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A literature review of netizens' online public opinion dissemination behavior on food safety

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Abstract: This paper reviews the current status of research on the dissemination behavior of Chinese netizens regarding food safety in recent years. It identifies the progress made and existing problems, providing practical guidance for relevant authorities to develop targeted governance strategies. This is of significant importance for optimizing the public opinion governance system related to food safety. A systematic review methodology was employed to organize recent research findings, with in-depth analysis conducted across several dimensions, including the theoretical framework, influencing factors, dissemination pathways, and the characteristics of netizens' public opinion dissemination behavior concerning food safety. The dissemination behavior of netizens is driven by multiple factors such as the credibility of information, emotional appeal, and social trust. The dissemination pathways exhibit features of fragmentation, circle-based sharing, and cross-platform dissemination. Future research should focus on understanding the influence mechanisms of emerging platforms, the dynamic evolution of netizens' psychology, and the integration of interdisciplinary theories. These efforts will help establish a solid foundation for enhancing the public opinion governance system related to food safety.

Keywords: *Food safety, Netizens' dissemination behavior, Online public opinion.*

1. Introduction

In the era of social media, information dissemination is no longer limited by the boundaries of time and space. Everyone is a producer and disseminator of information. The anonymity of the Internet allows netizens to freely share and repost views and opinions, which has led to a more rapid spread and fermentation of food safety public opinion [1]. As a reflection of public opinion, food safety online public opinion accommodates diverse social voices, helps to expose some social problems, supervise government and corporate behavior, and promote the resolution of many social problems [2]. On the other hand, due to the natural amplification potential of the media, in the new media environment, the topic setting, information variation, and emotional stimulation of online public opinion have led to the continuous amplification of online public opinion risks [3] exacerbating public panic and distrust, and even generating group polarization behavior, causing economic damage to related companies or industries and a decline in government credibility [4].

Internet users are the largest group of public opinion subjects [5]. The process of online public opinion dissemination behavior is actually the behavior of netizens who, after seeing a certain public opinion information, interpret the information and then publish, participate in discussions or forward it under the influence of psychological factors such as cognitive games, emotional resonance and social conformity [2]. Internet user participation plays an important role in the process of online public opinion dissemination on food safety, and has a profound impact on public cognition, corporate image and healthy market development. According to the 55th Statistical Report on the Development of China's Internet [6] by December 2024, the size of China's Internet users will reach 1.108 billion, and

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the digital literacy and skills of Internet users will gradually improve. Among them, 80.4% of Internet users have mastered the skills of "copying and pasting information from computers or mobile phones", and 59.6% of Internet users have mastered the skills of "expressing opinions on the Internet and communicating with them" (as shown in Figure 1). In the 2023 "rat head and duck neck" incident, netizens continued to ferment public opinion through short videos and social media interactions, which eventually evolved into a national public event. In this context, systematically summarizing the research progress of netizens' food safety network public opinion dissemination behavior is of great significance for optimizing public opinion guidance strategies and maintaining social stability.

