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Impact of Government Social Media on the City Image Communication Effect During a Sudden Public Health Crisis: Qualitative Comparative Analysis

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Abstract: The outbreak of public health crises highlights the key role of government social media in crisis communication. However, during a public crisis, the narrative approach of government social media directly affects how a city's image is communicated. For instance are the singularity of urban cases, the listing of explanation attributions, and the generalization of coping strategies. Therefore, this study aimed to bridge the identified research gap by offering insights into the intricate mechanisms of how city image is shaped and disseminated through government social media during health crises. This study used qualitative comparative analysis to construct a multi-factor model to assess the effectiveness of city image dissemination. The research samples, a total of 14 cities, were randomly selected from 31 provincial capital cities in China based on the sum of the total number of provincial capital cities in the eastern (8), central (2), and western (4) regions, as well as the weight ratios of city levels. The results indicated that from the perspective of single conditional factors, urban hierarchy (UH) and reporting strength (RS) had the greatest impact on the communication effect (CE), while the impact of the reporting theme (RT) is not significant enough. The results indicated that a combination of configurations with a strong focusing RT and high RS could achieve good CE, and UH, as a marginal factor, maintained a certain impact on CE. In view of the impact of COVID-19, the following construction logic and communication path for communicating China's city image are proposed: First, the hierarchical structure of the city has been broken and a new spatial pattern for the city image has been constructed; second, constructing cultural symbols of the metropolitan area and forming a new cultural identity; third, communication strategies should be adjusted and RTs gathered.

Keywords: Government Social Media, City Image, Communication Effect, COVID-19, Qualitative Comparative Analysis Method

1. Introduction

The outbreak of public health crises has underscored the critical role of government social media in crisis communication. During the COVID-19 pandemic, cities like Wuhan, initially the epicenter of the outbreak, utilized social media to transform their image from a crisis zone to a resilient city[1]. Similarly, New York City's government used Twitter to disseminate information, showcasing the city's efforts in

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handling the pandemic and reinforcing its image as a global leader[2]. Prior research has delved into the multifaceted role of social media in crisis communication and has highlighted its capacity either to enhance or damage a city's image during a public health emergency[3][4]. Studies have emphasized the strategic crafting of messages, audience targeting, and the timing of communication as pivotal elements that influence public sentiment and trust[5]. However, such analyses focus primarily on the image of an individual city, which leaves gaps in the context-specific understanding at the level of multiple cities during health crises[6]. Therefore, this study aimed to bridge the identified research gap by offering insights into the intricate mechanisms of how city image is shaped and disseminated through government social media during health crises. It emphasized the practical implications of strategic communication and provided actionable guidance for city managers and policymakers on the effective use of social media to maintain and enhance a city's image during a crisis.

Information communications technology expands the ability of government agencies to communicate and engage with the public[7]. Social media has emerged as an important medium for governments and citizens to capture and explain crises make public decisions, and take action accordingly[8]. Government departments open social media accounts to disclose information and to establish connections with the public[9]. Mansoor's research[10]has shown that the use of social media by the government has a positive impact on government transparency and reliability. The higher the use of social media by the government, the greater its public transparency tends to be, which makes it easier to gain public trust. Chen et al.[11]used Greater London as a case study and selected three reopening measures (i.e., reopening of schools, shops, and hospitality). They applied sentiment analysis and topic modelling to explore public opinions expressed via Twitter and provided a time-sensitive approach for local authorities and city managers to rapidly sense public opinion using real-time social media data. Governments and policymakers can make use of the framework to assess public opinion and use it in leading their post-lockdown cities into an adaptive, inclusive, and smart recovery.

During a public health, many problems have thus been exposed in urban spaces, Urban environments, and urban service systems, and these have damaged the image of the city. For instance, people have also needed to maintain social distancing in public places, and many places have implemented closed management. Therefore, to reshape the image of the city, the government has used social media to transmit city information and expand its radiation space to strengthen the public's understanding of the city as a whole. The government also has to make an overall plan, of course, and release high-quality information so that the city image can be disseminated effectively and accurately[12].

This study used qualitative comparative analysis to construct a multi-factor model to assess the effectiveness of city image dissemination. The research samples, a total of 14 cities, were randomly selected from 31 provincial capital cities in China based on the sum of the total number of provincial capital cities in the eastern (8), central (2), and western (4) regions, as well as the weight ratios of city levels. These provide a reference for the construction of China's urban image, the establishment of a reporting mechanism for urban image dissemination, and improved dissemination efficiency. The role played by Chinese local government social media in the dissemination of city image during public crisis events and the strategies that they adopt provide reference cases for the construction and communication of city image in cities worldwide.

2. Literature Review

The COVID-19 pandemic wreaked havoc on city image systems. While previous researchers have paid attention to the negative impact of this phenomenon on city image and have studied city images in multiple dimensions, they have also proposed relevant coping mechanisms and solutions. This research has primarily focused on two aspects: the dimensions of city image research and social media platforms. Regarding the former, COVID-19 was a test for urban systems, so researchers focused on urban

transportation, the urban environment, innovation, and other related dimensions.

2.1 COVID-19 Erisis and City Image

In the era of new media, the "city image"[13-15]should thus be a multi-dimensional, diversified, complex, and brand-new three-dimensional concept. At present, the literature has studied the dimensions of city image composition, with a primary focus on architectural and urban attractiveness, transport and communications infrastructure and traffic, historical heritage, environment, social problems, culture, innovation and business culture, economy and commerce, range of services, education and universities, the city's international projection, and citizens' self-perception[16]. The results of such research provide the foundation for the present study.

