CEGSM.

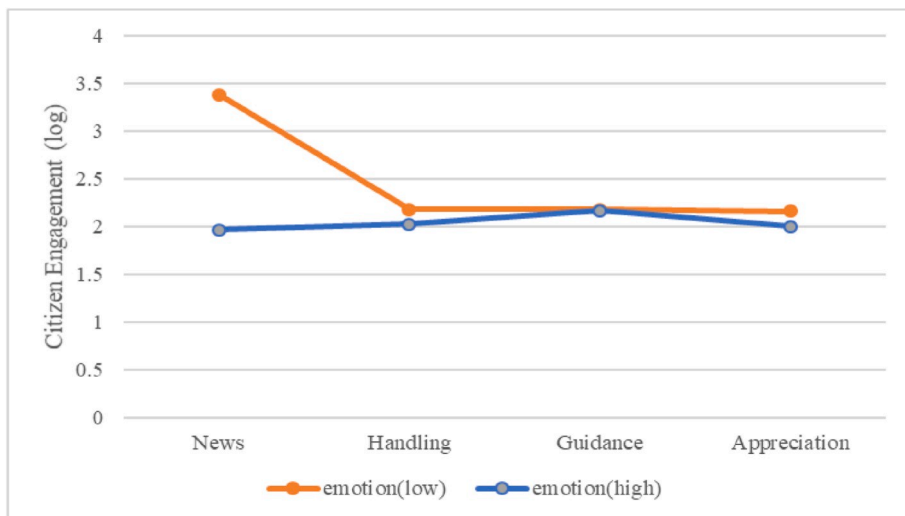


Fig. 5. Two-way interaction between content type and emotional valence in predicting CEGSM.

improvisation and unpredictability of his tweets made the plain text more popular, while using pictures was not a predictor for liking and retweeting. The inclusion of video has no effect on the amount of retweeting but significantly reduces the number of likes (Lee & Xu, 2018). Although many studies have supported the positive effect of media richness on citizen engagement via social media to different degrees, most have been conducted under normal situations (Bhattacharya et al., 2017; Bonsón et al., 2019; Guidry et al., 2019, pp. 1–9; Yue et al., 2019). This means that the impact of media richness on citizen engagement during uncertain conditions requires further investigation. The results also show that, in times of public health crisis, citizens care more about the textual content of a post, rather than whether it contains a picture or video. Meanwhile, matching between crisis-related information demand and supply directly determines the effect of online communication (Hong et al., 2018; Wukich & Mergel, 2015). This empirical study also reveals that posts with pictures and videos attached relating to the latest information on the pandemic still brings the most citizen engagement; this could attribute to the Elaboration Likelihood Model (Petty & Cacioppo, 1986, pp. 141–172), in which the public are more likely to use a central path to process information, rather than focusing on the use of multimedia and other peripheral clues that are not pertinent to the content during crisis. Meanwhile, this study also supports the inferences by Chung (2017) and Denктаş-Şakar and Sürücü, 2018 that the technical features of Weibo and Twitter require the public to click more often to get supplementary information with pictures or videos, thereby reducing citizen engagement.

This study confirms that the dialogic loop will increase CEGSM during public health crises. This further supports the results of del Mar Gálvez-Rodríguez et al. (2018) and Men et al. (2018). In fact, in order to facilitate the dialogue loop, more than 96% of the sample uses hashtags and nearly a quarter use forms of questioning when posting information. DCT states that successful online communication and dialogue depends on the implementation of five principles, including: *usefulness of information, ease of interface, rule of conservation of visitors, generation of return visits, and dialogic loop* (Rybalko & Seltzer, 2010). Among them, the first three relate to technology and design, while the last two relate to dialogue (Rybalko & Seltzer, 2010). A dialogue loop is a suitable starting point for eliciting a dialogue between organizations and the public. The dialogue loop makes it possible for the public to talk with the organization and for the organization to respond to public questions and concerns (Kent & Taylor, 1998). All these actions improve the relationship between the organization and the public and gradually promote citizen engagement (Kent & Taylor, 1998). During public health crises, government agencies actively interact with the public through a dialogue loop, demonstrating their concern for public interests, ideas, and suggestions; in response, the public feel concerned, valued, recognized, and perceive a sense of enhanced belonging to government agencies and their social media communities, which in turn becomes an important motivation for continued engagement (Wang & Yang, 2020).

