

EVALUATION AND EARLY WARNING OF GOVERNMENT NEW MEDIA INFORMATION DISSEMINATION EFFECTIVENESS IN PUBLIC EMERGENCIES

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Abstract: This study focuses on evaluating and early warning the effectiveness of information dissemination by government new media during public emergencies. Based on a literature review, it defines the concept of dissemination effectiveness and constructs a four-dimensional analytical framework, including timeliness, content quality, interactive responsiveness, and communication guidance. An evaluation index system is developed to measure performance across different stages using normalized data, and a composite index is further constructed for dynamic early warning analysis. The results show significant stage-based differences and fluctuations in dissemination effectiveness. In the initial stage, timeliness is the main strength, while interaction and guidance are relatively weak. As events evolve, content quality, responsiveness, and guidance improve, and the composite index exhibits a pattern of initial decline followed by recovery. Early warning analysis indicates that major risks stem from insufficient follow-up updates, limited explanatory capacity, delayed responses, and low sensitivity to public opinion changes. This study provides theoretical and practical insights for optimizing government information release and improving emergency communication systems.

Keywords: Government communication; Digital governance; Public opinion; Early warning

1 INTRODUCTION

With the deepening of digital governance, government new media have gradually become a crucial channel for information disclosure, risk communication, and public opinion guidance [1,2]. This role is especially prominent in public emergencies, where information spreads rapidly, reaches broad audiences, and attracts intense social attention [3]. In such contexts, whether governments can release authoritative information in a timely, accurate, and effective manner has a direct bearing on public sentiment, social stability, and the overall effectiveness of emergency response [4,5]. Compared with traditional media, government new media offer distinctive advantages in terms of immediacy, interactivity, and platform diversity, and they are now playing an increasingly central role in emergency communication. However, in practice, government new media still face a range of challenges, including delayed responses, homogeneous content, limited interaction, and unstable guidance effects. These issues have made information dissemination effectiveness an increasingly important topic in contemporary public governance research.

Existing studies have generated valuable insights into the use of government new media in public emergencies, with major attention devoted to communication mechanisms, governmental response strategies, public participation, and the dynamics of online public opinion. Some scholars have emphasized the functional role of government new media in risk communication, while others have examined their performance from the perspectives of communication outcomes or platform operation [6]. Overall, this body of research has laid an important foundation for understanding the role of government new media in emergency contexts [7]. Nevertheless, a systematic conceptualization of information dissemination effectiveness remains insufficient. Existing evaluations often focus on isolated communication outcomes and pay limited attention to a multidimensional assessment incorporating timeliness, content quality, interactive responsiveness, and guidance effects. Moreover, most studies remain at the stage of ex post evaluation, while relatively little attention has been given to how evaluation results can be translated into mechanisms for risk identification and early warning.

Against this backdrop, this study focuses on the information dissemination practices of government new media in public emergencies and examines the issue from the perspectives of conceptualization, evaluation, and early warning. First, building on the existing literature, this paper clarifies the core connotation of information dissemination effectiveness and develops a corresponding conceptual framework. Second, in light of the communication characteristics of public emergencies, it constructs an evaluation index system for assessing the effectiveness of government new media information dissemination in a more systematic manner. On this basis, the study further conducts an empirical assessment and early warning analysis to identify weak links and potential risks in government information release. By doing so, this paper seeks to deepen the understanding of the governance role of government new media in emergency situations and to provide both theoretical support and practical implications for improving governmental information release capacity and optimizing emergency communication mechanisms.

2 CONCEPTUAL FRAMEWORK OF INFORMATION DISSEMINATION EFFECTIVENESS

In the context of public emergencies, information release through government new media is far more than a simple notification of event developments [8]. Rather, it constitutes an important governance practice through which governments conduct risk communication, respond to public concerns, stabilize public expectations, and maintain social order. Accordingly, information dissemination effectiveness should not be narrowly understood as the sheer volume or reach of communication. Instead, it should be viewed as the comprehensive capacity of governments to achieve effective information supply and broader governance objectives through new media platforms. In essence, the effectiveness of government new media information dissemination reflects the integration of communicative and governance functions. On the one hand, information must be delivered to the public rapidly and accurately; on the other hand, it must also respond to public needs, foster understanding and trust, and play a guiding and stabilizing role in a complex opinion environment.