The COVID-19 pandemic has, however, affected the public transportation systems and environmental systems in many cities around the world, so scholars have put forward targeted solutions and suggestions through case studies. Deb and Hinge[17]used the experience of Guwahati City in India as an example; by conducting an online survey on the impact of COVID-19 on travelers' perception, they identified parameters related to user dissatisfaction with the city's public transportation services. They compared the survey data from travelers before and after COVID-19, and the number of user priorities increased. Factors such as comfort, fairness, reliability, convenience, and safety became areas of user priority, while bus service attributes, such as vehicle condition and hygiene, became another priority area for users after COVID-19. The research results suggested that health-related elements of the city's bus services led users to switch to other modes of transportation. Liu et al.[18]used King County, Washington as a case study and explored the methods for researching infectious diseases in urban areas. Using principal component analysis and the Pearson correlation coefficient to process data, multiple linear regression and geographically weighted regression models were built at the ZIP code scale. The results indicated that although socioeconomic indicators were the primary factors influencing the spread of COVID-19, the built environment affected different aspects of COVID-19 cases, and built environment density was positively associated with incidence rates.

Urban innovation can promote urban transformation and upgrading, enhance a city's core competitiveness, and inject new cultural and social elements into the city, thereby shaping its image. Wang and Li[19]have discussed the impact and thinking behind promoting the construction of a new smart city—that is, the impact of COVID-19 on urban development. They proposed that, to ensure the normalization of urban life while maintaining a balance between daily management and crisis response needs, the new smart city should be integrated with urban public safety and sustainable development. Therefore, the results of this study also provided lessons for the future construction of city image.

Urban public transportation, urban architecture, and urban environment are the most direct experiences of city image systems by the public. The above studies mainly focus on the negative impacts on the formation of the city image system during COVID-19. These findings inform the study of government social media for urban image management and government communication strategies during public health crises. However, these studies have proposed targeted problem-solving strategies and methods for a single problem, which is somewhat different from this study's multifactorial impact on the effectiveness of city image communication.

2.2 Government Social Media and City Image Communication

The second research dimension that has been investigated is city image communication through various social media platforms, which covers communication strategies, image construction, and narrative methods, among others, particularly in light of the relationship between the pandemic and communicating city image. There are, however, few studies in this stream of research.

When information is poorly communicated, the city image is vulnerable to public emergencies, the COVID-19 outbreak has thus necessitated the reconstruction and dissemination of city images. For example, Yin et al.[20]took Wuhan in the post-epidemic era as an example and discussed the reshaping of the city's image after public emergencies. They proposed that the reshaping of the city image was a process of dissemination and identification, in which the media spread information and the audience is responsible for identification. Yu[21]also studied city image information dissemination activities during the epidemic by exploring how to reconstruct the identity of city image in the context of the crisis. In the context of the current new media communication ecology and model transformation, it is proposed to realize identity construction in city image communication from multiple levels.

In summary, previous studies have thus covered multiple research perspectives and dimensions, providing inspiration for this study. However, in the context of the public health crisis, there is a certain gap in the research on the factors influencing the effect of government social media on city image communication, which can be seen at three levels: research objects and dimensions, research methods, and research conclusions.

First, relevant studies have mainly examined the image communication of a single city as the research object. The dimensions of analysis have included communication characteristics, mechanisms, and strategies. These studies on a single city cannot, however, provide insight into the factors that affect the communication of the city image as a whole, which limits their research conclusions. Especially during the COVID-19 pandemic, different transmission mechanisms and solutions should be proposed for regional differences.

There have been both quantitative and qualitative studies, but these have generally involved single-attribute research methods. The present study combined qualitative and quantitative approaches, which allows the deep integration of theory and data, ensures the scientificity and accuracy of the results, and gives the results practical value and significance.

The results of previous research only focused on a single city, and the conclusions also tended to be limited to suggestions for a certain conditional factor. This approach, however, does not truly solve the essential problems in the dissemination of a city's image. There may be many factors that influence the effects of city image communication, and multiple conditions should be considered simultaneously. The countermeasures proposed should also consider various conditions to truly reflect the situation. The outbreak of COVID-19 has also disrupted the spatial order of cities and brought serious negative impacts on their city images. Government social media can encode and decode comprehensive information about cities and allow the public to a new understanding of the city's image. Agenda setting for the media thus has a direct impact on the effects of city image communication and should be used as a conditional factor for investigation.