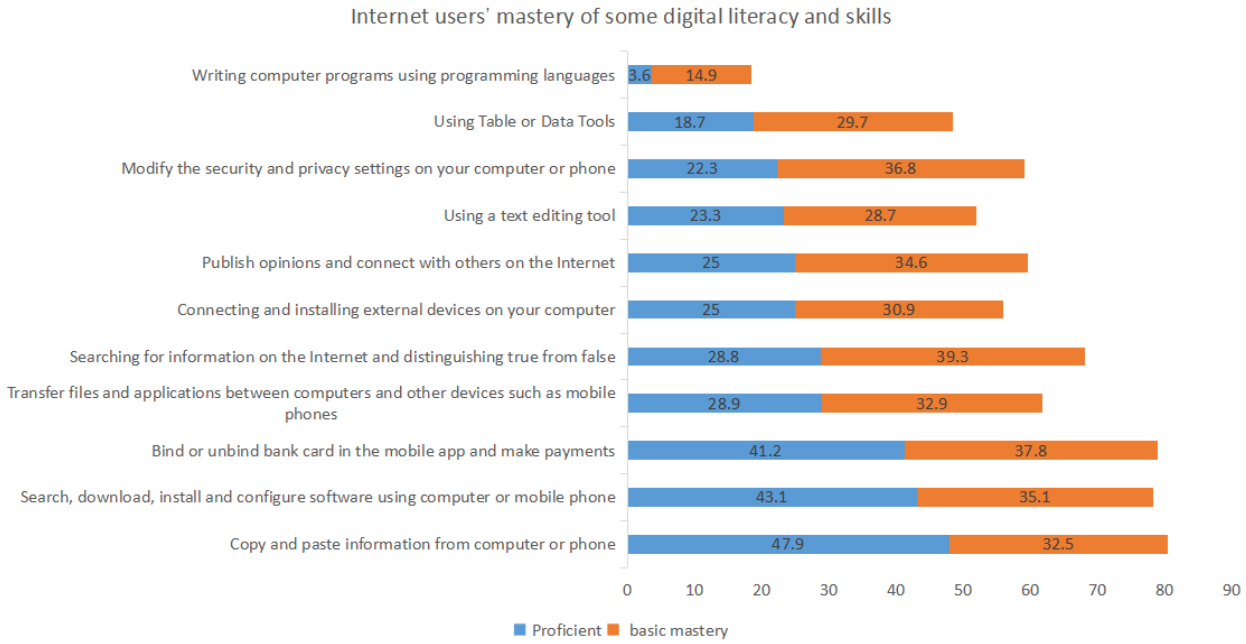


Figure 1.
Internet users' mastery of some digital literacy and skills.
Source: CNNIC China Internet Development Statistics Survey.

2. Theoretical Framework and Research Perspective

2.1. Social Amplification of Risk (SARF)

As the phenomenon of risk amplification and its social impact gradually emerged, the academic community began to use the social amplification framework (SARF) of risk to analyze and explain the amplification phenomenon. Risk amplification, also known as the social amplification of risk, was proposed by Kasperson, et al. [7] who believed that risk events do not exist in isolation, but are amplified or weakened through the interaction of social systems (such as media, public psychology, and social organizations), forming a "ripple effect". Specifically, the social amplification framework of risk is divided into two stages (as shown in Figure 2). The first stage is the spread of risk information. In this process, the risk is amplified or weakened through the role of a series of "risk amplification stations". Among them, "risk amplification stations" include social amplification stations such as news media, government agencies, voluntary organizations, social and cultural organizations, and personal amplification stations; due to the rapid development of digital technology and new mobile communication technologies, the information form, information production mode and communication process have undergone profound changes. This change has given rise to a high degree of technical coupling between new media and risk amplification [8]. Therefore, factors such as the depth of media involvement in events and emotional tendencies affect the public's perception of risk events. The second

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stage is the social response mechanism. In the ripple effect, the risk spreads simultaneously through two paths: people and industries, and triggers a high-order amplification effect [9]. This theory is often used by researchers to explain the phenomenon of risk transmission in the field of food safety.