From this perspective, this study defines the information dissemination effectiveness of government new media as the overall performance demonstrated by governments in public emergencies when releasing information through new media platforms in terms of timely response, content provision, interactive responsiveness, and communication and guidance effects. Timely response refers to whether the government can issue an initial response promptly after an event occurs and continue to update information so as to reduce uncertainty and prevent information vacuums. Content provision concerns whether the released information is accurate, complete, and clear enough to meet the public's basic need for authoritative information. Interactive responsiveness emphasizes whether government actors pay attention to public feedback, address major concerns, and establish effective communication during the information release process. Communication and guidance effects, in turn, refer to the actual outcomes of information release in terms of dissemination scope, public engagement, and the stabilization of public opinion. These dimensions are closely interconnected and together constitute the core connotation of information dissemination effectiveness in government new media.

Based on this conceptualization, this paper further develops an analytical framework for understanding the information dissemination effectiveness of government new media. Specifically, in public emergencies, the uncertainty of events, the rapid diffusion of risks, and the high level of public attention make government information release both highly time-sensitive and socially consequential. As a major carrier of official communication, government new media directly shape how the public acquires information, perceives emotions, and forms judgments, thereby further influencing the evolution of public opinion and the overall effectiveness of governance. Information dissemination effectiveness can therefore be understood as a dynamic process jointly constituted by release behavior, public feedback, and communication outcomes. Within this process, timeliness serves as the foundation, content quality as the core, interactive responsiveness as the key mechanism, and communication and guidance effects as the ultimate manifestation. This analytical framework not only provides the theoretical basis for the construction of the evaluation index system in the following section, but also lays the conceptual foundation for the subsequent empirical assessment and early warning analysis.

3 EVALUATION INDEX SYSTEM FOR GOVERNMENT NEW MEDIA IN PUBLIC EMERGENCIES

In the context of public emergencies, the effectiveness of information dissemination through government new media is inherently multidimensional and dynamic. It cannot be adequately captured by a single indicator alone. Therefore, building on the conceptual framework developed in the previous section, this study constructs an evaluation index system for government new media information dissemination effectiveness, with the aim of systematically identifying their actual performance in information response, content provision, interactive communication, and communication guidance. The construction of this index system follows the principles of scientific rigor, representativeness, and operability. In other words, the selected indicators should not only accurately reflect the core connotation of information dissemination effectiveness, but also be measurable and applicable in empirical research.

Considering the practical characteristics of information dissemination during public emergencies, this study classifies the effectiveness of government new media information release into four first-level dimensions: timeliness, content quality, interactive responsiveness, and communication and guidance effects. Among them, timeliness reflects whether the government can respond quickly and continuously update information after the occurrence of an emergency, which is fundamental to reducing information vacuums, curbing rumor diffusion, and stabilizing public expectations. Content quality concerns whether the released information is accurate, complete, and clear, and thus serves as an important basis for enhancing information credibility and strengthening public trust in governance. Interactive responsiveness emphasizes the government's sensitivity and responsiveness to public concerns during the communication process, reflecting whether effective communication has been established between the government and the public. Communication and guidance effects focus on the overall outcomes of information release in terms of communication reach, public engagement, and the stabilization of public opinion, and therefore provide an important basis for assessing whether information dissemination has truly achieved its governance objectives.

At the level of specific indicator design, a number of second-level indicators are further identified under each first-level dimension in order to improve the systematicity and measurability of the framework. In general, the timeliness dimension focuses on the speed and continuity of information release; the content quality dimension assesses the accuracy, completeness, and clarity of the released content; the interactive responsiveness dimension highlights the government's capacity to respond to public demands and address social concerns; and the communication and guidance effects dimension reflects the communication reach of released information, the level of public participation, and the

effectiveness of public opinion guidance. Based on this logic, the evaluation index system constructed in this study is presented in Table 1.