3. Research Methods

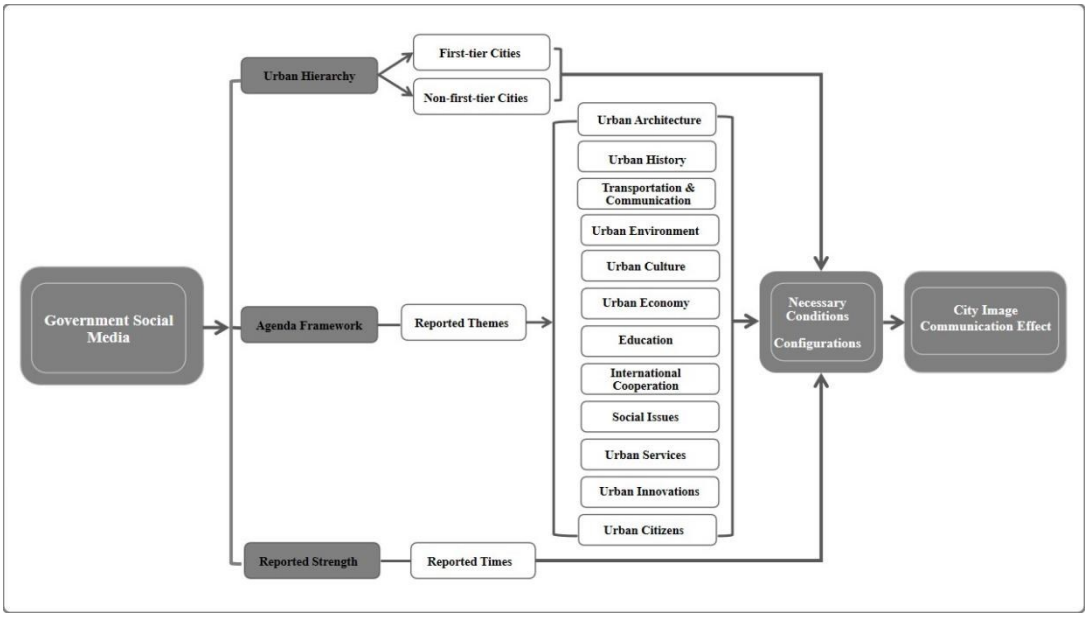
3.1 Method Selection and Framework

Qualitative comparative analysis (QCA) is proposed as a method that addresses some of the criticisms of both qualitative[22]and quantitative studies[23]by achieving high levels of generalizability and accuracy[24]: QCA "is a new analytic technique that uses Boolean algebra to implement principles of comparison used by scholars engaged in the qualitative study of macrosocial phenomena."[25]The method explores the multiple concurrent relationships among variables from a configurational perspective. It aims to investigate the causes of certain social occurrences by providing effective means to understand the complex causal relationships between factors[26]. Therefore, this study examined if the relationship between government social media and the effectiveness of city image communication conforms to the characteristics of multiple concurrent causalities, and the choice of the QCA

methodology provides suitable technical support for explaining this issue.

This research is primarily focused on the effect of exploring which combinations of causes and conditions can affect the effects of communication; this is a causal relationship problem, and each conditional variable and outcome variable can be better judged by a 0 or 1 dichotomy. Therefore, QCA was selected to explore the factors influencing city image CE. The specific steps include case selection, variable selection and model building, result variable determination, coding and assignment, output of truth table, and analysis based on conditional variable combination and result variable.

This study is based on the supposition that a city's image is composed of multiple dimensions, and there is generally not one single factor that determines the dissemination effect of a city's image. The evaluation of the effectiveness of government social media in promoting the image of multiple cities involves extracting conditional factors. The first factor that needs to be considered is regional differences. Given the unbalanced economic development in the eastern, central, and western regions of China, there are also city-level differences, as well as differences between first-tier and second-tier cities. The agenda framework of government social media, as an official media outlet, will also have a direct impact on the dissemination effect, and this is the second factor that needs to be considered. Finally, the intensity of media coverage can best reflect the attention to and importance of the communication theme. After determining the three conditional factors, we identified the core factors through data calculation, as well as the configurations of combinations that affect the dissemination effect [Fig. 1].



[Fig. 1] Research Framework

3.2 Case Selection

This study focused on the effect of city image communication in China, so the choice of social media platform is critical. Currently, WeChat is the most popular social media platform in China, with approximately 1.26 billion monthly active users[27]. Since WeChat public accounts were first created in 2014, the government WeChat public account has become an indispensable and important part of the government's new media matrix and engages in information release, public service, and government–civilian interaction. At present, 31 provinces in China have opened WeChat city services. Overall, the coverage rate of new media for government affairs in China has reached 90%, and the trend of its development shows popularization and comprehensiveness[28].

QCA is advantageous in studying small and medium-sized samples. This study employs a small sample research approach and primarily focuses on cities in eastern, central and western China, because China's first-tier cities and new first-tier cities are concentrated in eastern, central and western regions of China. However, there is a certain gap in urban development between the eastern, central, and western regions of China, with cities in the eastern region developed more than those in the central and western regions. Given that this study examined city image communication effectiveness during sudden public crises, it required a more representative and typical selection of cities. Therefore, in the selection of cases, a total of 14 cities were randomly chosen based on the proportion of provincial capital cities in the eastern, central, and western regions of China (31 in total) as well as the combined weight ratio of the city tiers. The eastern region of China has a total of 11 provincial capital cities, including three first-tier cities and three municipalities directly under the central government; therefore, a total of eight cities were selected. The central region of China has a total of eight provincial capital cities, from which two cities were selected. The western region of China has a total of 12 provincial capital cities, including one municipality directly under the central government, from which four cities were selected. Information crawling and processing methods for online big data were comprehensively applied at the provincial-level big data information research center at the researcher’s workplace to crawl the official WeChat public accounts and relevant data on the network platform of the 14 selected provincial capital cities. Through a keyword search, the topics related to city image published from January 1, 2021 to December 31, 2021, were selected as samples. A total of 22,273 pieces of data [Table 1] were collected from the 14 cities, based on statistical analysis and deletion of data irrelevant to the city image.