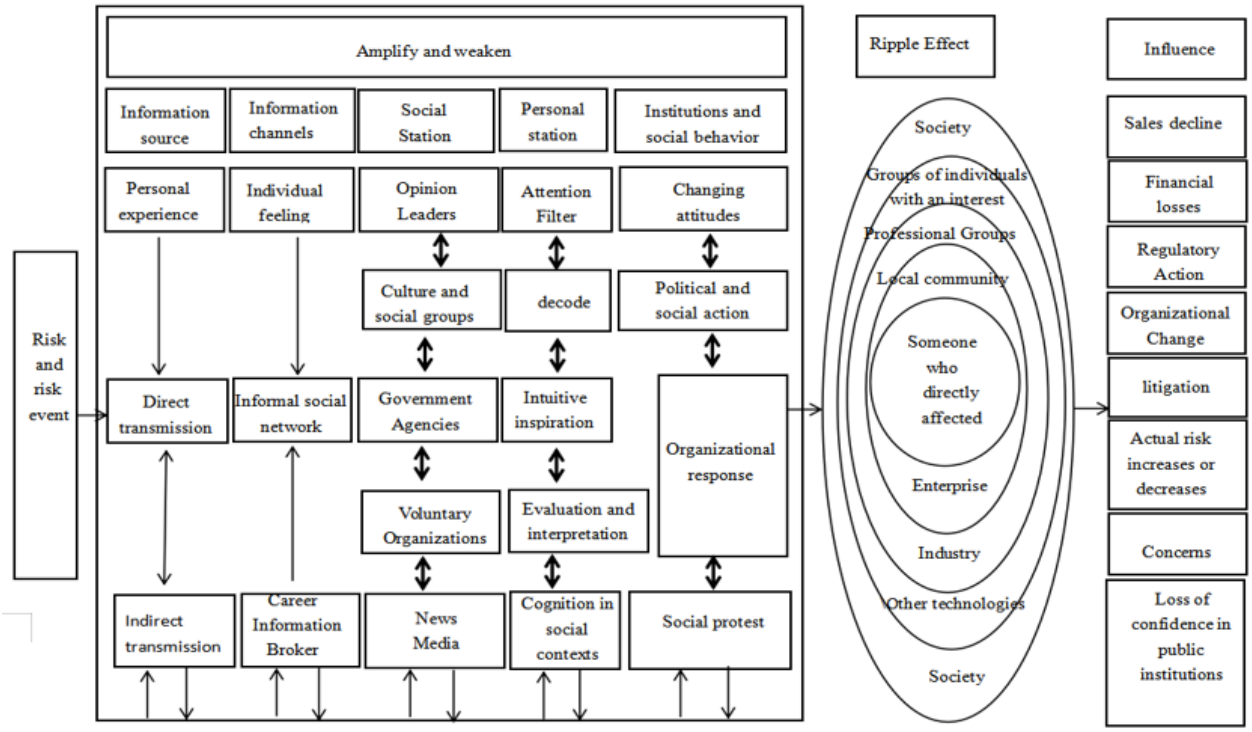


Figure 2.
The social amplification framework of risk.

2.2. Theory of Knowledge Convening and Fermenting Model

The theory of knowledge-integration and fermentation was proposed by Professor He [10]. He combined the basic principles of bionics and compared the process of knowledge formation and growth to the process of biological fermentation. He believed that organizational knowledge activities are similar to biological fermentation, and the growth and iteration of organizational knowledge are also completed under the common influence of strains, nutrient matrix, enzymes, technology, environment and rules [10]. By analyzing the relationship between the various elements of biological fermentation, the Knowledge Convening and Fermenting Model was proposed, which provides a new perspective and research framework for revealing the internal mechanism of organizational knowledge acquisition, transfer, dissemination, growth, and renewal. This theory has been used by researchers to analyze the fermentation process of various online public opinion events. Zhang [11] pointed out that the essence of public opinion is the process of information dissemination. The fermentation of public opinion is accompanied by the growth, transfer and dissemination of public opinion information. He used this theory to analyze the fermentation factors of public health emergency network public opinion, and studied the action mechanism and dynamic evolution mechanism of public health emergency network public opinion fermentation factors from micro and macro perspectives. Gu [12] extracted the influencing factors of food safety network public opinion generation based on the theory of integration and fermentation, and constructed a food safety network public opinion generation model.

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2.3. Social Network Analysis (SNA)

Social network analysis (SNA) is an analytical method that analyzes the connections and attributes between behavioral subjects through calculation and visualization, so as to describe and measure the relationship structure and attributes between conscious behavioral subjects such as individuals, groups and organizations [13]. This method is used to identify the key nodes and propagation paths of online public opinion dissemination and explore the propagation laws and characteristics of online public opinion. Researchers use social network analysis to construct an interactive network model of netizens, identify key propagation nodes (such as opinion leaders) and network structure characteristics (such as circle density), and reveal the law of information flow. Studies have shown that in food safety public opinion, opinion leaders such as experts and media big Vs have a significant guiding role in the direction of public opinion due to their high influence, while the exaggerated remarks of some Internet celebrities will accelerate the polarization of public opinion Tian [14]. Yu and Su [15] found through simulation of the Facebook data set that nodes with high propagation probability (such as users with high betweenness centrality) play a "bridge" role in information diffusion, and their propagation behavior has a far greater impact on the coverage of public opinion than ordinary nodes.

