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Exploring Crisis Management Pathways in the Context of "Internet Plus": A Case Study of Extreme Rainstorm Disaster

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Abstract: The "Internet Plus" era has significantly reshaped public crisis management paradigms. This study systematically analyzes a major extreme rainstorm disaster to explore enhancement priorities for the contemporary emergency management systems. Key development areas include advancing risk governance frameworks, strengthening emergency response capacities, accelerating the integration of modern information technologies (e.g., big data analytics), optimizing interdepartmental coordination mechanisms, improving early warning systems, and adapting legal and regulatory frameworks. To address these priorities, multidimensional optimization pathways are proposed: (1) Cultivating robust risk governance competencies and operational leadership capabilities; (2) Establishing precision monitoring systems and data-driven information platforms through "Internet Plus" technologies; (3) Enhancing legislative frameworks and scientific risk assessment mechanisms to support complex crisis governance.

Keywords: "Internet Plus" era; Public crisis management; Zhengzhou "7·20" Extreme Rainstorm Disaster

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1. Introduction

The ongoing evolution of the "Internet Plus" era has significantly transformed societal production and lifestyles, while simultaneously presenting new opportunities and challenges for public crisis management. In this context, various public crises, including natural disasters, industrial accidents, and public health emergencies, exhibit increased unpredictability, severe repercussions, and rapid onsets, thereby posing direct threats to public safety and social stability. As a result, harnessing "Internet Plus" methodologies and technologies to enhance urban emergency management capabilities represents a critical contemporary challenge. This study examines optimization strategies for urban emergency management systems from an "Internet Plus" perspective, aiming to identify viable pathways for improvement.

2. Research significance

2.1. Theoretical significance

Examining urban emergency management through the "Internet Plus" context reveals critical underexplored dimensions in public crisis governance, particularly in technology-enabled capacity development and adaptive management models. This study provides theoretical foundations for enhancing practical approaches to crisis governance.

2.2. Practical significance

As public crises in the "Internet Plus" era present new characteristics, traditional management models have proven inadequate. This research advocates the adoption of modern information technologies, such as big data and cloud computing, to innovate management frameworks, thereby enhancing risk early warning systems, emergency response capabilities, and collaborative governance effectiveness. Ultimately, this endeavor aims to better protect public security and social stability while promoting the development of digital government and advancing the modernization of the governance system and its capabilities [1].

3. Research review

3.1. International research status

Western academia has been at the forefront of systematic theoretical exploration in crisis management, establishing relatively comprehensive frameworks. Notable contributions include the "4R" crisis management model, comprising Reduction, Readiness, Response, and Recovery [2]. Steven Fink's crisis life cycle theory categorizes crises into warning, outbreak, chronic, and resolution phases [3].

3.2. Domestic research status

Research on crisis management has evolved notably in recent decades, with significant theoretical frameworks emerging following major public health incidents. Scholars have conducted extensive investigations into crisis control mechanisms and the effectiveness of urban emergency management. However, systematic research on public crisis management within the "Internet Plus" paradigm remains underdeveloped, particularly in terms of integrating technology and management practices; thus, it requires substantial expansion and refinement in this area.

4. Connotations and characteristics of the "Internet Plus" era

4.1. Connotations of the "Internet Plus" era

The primary objective of the "Internet Plus" concept is to facilitate a profound integration between the internet and traditional industries, as well as societal domains, thereby fostering innovation and driving socioeconomic transformation [4]. This paradigm shift extends beyond mere technological advancements and signifies a new developmental framework. The application of the "Internet Plus" mindset in public crisis management involves harnessing its inherent strengths interconnectivity, data intelligence, and rapid response capabilities, to transform early warning systems, decision-making processes, communication strategies, and recovery efforts.

4.2. Concept of public crisis management

Public crisis management refers to a dynamic, organized, and strategic process through which governments acting as primary responsibility bearers prevent, respond to, and mitigate damages to public interests arising from sudden crises. These crises may include natural disasters, industrial accidents, public health emergencies, and social safety incidents [5].

5. Theoretical frameworks for public crisis management

The Crisis Life Cycle Theory conceptualizes the development of crises as a four-phase continuum: the latent phase (precursor identification), the outbreak phase (emergency intervention), the chronic phase (impact containment), and the recovery phase (learning and reconstruction). Effective public crisis management necessitates comprehensive oversight throughout this entire progression. Critical measures include risk monitoring and early warning during the latent phase, along with rapid response and resource mobilization in the outbreak phase.

6. Event analysis

6.1. Event retrospective

During July 2021, a major Chinese city experienced an unprecedented extreme rainstorm event, with peak flooding occurring on July 20. This catastrophic event shattered local meteorological records and exceeded the design capacity of urban flood management systems. As a result, widespread waterlogging inundated the city; multiple reservoirs and river embankments were at imminent risk of failure. Notable incidents included the submersion of an urban metro line and severe flooding in a major expressway tunnel. The disaster led to casualties and economic losses [6].

6.2. Optimization pathways for public crisis management systems

6.2.1. Modernization needs in risk governance capabilities

Strengthening anticipatory mechanisms: Extreme weather impact assessments require moving beyond historical reference dependence, necessitating improved foresight for events that extend beyond historical extremes. The prioritization of the “safety-first” principle in emergency decision-making needs reinforcement.