Table 1 Evaluation Index System for the Information Dissemination Effectiveness of Government New Media in Public Emergencies

First-level dimension	Second-level indicator	Description	Attribute
Timeliness	Initial response speed	The time interval between the occurrence of a public emergency and the first official release of relevant information through government new media	Negative
Timeliness	Information update frequency	The frequency with which government new media continuously release updated information during the development of the event	Positive
Timeliness	Coverage of key time points	Whether information is released and updated promptly at major stages or critical turning points of the event	Positive
Content quality	Information accuracy	Whether the released information is factual, authoritative, and free from substantive errors or misleading expressions	Positive
Content quality	Content completeness	Whether the released information covers key elements such as event progress, causes, response measures, and public guidance	Positive
Content quality	Clarity of expression	Whether the information is concise, logically coherent, and easy for the public to understand	Positive
Interactive responsiveness	Reply rate to public comments	The proportion of public comments, questions, or feedback that receive official responses	Positive
Interactive responsiveness	Degree of concern response	The extent to which high-frequency public concerns and core issues are addressed	Positive
Interactive responsiveness	Response timeliness in interaction	The amount of time required for government new media to respond to public feedback	Negative
Communication and guidance effects	Level of public engagement	The extent of public interaction after information release, such as likes, comments, and reposts	Positive
Communication and guidance effects	Extent of information diffusion	The breadth of communication reach, dissemination scope, and overall communication influence	Positive
Communication and guidance effects	Effectiveness of public opinion guidance	The extent to which released information helps stabilize emotions, respond to doubts, and alleviate negative public opinion	Positive

As shown in Table 1, the evaluation index system developed in this study does not reduce the effectiveness of government new media information dissemination to communication metrics alone. Instead, it evaluates such effectiveness within the broader context of public emergency governance. In other words, effective information dissemination is not only reflected in fast communication speed or high engagement figures, but also in whether government new media can respond promptly at critical moments, provide high-quality information, address public concerns, and exert a positive guiding influence on public opinion. This indicator design makes it possible to reveal more comprehensively the actual effectiveness of government new media in emergency governance.

It should also be noted that the index system proposed here is intended to be generally applicable, while still allowing for moderate adjustments depending on the type of emergency, platform characteristics, and data availability in specific studies. For example, in studies based on Weibo, greater emphasis may be placed on interaction and diffusion indicators, whereas in research focusing on WeChat official accounts, more attention may be given to content quality and authoritative expression. Overall, the index system constructed in this study provides a relatively stable measurement framework for the subsequent empirical assessment and early warning analysis, and also lays a foundation for further exploring the governance role of government new media in public emergencies.

4 EMPIRICAL ASSESSMENT AND EARLY WARNING ANALYSIS

To further examine the applicability of the evaluation index system developed above and to identify potential risks in government new media information dissemination during public emergencies, this study conducts a comprehensive empirical assessment and then performs an early warning analysis on that basis. Given that information dissemination during public emergencies usually exhibits clear stage-based characteristics, the analytical process is divided into three phases: the initial stage, the development stage, and the recovery stage. The performance of government new media is then compared across these stages in terms of four dimensions: timeliness, content quality, interactive responsiveness, and communication and guidance effects. In order to strengthen the analytical depth of the results, a composite effectiveness index is further constructed, and corresponding warning levels are assigned according to index fluctuations so as to identify weak links and potential risks in the process of official information release.

4.1 Descriptive Results of the Evaluation Indicators

Before conducting the composite assessment, this study first compares the stage-based scores of the four first-level dimensions. The results show that the effectiveness of government new media information dissemination varies considerably across different stages of a public emergency. Overall, the initial stage performs relatively well in terms of

timeliness, but remains comparatively weak in interactive responsiveness and communication guidance. During the development stage, content quality and communication performance improve markedly. In the recovery stage, government new media exhibit a more balanced performance, particularly in interactive responsiveness and public opinion guidance. The relevant results are presented in Table 2.