3. Factors Influencing Netizens' Communication Behavior

3.1. Credibility and Distortion of Information

Internet users' trust in information directly affects their willingness to spread information. Studies have shown that the lag and ambiguity of official notifications will reduce the credibility of information and prompt Internet users to turn to non-authoritative sources (such as self-media and short videos) [16]. For example, in the "rat head and duck neck" incident in Jiangxi universities, the initial response of the school and regulatory authorities aroused doubts due to the lack of details, resulting in the widespread dissemination of mocking content such as "pointing to a rat as a duck". From a mechanism perspective, the authority and formal integrity of the information source are the core influencing factors of credibility: Hong, et al. [17] found based on survey data from 12 provinces and 48 cities that the timeliness and accuracy of government and media information are the primary basis for Internet users to choose information sources, while information distortion (such as one-sided interpretation and rumor mixing) will amplify public opinion risks through the "information dissipation effect".

With the development of social media, the channels and forms of information distortion have become more complex. Xu [18] pointed out that the frequent appearance of false food safety information on short video platforms such as Kuaishou and Douyin is more likely to mislead the public with the help of visual presentation, and the existence of "information cocoons" will further aggravate information tearing - even if the government responds in a timely manner, it may be difficult to correct cognitive biases because the audience is limited to homogeneous information by algorithms. Feng, et al. [19] also confirmed that in order to gain attention, some media used exaggerated statements such as "broilers are fed with feed and medicine, and are ready for slaughter in 45 days. The feed can kill flies", combined with shocking pictures, to stimulate public anger and fear through polarized content, resulting in a significant amplification of risk perception. In this process, the "viral spread" of false information has caused the industry's stigmatization label to exist for a long time.

Information form also significantly affects credibility perception. Hong, et al. [20] used the Shanghai Husi incident as an example of empirical research to show that information containing links and videos is more likely to be forwarded because it is perceived as "supported by empirical evidence", while the credibility score of pure text information is reduced by 27.3%. Xu [18] further found through Weibo data mining that the content with the labels "sampling report" and "expert interpretation" has a 40% higher dissemination breadth than ordinary content, indicating that professional endorsement can effectively improve credibility. It is worth noting that the multi-sentiment analysis model constructed by Lv, et al. [21] confirmed that the emotional tendency of comment text is highly dependent on the topic and blog context. When the emotional polarity of the comment is inconsistent with the topic and blog, analyzing the comment text alone is prone to misjudgment, while integrating the information of

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the three can increase the accuracy of sentiment classification by at least 5.8%. This also indirectly shows that the integrity of information (including contextual association) is an important prerequisite for credibility perception, and fragmented information without context is more likely to cause misunderstanding and distortion.

In addition, Chen [22] pointed out in his research based on the risk society amplification framework that there are multiple "information amplification stations" in the network field, and disordered interactive communication not only leads to information distortion, but also may derive secondary hazards such as rumors. For example, in the Chengdu No. 7 Middle School Experimental School cafeteria incident, unverified pictures of "moldy food" spread rapidly on Weibo. Coupled with the mutual infection of emotions among netizens, the local government's authoritative rumor-busting later was difficult to effectively dispel negative public opinion, confirming the key impact of information distortion on the evolution of public opinion in highly sensitive events.

3.2. Emotional Contagion and Psychological Factors

In today's society, food safety issues are closely linked to the vital interests of the public and can easily trigger negative emotions such as anxiety and anger among the public. According to Schacht's two-factor emotion theory, emotions arise from the interaction between physiological arousal and cognitive evaluation, and this emotional expression will be further strengthened under the instant feedback mechanism of social media (such as likes and comments, etc.) Lai and Cao [23]. Liu [24] used the structural equation model for in-depth verification. The results showed that in food safety incidents, the psychological influence of "emotional catharsis" on netizens' forwarding and commenting behaviors was as high as 0.233, significantly exceeding other psychological factors, while "herd mentality" promoted the spread of information through group pressure.