This study shows that different content types have differentiated influences on CEGSM. Compared with information appreciating front-line emergency services, information relating to the latest news on the pandemic, and information on the government's handling of the crisis lead to increased citizen engagement, which denotes that the public concern these two types of information most frequently to reduce potential risks and uncertainties. This result supports previous findings which claim that different types of content meet public demands in different ways, and the differences are directly reflected in the number of likes, retweets and comments (Keib et al., 2018; Lee & Xu, 2018; Wang et al., 2016; Xie et al., 2017). Furthermore, the study of Xie et al. (2017) also found that Chinese social media users pay more attention to government disposal information and the latest developmental information in times of crisis. They further confirmed that these information needs positively affect the sharing behavior of users. The U&G theory can be used to explain current findings, which have also been used by scholars in recent years to study citizen engagement through social

media in public crises (Xie et al., 2017). It shows that active audiences will choose different media platforms according to their own needs, and that satisfaction with chosen media will in-turn affect their subsequent media choices and media usage (Katz et al., 1973). The public will have more continuous usage behaviors, including liking and reposting in public health crises, when their demands are met from GSM outlets. Consequently, government agencies should fully consider citizens' information needs to promote their engagement while adopting official social media channels.

Above all, this study confirms that emotional valence moderates the relationship between media richness, dialogic loop, content types, and CEGSM. In terms of media richness, when posts with both a high media richness and positive emotion are displayed, CEGSM increases, while posts with a high media richness and negative emotion decline CEGSM. For the dialogic loop, when posts contain negative emotions, CEGSM reduces. Regarding content type, when posts are related to the latest news about the pandemic, stronger negative emotions lead to increased CEGSM. This study proves that if government agencies fail to use emotional valence and media richness appropriately, high media richness may reduce CEGSM, which provides a novel perspective to explain the controversial relationship between media richness and social media engagement in existing research. Similarly, when governments adopt a dialogic loop strategy to promote CEGSM, the compatibility of emotional valence and dialogic loop deserve special attention. In addition, this study expands Keib et al.'s (2018) conclusion that emotional presence has a moderating effect on the relationship of content types and retweeting behavior by affirming emotional valence as a moderating variable, especially the facilitating role of negative emotions in the relationship between posts related to specific content themes and CEGSM.

6.2. Practical implications

The findings of our study provide several implications for government practices in engaging citizens through social media during global pandemic crises. First, government agencies should comprehensively use artificial intelligence and cloud computing technologies to analyze public demand and their changes during different stages of crisis. Government social media can therefore satisfy the needs of citizens to the greatest extent through the releasing of customized crisis information. According to the U&G theory and the Media Dependence Theory, demand satisfaction will enhance the influence of government social media on the public, and the public will further rely on it as the main source of crisis information; this will all eventually promote CEGSM.

Secondly, government agencies should actively use the dialogic loop to enhance CEGSM. Government agencies can take full advantage of social media functions, especially mentions @ and hashtags. Governments may post and respond to citizen questions to increase interactions with the public, so as to improve the level of engagement. In addition, government agencies should consider the impact of emotional valence when using the dialogic loop. For example, posts displaying positive emotions will promote CEGSM more through the dialogue loop.

Thirdly, the media richness of a post should not be simply considered "the higher the better". Government agencies should consider fully how media richness matches content type and emotional valence when creating posts. When latest news about the pandemic is released through GSM, the impact of plain text is no less than that of posts containing pictures or videos. Those posts displaying positive emotions can include more videos or pictures, while plain text is more suitable for posts with negative emotions.

6.3. Limitations and future directions

This study has several limitations. Although the quantitative indicators such as number of likes, retweets or reposts, and comments, have become representative standards for scholars to evaluate citizen

engagement on social media, some studies suggest that more appropriated indicators beyond simply number of likes could be incorporated for the practical good (Men & Tsai, 2013). For example, Men and Tsai (2013) divided citizen engagement into passive content consumption and proactive content contribution in their research on social networking sites in China. Future research should concentrate on proactive engagement on GSM platforms, such as co-production with citizens. Secondly, this study focuses on the official Sina Weibo account of the National Health Commission of China; however, local GSM has also made considerable contributions during the COVID-19 pandemic. Future studies should deepen understanding into how local GSM accounts facilitate citizen engagement and co-production during public health crises, and how different it is from the central government's social media practices. Thirdly, according to the research by Ji et al. (2019), emotional strength, emotional presence, and emotional valence affect citizen engagement through social media differently. This study only focuses on the moderating role of emotional valence, and subsequent studies can further analyze the moderating role of emotional strength. Lastly, other influencing factors on CEGSM deserve further efforts, such as message strategies (Kim & Yang, 2017) and social presence (Yue et al., 2019).

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.chb.2020.106380>.

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