[Table 1] Case Library of City Image Communication

ID	City	RS (reported strength)	RT (reported theme)											
			UA	UH	UT&C	UEn	UC	UEc	Educ	IC	SI	US	UI	UCi
1	Beijing	2812	35	146	297	135	199	85	176	159	767	594	98	121
2	Wuhan	2841	41	68	263	84	209	1385	90	37	53	354	109	148
3	Chongqing	4471	123	155	831	314	313	315	284	237	214	1322	204	159
4	Nanjing	1411	48	79	165	50	99	51	76	53	64	552	115	59
5	Hangzhou	1685	114	95	254	116	173	61	149	62	158	312	56	141
6	Zhengzhou	89	0	0	3	0	1	0	1	0	1	80	1	2
7	Shanghai	3445	201	125	620	271	244	117	227	349	222	753	98	218
8	Fuzhou	420	3	21	4	5	5	46	17	14	70	221	9	5
9	Jinan	1435	64	45	199	126	101	111	142	70	88	301	64	124
10	Xi'an	539	2	26	0	19	0	10	16	2	15	441	5	3
11	Kunming	730	30	31	116	84	59	47	45	45	50	117	21	85
12	Guangzhou	526	6	19	50	40	18	40	58	52	52	106	23	62
13	Tianjin	799	1	29	6	13	2	17	19	9	41	655	7	0
14	Chengdu	1070	16	16	29	64	34	95	29	41	27	609	54	56

Note: UA, urban architecture; UH, urban history; UT&C, urban transportation and communication; UEn, urban environment; UC, urban culture; UEc, urban economy; Educ, education; IC, international cooperation; SI, social issues; US, urban services; UI, urban innovation; UCi, urban citizens.

3.3 Condition Variable Determination and Assignment

Urban hierarchy (UH) refers to the different levels of status and influence among cities in terms of economy, culture, and politics. Manuel Castells has talked about the “flowing space” provided by social media for city image dissemination from a regional perspective, allowing audiences to present more “co-existing” city image elements, forming a three-dimensional and diverse city image[29]. Social media can help residents build connections and a sense of community, which helps strengthen the city’s social connections and cohesion. UH may, however, also affect the use and dissemination of social media. There is a certain gap in urban development between the eastern, central, and western regions of China, with cities in the eastern region developing more than those in the central and western regions.

For example, Beijing, Shanghai, Guangzhou, and other first-tier cities have quite a strong influence, and their city images have a widespread effect on a global scale. The effect of city image communication in government social media still influences regional factors. Based on this, this study assigned 1 to first-tier cities in the case base and 0 to the rest.

An agenda framework (AF) refers to the media guiding the public's attention through reporting content. Maxwell McCombs proposed that the attributes of the media agenda include a substantive dimension and an affective dimension. The substantive dimension is the core content presented to the public in the report and the process of conscious strengthening[30]. In the context of the COVID-19 crisis, however, the government had to consider the audience's cognition and needs when communicating city image, and the joint participation of multiple subjects in communication has become a new path choice. Each city should thus have different reporting themes (RTs) in the era of mobile and interactive network communication. The choice of RT is usually highly related to the image of each city itself, and gradually develops into a communication symbol that conforms to city characteristics. Through the construction of a theme framework and reporting symbols, the image of the city is established for the audience, thereby strengthening the interpretation of the communication content. The themes of this study were based on the dimensions of city image composition, and the contents of the reports on government WeChat public accounts for the 14 cities were sorted. The text content was divided into twelve topics: urban architecture (UA), urban history (UH), urban transportation and communication (UT&C), urban environment (UEn), urban culture (UC), urban economy (UEc, education (Educ), international cooperation (IC), social issues (SI), urban services (US), citizens (UC), and innovation (UI). The text content was manually coded. A focus value of 1 was assigned to the theme content for urban reporting (the number of a certain theme is greater than or equal to 30% of the total number of reports) and a value of 0 was assigned if there is not enough focus. For example, if 30% of the reported content in Chongqing is related to the topic of urban services, then it is assigned a value of 1.

Reported strength (RS) is the frequency, depth, and breadth of media coverage on a topic. Typically, topics with higher reporting intensity may attract more widespread public attention. The impact of RS on communication effectiveness is thus relatively direct. Some scholars use RS as an indicator to examine the relationship between factors such as reporting intensity and communication effectiveness[31]. Looking at statistics on the RS for the 14 cities, Chongqing had the highest RS (4471 times), while Zhengzhou had the lowest (only 89 times). At the same time, to ensure that the determination of the value of this conditional factor conforms to the numerical trend of the entire case set, the median of 1070 (Chengdu) was set as the boundary, and cities with an RS greater than 1070 times were recognized as areas with strong RS and assigned a value of 1. Otherwise, a value of 0 was assigned.

3.4 Outcome Variable Determination and Assignment

The effect of city image communication was examined based on government WeChat public accounts, and CE was selected as the outcome variable for investigation. Most previous studies directly used the number of readings as the index for evaluating the CE of government WeChat[32], and some used the number of likes, reposts, and comments[33]. This study combined the method of Yan et al.[34]and others to evaluate CE and conducted a statistical analysis of the CE of government WeChat public accounts in 14 cities, where CE = Reads+Likes+Reposts+Comments (These indicators only carry out data statistics, not content evaluation and analysis, so these contents do not involve the discussion of ethical issues). Because the COVID-19 pandemic has affected each city to varying degrees, there is a significant gap in the intensity of reporting among different city levels. To ensure the authenticity and effectiveness of CE

data, this study weighted the total amount of CE for all statistics. Based on the standard of equal sample size for samples from different cities, a weight value was determined for each city sample. The final dissemination effect is thus equal to the existing dissemination effect quantity divided by the weight value. After calculating the dissemination effects of the 14 cases, the Shanghai index was found to be the highest at 5,053,912, and the Tianjin index was the lowest at 26,932. To ensure that the division of CE conformed to statistical significance and the numerical trend of the entire case set, the median CE values of 163,392 (Guangzhou) were set as the boundary. Cities greater than 163,392 were considered to have good CE, with a value of 1. Cases less than or equal to this value were considered to have poor CE and assigned a value of 0.

3.5 Building a Truth Table

After completing the selection of condition and result variables, values were assigned according to the dichotomy judgment principle, and a truth table was built with the help of the Boolean algebra algorithm in fsQCA3.0 analysis software. The possible combinations of conditional variables and outcome variables for all cases were obtained logically, as well as the number of cases [Table 2].