Specifically, emotional infection presents the characteristics of "three-level transmission". First, food safety incidents themselves will quickly trigger the public's fear of health risks. For example, the "earth pit pickled cabbage" incident exposed by CCTV media in 2021 greatly stimulated the public's instinctive rejection of food hygiene issues. Secondly, the emotional remarks of opinion leaders (such as "unscrupulous companies have lost all conscience") intensify group anger [20]. For example, in a food additives incident, a well-known opinion leader in the field of food safety wrote that "unscrupulous companies have lost all conscience for the sake of profits and completely disregard the lives and health of consumers." This statement quickly attracted a lot of attention and forwarding, further escalating the anger of the public who were already highly sensitive to food safety. Finally, ordinary netizens will vent their emotions through various means such as emoticons and extreme language, thus forming a powerful "snowball effect." Zhang, et al. [25] conducted a comprehensive analysis of 3,600 public opinion events. The data showed that in food safety events, negative attitudes accounted for as high as 76.5%, and the incidence of online mobilization (7.8%) was significantly higher than in other fields, which fully confirmed the powerful driving effect of emotions on behavior. Cai and Li [26] research also pointed out that psychological resonance will promote the convergence of netizens' behavior. For example, for incidents that seriously violate moral bottom lines, such as "vendors passing off dead goods as alive", more than 80% of the comments showed a highly consistent tendency to condemn.

3.3. Social Trust and Platform Mechanism

Internet users' trust in the government, enterprises and media affects their communication behavior. Studies have found that if the public perceives that supervision is ineffective or that enterprises are concealing the truth, they will tend to spread negative information to express their dissatisfaction [16]. The transmission effect of this lack of trust is significant in specific events. For example, in the "fast-growing chicken" incident, the media used exaggerated statements such as "broilers are fed with feed and medicine, and are released in 45 days. The feed can poison flies" and accompanied it with shocking pictures, which significantly amplified the public's distrust of breeding companies, resulting in a 5-fold increase in the number of forwardings of negative information on platforms such as Weibo within 3 days, and this trust rift has a stigmatizing effect on the industry for several years [19].

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From the perspective of the composition of the trust mechanism, Hong, et al. [20] based on the TRUST-TAM model showed that among the trust in the media, "institutional structural guarantees" (such as information review mechanisms and release norms) have the greatest impact (standardized path coefficient 0.318), followed by "familiarity based on knowledge" (such as the accuracy of past media reports) and "trust based on calculations" (such as the actual utility brought by information). This means that establishing and improving institutional norms for media information release, such as clarifying the review process and publicizing the source tracing channels, can enhance netizens' trust more than simply increasing the frequency of reports. At the same time, there is a strong correlation between corporate trust and negative communication. Studies have shown that for every unit decrease in corporate trust, the amount of negative information forwarding increases by 1.8 times, especially when the company adopts a silent or vague response strategy in the early stage of public opinion, such as the "Shanghai Husi expired meat" incident. The company delayed 24 hours to issue a statement, resulting in a 3-fold surge in the amount of negative information dissemination, and the netizens' trust repair cycle for the company involved was extended to more than 6 months.

The fluctuation of government credibility also has a significant impact on communication behavior. Li and Xie [27] empirical research further confirmed that for every day of delay in government intervention, the heat of public opinion increased by 12.7%, while the ambiguity of the response content would reduce trust by 23%. For example, in the "dyed chives" incident in a farmer's market in a certain province, the regulatory department's initial response only stated that "the random inspection was qualified" but did not disclose the test report, causing netizens to turn to self-media to seek the "truth", and the spread of related rumor posts exceeded the official report by 3 times [18].

The platform mechanism amplifies the communication effect from a technical level. On the one hand, algorithm recommendations prefer content with high interaction volume, forming a positive cycle of "emotion-traffic": Xu [18] found through Weibo data mining that the probability of posts with negative emotions being recommended to the homepage is 2.3 times that of neutral posts, and the speed of content containing videos entering hot topics is 47% faster than that of pure text, which is closely related to the "visual impact-instant interaction" characteristics of short video platforms. The multi-sentiment analysis model of Lv, et al. [21] further confirmed that when the sentiment polarity of a comment is consistent with that of a topic or blog post, the secondary forwarding rate of the comment increases by 11.2%, indicating that the strengthening mechanism of emotional resonance in the platform will accelerate the transmission of trust signals or the spread of distrust. On the other hand, anonymity reduces the sense of responsibility: Wang, et al. [16] pointed out that in a non-real-name system environment, the probability of netizens posting extreme remarks increases by 60%, while the online real-name system can reduce irrational communication by 34%. However, Cai and Li [26] also mentioned that excessive anonymity will also aggravate "group polarization". For example, in an anonymous forum for a food safety rumor, the proportion of netizens who support the view that "the company is black-hearted" has risen from the initial 58% to 89%, forming an "echo chamber effect". In addition, the cross-platform communication characteristics exacerbate the spread. According to the research of Ren and Zhang [28] the combination of "strong relationship trust" of WeChat Moments and "weak relationship fission" of Weibo enabled rumors such as "plastic rice" to cover 83% of active netizens within 48 hours. Xu [18] added that this cross-platform communication is also reflected in "topic migration". For example, a food safety incident in a farmer's market first became a topic on Weibo, and then detonated WeChat communities through the "live shooting" clips of Douyin short videos, and finally derived "avoid pit guide" content on Xiaohongshu. The information complementarity of each platform has extended the life cycle of public opinion.