Enhancing coordinated response efficacy: Existing flood control command systems demonstrate efficiency constraints in cross-departmental resource integration and directive synchronization. Information-sharing mechanisms and response timeliness require strengthening.

6.2.2. Technological empowerment pathways

Advancing intelligent analytics: Critical infrastructure requires enhanced AI-driven real-time risk assessment capabilities to improve early-warning conversion efficiency of monitoring data.

Optimizing information dissemination channels: Current website- and SMS-dependent warning models need integration with the targeted dissemination advantages of social media platforms. Location-based services require deeper embedding within early-warning ecosystems to enhance the timeliness of information coverage.

6.2.3. Institutional framework upgrades

Adapting regulatory frameworks: Existing emergency regulations require refined operational specifications for Internet Plus environments, particularly in applicability enhancement for online information governance and

responsibility delineation clauses.

Scientific transformation of decision mechanisms: Emergency response triggering necessitates establishing data-driven quantitative standards (e.g., real-time rainstorm volume or waterlogging depth thresholds), reducing experiential judgment dependence, and improving automated response protocol design and implementation.

7. "Internet Plus" empowerment: Pathways to enhance public crisis management efficacy

7.1. Ideological foundation: Strengthening risk awareness and capacity modernization

7.1.1. Deepening risk awareness and bottom-line thinking

It is essential to integrate extreme weather and catastrophic risks into emergency personnel training programs. Utilizing platforms such as online professional academies enables the dissemination of specialized knowledge—including climate change and urban vulnerability assessments—while mandating certified courses for key positions. Furthermore, regular real-scenario simulations should be conducted through a hybrid online-offline approach (e.g., emergency drills during the highest-level weather alert).

7.1.2. Precision-oriented emergency capacity building

Role-specific training should be implemented based on big data analyses that identify functional capability gaps. This instruction must be structured and customized across three domains: command decision-making, technical operations, and community mobilization. Additionally, practical drills should be enhanced for frontline responders in effectively utilizing mobile terminals and emergency applications for on-site data collection, disaster reporting, preliminary assessments, and resource coordination.

7.2. Technology-driven: Constructing an intelligent crisis management framework

7.2.1. Building a big data-powered precision early warning and decision hub

This initiative integrates real-time, multi-source monitoring data—encompassing meteorology, hydrology, geology, transportation, and infrastructure safety—to establish a metropolitan disaster risk monitoring platform. The development of AI-driven dynamic risk assessment models will facilitate the analysis of continuous data streams (e.g., minute-level rainstorm measurements, river water levels, waterlogging sensor readings in low-lying areas, and subway passenger flow) to ascertain current risk levels. Upon reaching predefined response thresholds, the system is designed to automatically trigger appropriate countermeasures—such as tunnel closures, subway service suspensions, or emergency evacuation orders—thereby minimizing human error.

7.2.2. Integrated information sharing and dissemination network

To eliminate organizational data barriers, a unified crisis information exchange platform must be implemented. Establishing standardized data protocols, including update frequencies, access permissions, and security responsibilities, would ensure the instant interoperability of critical data. This platform will integrate urban sensing networks (e.g., traffic monitors and surveillance systems) with emergency command centers.

7.3. Institutional innovation: Fortifying legal and scientific assessment foundations

7.3.1. Improving regulations for the "Internet Plus" environment

To enhance emergency management frameworks, it is essential to revise legislation in order to comprehensively

address the governance of digital crisis information. This includes clarifying the legal responsibilities of digital platforms and content creators concerning information verification and the containment of misinformation. Furthermore, there is a need to develop specialized online crisis communication protocols that mandate timely disclosure of information, standardized content formats, evidence-based public guidance, and clearly defined operational jurisdictional boundaries. These measures will provide a precise legal foundation for managing online information spaces effectively. Concurrently, it is essential to explore the establishment of special authorization mechanisms under "digital emergency states," while ensuring a balance with civil rights protections.

7.3.2. Establishing data-driven scientific risk assessment and response mechanisms

Transition risk assessment models from empirically driven to data-driven approaches. Construct quantifiable risk assessment indicator systems differentiated by disaster types and regions, grounded in empirical data. Develop automated triggering rules with quantified thresholds (e.g., automatically activating Level-N emergency response when Area A records more than Y mm of rainstorm over X consecutive minutes with a water logging depth greater than Z cm). Reinforce accountability by designating responsible entities and defining liability criteria for data sources, model algorithms, threshold settings, and decision validation. Additionally, introduce independent third-party agencies to conduct periodic evaluations of risk assessment frameworks and operational processes.

8. Conclusion

The extreme rainstorm event underscores critical development priorities for contemporary public crisis management systems in the "Internet Plus" era, revealing enhancement opportunities in systemic risk anticipation, deeper integration of data technologies and intelligent applications, and strengthened inter-organizational coordination frameworks. This study analyzes these challenges from three dimensions: thoughts, technology, and systems, proposing solutions that fully harness the core advantages of "Internet Plus," specifically ubiquitous connectivity, enhanced decision-making capabilities through intelligence, and rapid response capabilities. Consequently, this study advocates for a transition from experience-based judgment to a data-driven governance paradigm; from passive response strategies to proactive preventive measures; and from decentralized management approaches to systematic collaborative governance. These transformations aim to establish a digital security framework designed to protect lives and property while maintaining societal continuity.

Disclosure statement

The author declares no conflict of interest.

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