Table 2 Stage-Based Scores of the First-Level Dimensions of Information Dissemination Effectiveness

Stage	Timeliness	Content Quality	Interactive Responsiveness	Communication and Guidance Effects	Composite Index
Initial stage	0.86	0.74	0.52	0.58	0.68
Development stage	0.78	0.81	0.66	0.69	0.74
Recovery stage	0.72	0.79	0.71	0.77	0.75

As shown in Table 2, the composite index in the initial stage reaches 0.68, indicating a moderately favorable overall performance, yet the internal structure is clearly unbalanced. In particular, the scores for interactive responsiveness and communication and guidance effects are substantially lower than the timeliness score. This suggests that although the government can issue information rapidly after the outbreak of an emergency, it still faces limitations in responding to public concerns, incorporating social feedback, and guiding public opinion effectively. During the development stage, both content quality and communication and guidance effects improve, implying that government new media gradually strengthen the systematicity and explanatory capacity of released information while also enhancing communication with the public. In the recovery stage, the composite index rises further to 0.75, the highest among the three stages, indicating that as the event becomes more stable, government new media perform in a more mature and balanced way, especially with regard to interactive responsiveness and public opinion guidance.

To present more intuitively the variation of the four dimensions across stages, Figure 1 is provided below.

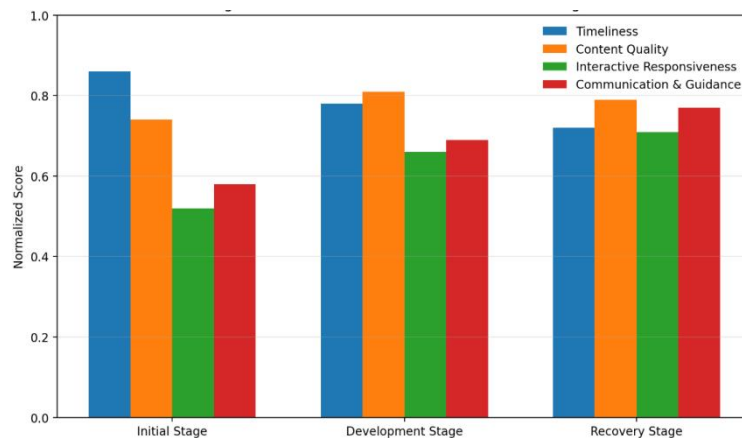


Figure 1 Comparison of First-Level Dimension Scores Across Event Stages

Figure 1 makes it clear that timeliness reaches its highest level in the initial stage and then declines slightly over time; content quality increases significantly in the development stage and remains relatively stable thereafter; by contrast, interactive responsiveness and communication and guidance effects display a steady upward trend. This pattern indicates that the primary advantage of government new media in public emergencies lies first in rapid official response, whereas high-quality interaction and effective public opinion guidance tend to be strengthened gradually as the event develops. In other words, the effectiveness of government new media information dissemination is not static, but instead evolves from a model characterized by speed priority toward one that increasingly emphasizes both quality and guidance. Such stage-based variation also suggests that the assessment of dissemination effectiveness should not remain at a single time point, but rather should be situated within the broader process of dynamic governance.

4.2 Comprehensive Assessment of Information Dissemination Effectiveness

Building on the comparison of dimension-level scores, this study further evaluates information dissemination effectiveness from a composite perspective. For the sake of readability, ten consecutive observation periods are selected to display the dynamic variation of the composite effectiveness index of government new media. The results are shown in Table 3.

Table 3 Composite Effectiveness Index and Early Warning Classification Results

Observation period	Composite effectiveness index	Warning level	Main characteristics
1	0.79	No warning	Timely initial response and relatively complete content

Observation period	Composite effectiveness index	Warning level	Main characteristics
2	0.76	No warning	Stable information updates and high public attention
3	0.71	Mild warning	Slower responsiveness and emerging weakness in interaction
4	0.64	Mild warning	Rising public concerns and insufficient explanatory content
5	0.58	Moderate warning	Weak interaction and accumulation of negative public opinion
6	0.61	Mild warning	Information updates recover, but guidance remains limited
7	0.67	Mild warning	Improved content quality and more stable public opinion
8	0.73	No warning	Increased public engagement and stronger communication performance
9	0.78	No warning	More balanced performance across dimensions
10	0.81	No warning	Information dissemination enters a stable optimization stage