The optimization of platform mechanisms can effectively alleviate the trust crisis. For example, through technology empowerment, the establishment of a "traceability label" system, the weight of content including "sampling report" and "expert interpretation" can be tilted, and its communication credibility can be increased by 38% [18]; at the same time, the introduction of the "multi-view balance"

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mechanism at the algorithm level, when pushing negative content, the official response is simultaneously associated, which can speed up the trust repair of netizens by 20% [26].

4.Transmission Path and Platform Characteristics

4.1. Fragmented Information Diffusion

In the new media era, netizens spread "fragmented" information through short videos, pictures, short comments, etc. This type of information, due to the lack of complete context and empirical support, is prone to cause cognitive bias and accelerate the fermentation of public opinion. Lai and Yang [29] empirical research pointed out that the public has a "pessimistic bias" in their perception of food safety risks, that is, they tend to overestimate the risks they face, and the one-sided presentation of fragmented information (such as only highlighting keywords such as "toxic" and "carcinogenic") will strengthen this bias, resulting in the spread of false information significantly faster than complete information. For example, in the "plastic rice" rumor, the short video only shows a clip of "plastic particles are similar to rice", but omits key verification methods such as combustion identification, which has caused the public to generally distrust the food supply chain. Feng, et al. [19] found in his study of the "fast-growing chicken" incident that fragmented information amplified risks by "taking things out of context": the media intercepted individual improper operation videos in the breeding process and ignored the overall industry regulations, causing the public to perceive "individual corporate violations" as "industry-wide risks", and public opinion spread to the whole country within 3 days. This diffusion pattern is closely related to the need for immediacy in information release - netizens are more inclined to quickly forward short information rather than wait for complete reports, further exacerbating the negative impact of fragmented communication.

4.2. Circle Formation and Cross-Platform Communication

Internet users form "information circles" based on interests, trust or social relationships. Information continuously strengthens group consensus through interaction within the circle, and spreads across the entire network through cross-platform flow. Ren and Zhang [28] analyzed from the perspective of stakeholders that in the circle-based communication of food safety public opinion, the frequency of information interaction in the core circle (such as consumer groups and industry practitioners) is more than three times that of the marginal circle, and the "trust endorsement" within the circle will reduce the cost of information screening and make opinions solidify quickly. For example, in WeChat Moments, the information shared by relatives and friends that "a certain brand of milk powder causes allergies in infants" is forwarded frequently due to emotional trust, forming a "consensus reinforcement" within the closed circle. In cross-platform communication, the technical characteristics of different platforms promote the fission of public opinion: Zhang, et al. [30] research based on the theory of value accumulation shows that the "topic tag" function of Weibo, the "algorithm recommendation" mechanism of Douyin and the "social sharing" feature of WeChat complement each other, allowing information on events such as "Tukeng Pickled Cabbage" to complete the leap from "local news" to "hot spots on the entire network" within 24 hours. Lin [31] further confirmed in his research on public opinion on genetically modified foods that the "visual impact" of short video platforms (such as laboratory testing images) is easier to break through circle barriers than text reports, and its cross-platform communication efficiency is 2.1 times that of pure text information.