[Table 2] A Truth Table

AF	UH	RS	CE	Number
1	1	1	1	3
0	1	1	0	4
1	1	0	0	4
0	0	0	0	1
1	0	0	0	1
0	1	0	0	1

Note: AF, agenda framework; UH, urban hierarchy; RS, reporting strength; CE, communication effect; number, number of cities.

4. Data analysis

This study utilized fsQCA 3.0 software to conceptualize the causal relationship between influencing factors and communication effects as a relationship of necessity and sufficiency. Necessity refers to the condition where a certain condition is present in all outcomes, while sufficiency means that all cases with a specific condition lead to a certain result. The study selected three condition variables, with the logically possible combinations totaling eight (2^3). Since some combinations will not be represented in the sample or are contrary to facts, it was necessary to set threshold limits. The consistency threshold was set at 0.8, PRI (Proportional Reduction in Inconsistency) is set at 0.75, and the case threshold was set to 1[35], identifying the conditions that lead to good communication effects and ensuring that these combinations have robust stability.

4.1 Necessary Condition Analysis

In QCA, an important metric for requisite analysis is the level of consistency. When the consistency index is greater than or equal to 0.9, the conditional variable is a necessary condition for the outcome variable, and the causal condition can lead to the occurrence of the result[36]. The coverage rate indicates the degree to which the conditional variables explain the results, and the greater the coverage rate, the stronger the explanatory power [Table 3]. According to the analysis, among all of the influencing factors of the conditional variables, the consistency of UH is greater than 0.9, which meets the standard of necessary conditions. The coverage rate is 0.58, which means that the single factor of UH has a good CE on the dissemination of urban images.

The value of the conditional variable RS is 0.86, which indicates that it is a sufficient condition for city image communication to achieve good results. The coverage rate is 0.85, which indicates that it has strong explanatory power, and most cases with good urban image CE have relatively high RS. For example, in the case sample, the cities with higher RS include Shanghai, Chongqing, and Wuhan; taking Chongqing as an example, as a new first-tier city, it is the core city of the Chengdu Chongqing dual economic circle in western China, with a reporting intensity of 4,471 times and a main focus on social services. During the COVID-19 pandemic, many cities focused on social service reports to solve citizens' basic life problems. In addition, the value of the condition variable AF is 0.57, indicating that this does not constitute a necessary and sufficient condition for a good communication effect of the city's image.

[Table 3] Sufficiency and Necessity Analysis of a Single Conditional Factor

	Consistency	Coverage
AF	0.571429	0.5000000
UH	1.000000	0.583333
RS	0.857143	0.857143

Note: AF, agenda framework; UH, urban hierarchy; RS, reporting strength.

4.2 Conditional Combination Analysis

QCA not only focuses on the necessity analysis of individual variables, but also needs to analyze the combination of conditional variables, which is the focus of this study because it is necessary to analyze how the combination of various causes and conditions affects the results. For the analysis of conditional combinations, standard analytics is usually used, which produces three solutions: complex, intermediate, and simplified solutions. The intermediate solution is between the complex solution and the simplified solution and takes into account the representativeness and explanatory strength. It is neither as complicated as the complex deconstruction type, nor as simple as the simplified deconstruction type[37]. Therefore, this study chose to analyze the results using intermediate solutions. Based on the software calculations, the combination of conditions for the intermediate solution in this study is shown in Table 4. To display the relationship between the combination of core factors and marginal factors in the configuration and the case more comprehensively, according to the suggestion of Fiss[38], it is shown in the following form.

[Table 4] Conditional Combination Analysis

	Configuration one
UH (urban hierarchy)	
AF (agenda framework)	●
RS (reported strength)	●
RCV (raw coverage)	0.428571
UCV (unique coverage)	0.428571
CON (consistency)	1
SCV (solution coverage)	0.428571
SCS (solution consistency)	1

Note: (1) The factors that appear in both the simplified solution and the intermediate solution are core factors, represented by big dots (●), and the factors that only appear in the intermediate solution are marginal factors, represented by small dots (●). (2) The presence of a factor is represented by a solid circle, and the absence of a factor is represented by a crossed dot. (3) RCV represents the original coverage rate, which is the proportion of cases that the configuration can explain, reflecting the adequacy of the configuration; UCV represents the net coverage, which is the coverage rate independently explained by the configuration, reflecting the necessity of the configuration; CON represents the consistency of each configuration. (4) Blank indicates that the conditional factor does not appear in this configuration.

The solution consistency (SCS) is 1, which means that the configuration satisfies all of the cases in the 14 cities and has a strong interpretation ability. It can be interpreted as: good city image dissemination effect = focused RT * high RS. Next, the combination of conditions was analyzed.

Configuration 1: Strongly focused RT * high RS. RT and RS are the core conditions, but UH is a marginal factor. This indicates that UH does not play a core role in the effectiveness of city image communication, a result that is proven in case studies. For example, Guangzhou, as a typical first-tier city, does not have a high RS (526). Indeed, the time, depth, and breadth of media coverage directly affect CE, which are also in line with the characteristics of government social media, the speed of updating, and the acceptance of content which directly affects CE[39]. As the COVID-19 pandemic continued, the communication and dialogue between the city and the citizens was seriously affected. The government should thus make full use of the interactive function of social media, make a good AF, and produce city image theme content that can interact with citizens. At the same time, through high RS, the construction and reshaping of the city's image should be completed to resonate and empathize with the audience, and ultimately form recognition to achieve good CE.

The unique coverage (UCV) of this combination is 0.43, which means that only 43% of the cases in the sample can be explained through this combination. For example, in all cases, Shanghai focused on reporting urban transportation and communication topics (RS=620). Wuhan focused on reports on the theme of urban economy (RS=1385).