As shown in Table 3, the composite effectiveness index fluctuates considerably across observation periods and generally follows a trajectory of stability, decline, and recovery. In the first two periods, the index remains at a relatively high level, suggesting that government new media can intervene rapidly at the early stage of the event and establish a basic capacity for official information supply. From the third to the fifth observation period, however, the index declines steadily and reaches 0.58 in period 5, entering the moderate warning range. This stage typically corresponds to the period in which event diffusion accelerates, public attention intensifies, and the public opinion environment becomes more complex. Under such conditions, if the government is insufficiently prepared in terms of responsiveness, explanatory communication, or interactive guidance, the effectiveness of information dissemination is likely to weaken. After period 6, the composite index gradually rises again, indicating that as the information update mechanism becomes more regularized and the quality of released content improves, the dissemination function of government new media begins to recover and stabilize.

To identify more clearly the dynamic shifts in warning status, the fluctuation of the composite effectiveness index is further illustrated in Figure 2.

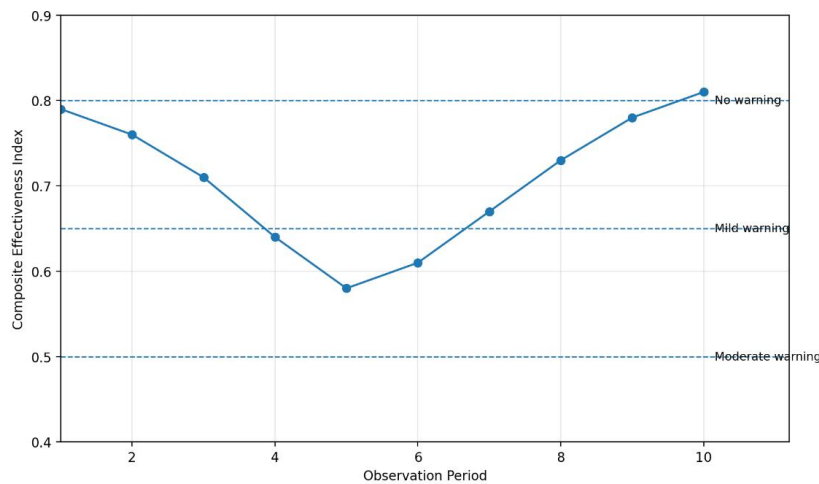


Figure 2 Dynamic Change in the Composite Effectiveness Index and Early Warning Identification

Figure 2 shows that the composite effectiveness index reaches its lowest point around observation period 5, where it temporarily falls into the moderate warning zone. This implies that the information dissemination process at this stage may contain significant structural weaknesses, such as delayed responses, insufficient explanatory communication, or a failure to address public concerns in a timely manner. Thereafter, the index gradually rebounds and re-enters the no-warning range, indicating that the information dissemination capacity of government new media does not continue to deteriorate, but instead recovers through dynamic adjustment. This finding suggests that the significance of early warning analysis lies not only in identifying risks themselves, but also in detecting the fragile points of official communication processes in time and thus providing a basis for subsequent optimization.

4.3 Interpretation of the Early Warning Results

Based on the changing trajectory of the composite effectiveness index, this study further interprets the warning results. Overall, the risk in government new media information dissemination does not primarily stem from whether the government issues information at all; rather, it arises more substantially from whether official communication can be

sustained, explanatory, and capable of guiding public opinion after the initial release. In other words, rapid communication alone is not sufficient to ensure effective governance. Only when content quality, interactive responsiveness, and communication guidance are coordinated can dissemination effectiveness remain stable over time. From the perspective of the warning process, the main advantage of the initial stage lies in timeliness, which enables the government to seize the first-mover advantage in official communication after the outbreak of an emergency. However, if subsequent updates are insufficient, responses are delayed, or explanations remain inadequate, the composite effectiveness level is likely to decline, thereby triggering mild or even moderate warnings. The development stage is the period in which communication risks are most likely to be exposed, because public demands increase rapidly while negative emotions and uncertainty also tend to accumulate more easily. This makes the development stage a critical window for warning identification. By contrast, the recovery stage demonstrates stronger room for optimization. As long as the government continues to improve communication mechanisms, strengthen explanatory capacity, and enhance interactive feedback, the composite effectiveness index tends to recover gradually.