4.3. Interaction Between Opinion Leaders and Ordinary Netizens

The interaction between opinion leaders and ordinary netizens constitutes a "core-edge" communication network: opinion leaders guide the direction of public opinion through professional interpretation or emotional remarks, and ordinary netizens' forwarding and comments form a "chain reaction". Li and Xie [27] analysis of 10,600 public opinion events showed that in the field of food safety, the speech of opinion leaders (such as popular science bloggers and media celebrities) contributed 42% to the heat of public opinion, and within 2 hours after they released the information, the interaction

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volume (reposting + commenting) of ordinary netizens would peak. For example, in the "quality problem of Laotan pickled cabbage noodles", the "undercover investigation" video released by the opinion leader in the food field triggered 150,000 reposts, and the "boycott" comments of ordinary netizens further pushed the topic to the hot search. Chen [22] risk society amplification framework study pointed out that there is an "emotional resonance" effect in the interaction between opinion leaders and ordinary netizens: when opinion leaders use emotional expressions such as "unscrupulous enterprises" and "regulatory failures", the anger of ordinary netizens is activated, and the probability of their forwarding behavior increases by 37%. Through comment text analysis, Lv, et al. [21] found that 80% of ordinary netizens' forwarding behavior would directly quote the core views of opinion leaders, forming a closed loop of "leader speaks - netizens repeat - public opinion spreads". This interactive model is particularly evident in controversial events such as the "rat head and duck neck" incident.

5. Research Limitations and Future Directions

5.1. Insufficient Existing Research

Insufficient theoretical innovation. Existing research mostly relies on traditional Western analytical frameworks such as the Social Risk Amplification Theory (SARF) and the Theory of Planned Behavior, which have limited explanatory power for the uniqueness of online public opinion on food safety in the Chinese context, and the construction of localized theories lags behind. For example, with regard to the typical phenomenon of "circle-based communication", existing research mostly stays at the description of phenomena in scenarios such as WeChat Moments and Weibo Super Topic [28] and fails to analyze the influence mechanism of trust mechanisms within circles on information diffusion in combination with the characteristics of the "differential pattern" of Chinese society; there is also a lack of breakthrough theoretical construction on core issues such as power relations and emotional contagion in the interaction between "opinion leaders and ordinary netizens" [22].

Limitations in method application. Research methods tend to "emphasize text, not dynamics" and "emphasize quantification, not experiments": Big data analysis focuses on text data from Weibo and forums [18] and pays insufficient attention to emerging forms such as video content and barrage interaction on short video platforms such as Douyin and Kuaishou; although simulation research involves information dissemination paths [32] there are few tracking observations of netizens' real-time behavior; experimental methods are only sporadically applied in the field of risk cognition [23] and have not yet been popularized in the full process research of public opinion evolution, resulting in weak ability to infer causal relationships.

Interdisciplinary integration is weak. The research on food safety network public opinion involves the intersection of multiple disciplines such as psychology, communication, and computer science, but the existing results are mostly limited to a single discipline perspective: psychology focuses on the emotional characteristics of netizens [26] but ignores the impact of social network structure; communication focuses on the differences between media platforms [31] but lacks in-depth analysis of algorithm recommendation technology; computer science text mining methods [21] fail to effectively connect with the social needs of public opinion governance, resulting in insufficient practical guidance of research conclusions.

5.2. Future research Suggestions

According to this, in future research, researchers can deepen the research on the influence mechanism of emerging platforms, focus on the shaping role of algorithm recommendation logic on public opinion dissemination for emerging media such as short videos and live broadcasts, explore the conflict between the "traffic priority" principle and the rational expression of netizens, and propose a platform governance plan that takes into account both dissemination efficiency and information quality. On the other hand, we can combine the "risk perception-emotional activation-behavioral output" framework of cognitive psychology to construct a psychological model of the entire cycle of public opinion: in the latent period, pay attention to the initial shaping of risk cognition by information contact

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habits; in the outbreak period, track the diffusion threshold of emotions such as anger and anxiety [19]; in the fading period, explore the impact of trust repair mechanisms on behavioral shifts, and provide theoretical support for phased public opinion guidance.

6. Conclusion

The Internet users' public opinion dissemination behavior on food safety is the result of the interaction of multiple factors, and its research needs to integrate theoretical innovation and empirical analysis. Future research should focus on behavioral characteristics in the emerging media environment, strengthen interdisciplinary cooperation, and provide theoretical support and practical guidance for building a scientific and efficient public opinion governance system.

Transparency:

The authors confirm that the manuscript is an honest, accurate, and transparent account of the study; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained. This study followed all ethical practices during writing.

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