5. Discussions

The outbreak of public health crises highlights the key role of government social media in crisis communication. However, during a public crisis, the narrative approach of government social media directly affects how a city's image is communicated. Therefore, in the context of public crisis, it is of great significance to explore how government social media affects the communication effectiveness of a city's image for reshaping city image and enhancing the efficiency of city communication.

From a single conditional factor perspective, UH and RS were sufficient conditions to promote good CE; they appeared to have a significant impact on the dissemination of a city's image. UH is, however, a necessary and sufficient condition, which also showed that there is a noticeable gap in the effect of urban image communication between first-tier cities and non-first-tier cities. There are differences in the level of use between different levels of government and between different geographical areas[40]. First-tier cities (e.g., Beijing and Shanghai) have a stronger city image influence. Because first-tier cities are the core cities in the metropolitan area, they have a larger social media user group and draw higher attention, but the objective factor of COVID-19 cannot be ignored. As a first-tier city, Guangzhou's spread effect is not apparent. In fact, the frequency of theme coverage in the agenda framework can reflect the current state of urban development. However, RT does not produce good CE under a single conditional factor. Therefore, effective city image CE requires not only a clear theme but also a combination of several conditions to form a coherent city image identity.

6. Conclusions

Based on QCA, this study extracted data from government social media in 14 provincial capital cities in China, focusing on data related to city images published in government affairs WeChat public accounts. Through these data, the city image CE was analyzed for each city under the influence of COVID-19 to explore the conditional factors and configuration paths that affect city image communication from multiple perspectives. These research results provided a basis for the construction and reconstruction of urban image after the crisis, and also provided actionable guidance for city managers and policymakers on the effective use of social media.

Through these configurational analyses, highly focused RT and high RS can maximize the effect of city image communication. However, according to the present results, the impact of RTs on CE is not sufficient, indicating that China currently lacks a sense of media AF in city image communication, and there is no overall planning of theme content. Therefore, the government should make full use of social media to frame the agenda, capture the city's characteristics, and construct and reshape the city's image through high reporting intensity to gradually form the audience perception and achieve good CEs. In addition, UH does not have a strong influence on CE in the configuration, reflecting a departure from the standardized development model of China's first-and second-tier cities. In other words, in the post-pandemic era, the hierarchical relationships between cities and their images need redefinition and reconstruction. Therefore, in the context of COVID-19, this paper proposes the construction logic and implementation path for China's city image communication.

First, the hierarchical structure of the city has been broken and a new spatial pattern has been constructed. In the combined configuration results, UH has become a marginal factor, and its explanatory power for the effectiveness of city image dissemination is weak. Judging from the statistics of the number of reports in each city, first-tier cities do not necessarily have high RS. For example, Beijing, Shanghai, and Guangzhou, which are first-tier cities, do not have high RS. Beijing has 2,812, and Guangzhou only has 526. However, Chongqing, a new first-tier city, has an RS of 4,471. Evidently, the previous development pattern of urban standardization of first-tier and second-tier cities has been broken. China's urban scale and spatial form are thus transforming. For example, China began to put forward plans for the development of metropolitan areas, and this new spatial form has had an important impact on national economic growth and international competition and cooperation. Metropolitan circles re-quantify and position the development circles of Chinese cities in terms of city size, spatial distance, and connection strength. Facing the crisis test of COVID-19 and the homogenization phenomenon of thousands of urban areas in China, this new urban spatial form and planning is conducive to the construction of a new city image. By reviewing the current research results, the cases with high CE (e.g., Shanghai, Wuhan, and Chongqing) belong to the mature metropolitan areas and catch-up metropolitan areas, which reveals the internal relationship between the metropolitan areas, a new urban development plan, and the effect of city image communication. Therefore, this new metropolitan area development path needs more clear RTs and high RS to form a new metropolitan area image symbol.

Second, constructing cultural symbols of the metropolitan area and forming a new cultural identity. According to the theory of cultural semiotics by the Soviet literary scholar Lotman, the cultural symbolic system should continuously communicate and exchange information with the "outer system", thus building cultural dynamics and gradually changing the subject's cognitive mode[41]. During the COVID-19 pandemic, Wuhan was hailed as a "hero city" and received widespread public recognition. However, when examining the number of city image RTs across various dimensions, the frequency of reports on urban architecture, history, and culture in these 14 city cases was notably low. For instance, in Beijing, Guangzhou, Wuhan, and Fuzhou, reports on urban architecture accounted for only 1% of the total volume. This indicates that many cities have overlooked the dissemination of cultural themes. Therefore, it's imperative to construct and integrate the city image of core cities with the cultural symbols of non-core cities within the metropolitan area, thereby forging a distinctive cultural symbol for the metropolitan area.

Third, communication strategies should be adjusted and RTs gathered. The final form of the city image in the media is jointly constructed by various intermediary factors in the process of mutual conflict, negotiation, and interaction. The media can interpret various ideological factors such as the values of the times and society, institutional norms, power structures, language, and culture in the city image, which together affect and determine the depth of the public's understanding of the city image[42]. The combination of RS and RT of city image has a relatively good CE; however, according to the statistical

analysis of the results, out of the 14 city cases, only Shanghai, Wuhan, and Chongqing were successful. Many cities in China have thus not focused on the strength and theme of city image reporting, nor have they formulated long-term, clear, and sustainable plans. Each city should thus combine its own development characteristics and advantages, and local governments should set a good agenda for media, planning the dimensions, frequency, and strength of RT content. At the same time, the government should establish a good communication mechanism and form a consistent communication image. The overall thematic focus of city image reports is not high, which reflects the arbitrariness of content planning and mining in the dissemination and production process. Combined with the CE presented by Configuration 1 in this study, cities in each region should combine urban attributes to set centralized and heterogeneous RT in the communication process.