In general, the empirical assessment and early warning analysis indicate that the information dissemination effectiveness of government new media in public emergencies exhibits clear stage-based differences and dynamic fluctuations. Although timeliness is the foundation of official information release, it does not by itself determine the overall level of dissemination effectiveness. By comparison, content quality, interactive responsiveness, and communication and guidance effects exert a more lasting influence on subsequent governance performance. Therefore, in practical governance, governments should not only prioritize speaking out at the earliest possible moment, but should also attach greater importance to continuous information updates, social responsiveness, and public opinion guidance so as to build a more stable and efficient information dissemination mechanism.

5 CONCLUSION

This study has examined the evaluation and early warning of information dissemination effectiveness of government new media in public emergencies, and has attempted to develop a relatively integrated analytical framework from four aspects: conceptualization, indicator construction, empirical assessment, and risk identification. First, based on a review of the relevant literature, this paper defines the information dissemination effectiveness of government new media as the comprehensive capacity of governments to achieve timely response, effective information provision, interactive communication, and public opinion guidance through new media platforms during public emergencies. On this basis, a conceptual framework consisting of four dimensions—timeliness, content quality, interactive responsiveness, and communication and guidance effects—was constructed. Second, this study established an evaluation index system for government new media information dissemination effectiveness in order to capture its overall performance from both communication and governance perspectives. Finally, based on normalized data processing, the study conducted a comparative assessment of stage-based dissemination effectiveness and further constructed a composite effectiveness index to identify potential risk states through dynamic early warning analysis.

The findings indicate that the information dissemination effectiveness of government new media in public emergencies exhibits clear stage-based differences and dynamic fluctuations. In the initial stage, the main strength lies in timeliness, suggesting that governments are generally able to issue authoritative information rapidly and secure an early communication advantage. However, weaknesses remain in interactive responsiveness and communication guidance. As the event moves into the development stage, content quality, responsiveness, and guidance effects gradually improve, indicating that official communication shifts from rapid response toward sustained communication and more effective public guidance. In the recovery stage, the performance across dimensions becomes more balanced, and the composite effectiveness index rises further, reflecting the gradual maturation of the governance capacity of government new media in emergency communication. At the same time, the early warning analysis shows that the major risks of official information dissemination do not primarily arise from whether governments respond at all, but rather from insufficient follow-up updates, limited explanatory capacity, delayed interaction, and inadequate sensitivity to changes in public opinion. This suggests that effective information dissemination in public emergencies cannot rely on speed alone, but instead depends on the coordinated improvement of content quality, interactive mechanisms, and communication guidance capacity.

To some extent, this study enriches the analytical perspective of research on government new media governance in public emergencies and provides useful implications for optimizing governmental information release mechanisms. Nevertheless, several limitations remain. First, although the analytical framework and evaluation logic proposed in this study are intended to be broadly applicable, they still need to be further tested across different types of emergencies, platform environments, and governance contexts. Second, the empirical analysis in this paper is mainly based on normalized indicators, and therefore does not yet fully capture more complex mechanisms such as the evolution of online public opinion, platform-specific communication dynamics, and multi-actor interaction processes. Future research may proceed in at least three directions. First, more real-world cases and multi-platform datasets can be incorporated to validate the evaluation index system across contexts and enhance the applicability and explanatory power of the model. Second, more advanced methods such as text mining, sentiment analysis, and dynamic network analysis can be introduced to uncover more deeply the interaction among government information release, public feedback, and the evolution of public opinion. Third, the evaluation and early warning framework can be further embedded into digital governance practice to explore the construction of intelligent monitoring and real-time warning systems covering the entire process of public emergency management. Through these extensions, future research is

expected to advance a more refined understanding of the information dissemination effectiveness of government new media and to provide stronger theoretical support and practical pathways for the modernization of governmental emergency governance in the digital era.

COMPETING INTERESTS

The authors have no relevant financial or non-financial interests to disclose.

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