Based on the above analysis, city managers and policymakers need to be aware of the importance of maintaining a good dynamic and interactive relationship with social media platforms in shaping and disseminating the city's image during public crises. At the same time, the government should establish a good communication mechanism and always maintain a consistent communication image. Finally, the dissemination of media should be centered around the current policy needs of China, and communication about each city should forward the construction of the current national image of China to optimize the effectiveness of city image dissemination and enhance the overall identity of Chinese cities from a regional image to a national image.

7. Study limitations

Due to regional differences, there is a large gap in the development of various urban levels. To investigate the objectivity, cities were sorted into three groups based on their location in eastern, central, and western regions. However, the economic development of the eastern region is significantly stronger than that of the central and western regions. Therefore, random selection was conducted based on the proportion of cities in these regions. From the 31 provincial-level cities in China, 14 were finally selected as samples. There are thus certain limitations in the total sample size, which is rather small and may not have strong persuasiveness in the representativeness and universality of the research conclusions. In future research, based on the current study, more in-depth study of urban communication is needed.

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References

[1] Y. R. Li, Y. Chandra, N. Kapucu, Crisis Coordination and the Role of Social Media in Response to COVID- 19 in Wuhan, China, The American Review of Public Administration, (2020), Vol.50, pp.698-705.
DOI: 10.1177/0275074020942105

[2] How New York City’s government used Twitter during the COVID-19 pandemic.The New York Times, (2021)
Available from: https://en.wikipedia.org/wiki/COVID-19_pandemic_in_New_York_City.

[3] I. Mergel, Social media adoption and resulting tactics in the U.S. federal government, Government Information Quarterly, (2013), Vol.30, No.2, pp.123-130.
DOI: 10.1016/j.giq.2012.12.004

[4] J. Y. Shi, H. K. Kim, Integrating Risk Perception Attitude Framework and the Theory of Planned Behavior to Predict

Mental Health Promotion Behaviors among Young Adults, Health Communication, (2019), Vol.35, No.5, pp.1-10.

[5] S. R. Veil, T. Buehner, M. J. Palenchar, A work-in-process literature review: Incorporating social media in risk and crisis communication, Journal of Contingencies and Crisis Management, (2011), Vol.9, No.2, pp.110-122.

[6] T. Heverin, L. Zach, Examination of Twitter use in response to a 2009 violent crisis in the Seattle-Tacoma, Washington area. Information Systems for Crisis Response and Management, Proceedings of the 7th International ISCRAM Conference – Seattle, USA, (2010), Vol.7, No.1, pp.1-5.

[7] E. S. Zeemering, Functional fragmentation in city hall and Twitter communication during the COVID-19 Pandemic: Evidence from Atlanta, San Francisco, and Washington, DC. Government Information Quarterly, (2021), Vol.38, No.5, 101539.

[8] P. Panagiotopoulos, J. Barnett, A. Z. Bigdeli, S. Sams, Social media in emergency management:Twitter as a tool for communicating risks to the public, Technological Forecasting and Social Change, (2016), Vol.111, pp.86-96.
DOI: 10.1016/j.techfore.2016.06.010

[9] X. B. Tang, S. X. Li, M. L.Tan, D. S.Yang, Review and Prospects of Study on Social Media in Government, Journal of 4Modern Information, (2020), Vol. 40, No.1, pp.159-169.
DOI: 10.3969 /j.Issn.1008-0821.2020.01.018

[10] M. Mansoor, Citizens' trust in government as a function of good governance and government agency's provision of quality information on social media during COVID-19, Government Information Quarterly, (2021), Vol.38, pp.1-14.

[11] Y. Q. Chen, H. F. Niu, E. A. Silva, The road to recovery: Sensing public opinion towards reopening measures with social media data in post-lockdown cities, Cities, (2023), Vol.132, 104054.
DOI: 10.1016/j.cities.2022.104054

[12] G. P. He, City Image Communication: Framework and Strategies, Modern Communication, (2010), Vol.169, No.8, pp.13-17.
DOI: 10.19997/j.cnki.xdcb.2010.08.004

[13] K. Lynch, The Image of the City, Cambridge, Mass.: M.I.T. Press, (2008)

[14] P. Kotler, Marketing Managemen, Upper Saddle River, NJ: Prentice-Hall, (1997)

[15] C. V. Priporas, N. Stylos, I. (E.) Kamenidou, City image, city brand personality and generation Z residents' life satisfaction under economic crisis: Predictors of city-related social media engagement, Journal of Business Research, (2020), Vol.119, pp.453-463.
DOI: 10.1016/j.jbusres.2019.05.019

[16] T. Luque-Martínez, S. Del Barrio-García, J. Á. Ibáñez-Zapata, M. Á. R. Molina, Modeling a city’s image: The case of Granada, Cities, (2007), Vol.24, No.5, pp.335-352.
DOI: 10.1016/j.cities.2007.01.010

[17] S. Deb, G. Hinge, Passenger's perception about city buses in the aftermath of COVID 19: Experience from Guwahati city, India, International Journal of Disaster Risk Reduction, (2023),Vol.85, 103489.
DOI: 10.1016/j.ijdrr.2022.103489

[18] C. Liu, Z. R. Liu, C. H. Guan, The impacts of the built environment on the incidence rate of COVID-19: A case study of King County, Washington, Sustainable Cities and Society, (2021), Vol.74, 103144.
DOI: 10.1016/j.scs.2021.103144

[19] G. T. Wang, F. Li, Construction of new smart city powered by informatization: Effects and thinking of COVID-19 epidemic on urban development, Bulletin of Chinese Academy of Sciences, (2020), Vol.35, No.8, pp.1024-1031.

[20] H. Yin, L. L. Zhu, Z. Q. Fang, Reconstruction of city image after public emergency: Taking Wuhan in the post-epidemic era as an example, Journal of China University of Mining & Technolog (Social Sciences), (2021), Vol.23, No.5, pp.97-106.
DOI: 10.3969/j.issn.1009-105x.2021.05.009

[21] L. R. Yu, The dilemma and reconstruction of identity: Problems and countermeasures of urban image communication and construction in the context of crisis, Hubei Social Sciences, (2021), No.1, pp.59-65.

DOI: 10.13660/j.cnki.42-1112/c.015540

[22] A. G. Woodside, Bridging the chasm between survey and case study research: Research methods for achieving generalization, accuracy, and complexity, Industrial Marketing Management, (2010), Vol.39, No.1, pp.64-75.
DOI: 10.1016/j.indmarman.2009.03.017

[23] T. Greckhamer, V. F. Misangyi, H. Elms, R. Lacey, Using Qualitative Comparative Analysis in Strategic Management Research: An Examination of Combinations of Industry, Corporate, and Business-Unit Effects, (2007), Vol.11, No.4, pp.695-726.
DOI: 10.1177/1094428107302907

[24] A. G. Woodside, Bridging the chasm between survey and case study research: Research methods for achieving generalization, accuracy, and complexity, Industrial Marketing Management, (2010), Vol.39, No.1, pp.64-75.
DOI: 10.1016/j.indmarman.2009.03.017

[25] C. C. Ragin, Introduction to qualitative comparative analysis, In: Janoski T and Hicks AM (eds) The Comparative Political Economy of the Welfare State, New York: Cambridge University Press, (1994)

[26] C. C. Ragin, Redesigning Social Inquiry: Fuzzy Sets and Beyond, In: Chicago: University of Chicago Press, (2008)

[27] Datareportal Digital 2022: Global overview report.
Available fromt: https://datareportal.com/reports/digital-2022-global-overview-report

[28] Q. Yang, Don't let government new media become mere furnishings.
Available from: http://www.rmlt.com.cn/2020/0715/586970.shtml

[29] Y. Y. Zhang, Z. Y. Ye, Analysis on speechless urban publicity and empowered agenda frame: An empirical study of 31 Chinese cities' international communication effect based on Twitter data, Journal of Hubei University (Philosophy and Social Science), (2022), Vol.49, No.1, pp.162-170.
DOI: 10.13793/j.cnki.42-1020/c.2022.01.017

[30] M. McCombs, J. P. Llamas, E. Lopez-Escobar, F. Rey, Candidate images in Spanish elections: Second-level agenda-setting effects, Journalism & amp; Mass Communication Quarterly, (1997), Vol.74, No.4, pp.703-717.

[31] Y. Yin, Y. Y. Fu, Regional perspective and emotional frame: A frame analysis of the communication of Chinese film and television culture in Korea, Modern Communication, (2020), Vol.287, No.6, pp.101-109.

[32] W. Z. Lv, K.Y. Shi, L. Zheng, Research on the communication methods and effects of government WeChat, E-Government, (2017), No.2, pp.59-67.
DOI: 10.16582/j.cnki.dzzw.2017.01.008

[33] A. Lev-On, N. L. Steinfe ld, Local engagement online: Municipal Facebook pages as hubs of interaction, Government Information Quarterly, (2015), Vol.32, No.3, pp.299-307.
DOI: 10.1016/j.giq.2015.05.007

[34] Y. W. Yan, H. T. Zhang, S. Y. Sun, Research on the effect evaluation of the government WeChat information communication based on the BP neural network, Library and Information Service, (2017), Vol.61, No.20, pp.53-62.
DOI: 10.13266 /j.issn.0252-3116.2017.20.005

[35] T. Greckhamer, S. Furnari, P. C. Fiss, R. V. Aguilera, Studying configurations with qualitative comparative analysis: Best practices in strategy and organization research, Strategic Organization, (2018), Vol.16, No.4, pp.482-495.
DOI: 10.1177/1476127018786487

[36] C. C. Ragin, The comparative method: moving beyond qualitative and quantitative strategies, (1987), London: University of California Press.

[37] B. G. Du, P. J. Zhang, Multi-concurrent causality and multi-paths of the policies for the transformation of scientific and technological achievements: QCA analysis based on the technology transfer polices in 22 regions in China, Science of Science and Management of S. & T, (2019), Vol.40, No.11, pp.3-14.

[38] P. C. Fiss, Building better causal theories: a fuzzy set approach to typologies in organization research, Academy of Management Journal, (2011), Vol.54, No.2, pp.393-420.

[39] M. W. Graham, E. J. Avery, S. Park, he role of social media in local government crisis communications, Public Relations Review, (2015), Vol.41, No.3, pp.386-394.

[40] W. H. Yu, Y. K. Huang, Government Communication in Public Health Emergency: Response, Agenda, and Orientation, Journalism & Communication Review, (2020), Vol.73, No.5, pp.22-33.
DOI: 10.14086 /j.cnki.xwycbpl.2020. 05.002

[41] X. B. Zhao, The evolution and development of lotman's theory of cultural semiotics, Russian Literature & Arts, (2003), No.3, pp.39-44.

[42] Y. Chen, The media construction of city image: Concept analysis and theory frame, Press Circles, (2009), No.5, pp.103-104.