The Impact of the Spread of Epidemic Rumors on Audience Cognition Under the Algorithm Recommendation

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Abstract:In the era of the epidemic, the development of scientific and technology for Internet communication has also provided a medium for algorithm recommendation in the context of big data in modern China. In social media platforms, users can browse by searching for the content they are interested in, and then the big data will record the content that each audience is interested in through calculations, and recommend relevant content to users in the process. Through Pearson correlation analysis, the perception analysis of rumor contact frequency and rumor information cascade effect shows that people's contact frequency of rumors is significantly positively correlated with the number of rumors recommended by the platform they perceive. Taking the COVID-19 rumors in social media platforms as the research object, using the information cascade theory and the primacy effect as the theoretical basis, this paper uses the audience survey method to analyze the impact of the spread of COVID-19 rumors on social media platforms on the audience, and finds that people's contact frequency of rumors is significantly positively correlated with the number of rumors recommended by the platform they perceive.
Keywords: epidemic rumors, rumor spread, primacy effect, algorithm recommendation, information cascade

1 Introduction

In January 2020, the epidemic showed a multi-point distribution in China, and in this context, social media began to show an endless stream of reports. And rumors of the epidemic were widespread for a while out of fear of the virus and the unknown. Structural changes in society during the pandemic have made rumors spread more frequently. Even now that the three-year-long epidemic era is over, you can still hear relevant "rumors". We have noticed that under the precise recommendation mechanism such as Douyin and Toutiao, rumors will be accurately recommended through algorithm recommendations and repeatedly appear in front of users, making users believe in related epidemic rumors. And when the rumor-refuting message was issued, users didn't believe it much. We are curious about why this is the case and what causes this particular phenomenon. Taking the COVID-19 rumors in social media platforms as the research object, using the information cascade theory and the primacy effect as the theoretical basis, this paper uses the audience survey method to analyze the impact of the spread of COVID-19 rumors on social media platforms on the audience. The author find that people's exposure frequency to

rumors is significantly positively correlated with the number of rumors recommended by the platform they perceive.

2.Literature Review

2.1 Rumor Spreading

The phenomenon of rumor dissemination has aroused research from multiple perspectives in the academic community. American psychologist Gordon W. Allport, through the analysis of the study of wartime rumors such as the "Pearl Harbor Rumors", pointed out in The Psychology of Rumors that the production of rumors is a "projection" behavior, which is the externalization of personal thoughts, desires, etc., and summarized the original rumor formula "R=I×A", in which the importance of events (Important) and the ambiguity of events (Ambiguous) are the most important influencing factors of rumor propagation, and there is a positive correlation[1]. Communication scholar Cross further studied the original rumor formula and proposed a new view:

the lethality of rumors = the importance of (events) × the ambiguity of (events) / the critical ability of the public[2].

From this, it is concluded that the lethality of rumors generally comes from three aspects: first, the correlation between the event and the person itself, if it is closely related, then the importance is greatly increased. Second, the accuracy of the news is insufficient, resulting in the public's understanding of objective facts in a hazy state, and the ambiguity of the incident increases. Third, the public's judgement is not strong, and if any factor in the importance of time or ambiguity tends to be zero, then rumors will not occur. However, some scholars have studied the spread mode of "Live Journal" rumors on the blogging platform through mathematical modeling, and analyzed the influencing factors of their spread[3].

Based on the analysis of more than 4,000 rumors in WeChat Moments, Li Biao and Yu Guoming pointed out that the propagation path of online rumors conforms to the power-law distribution and adopts nested propagation, that is, circle group transmission similar to the traditional social interpersonal network[4]. Huang Aiping conducted a more detailed study of China's online rumors from the aspect of transmission laws in A Preliminary Study on the Transmission Characteristics and Transmission Forms of Online Rumors, and her research shows that the transmission mode of online rumors will change according to different times and scopes, and its overall law shows a trend of quadratic function rising first and then falling[5]. However, although these studies have studied rumors, they have ignored the phenomenon of repeated spread of rumors.

2.2 Primacy effect

The theory of the primacy effect was first proposed by the American psychologist Locchins in 1957, also known as the first effect, priority effect or first impression effect[6]. After proposing, it

has attracted great attention from scholars at home and abroad, and has achieved many research results. Foreign scholars Ashi et al. supplemented the theory by studying the primacy effect in the field of social cognition, and finds that the effect of first impression is not only strong, but also long.

In The Primacy Effect and Brand Reconstruction, the domestic scholar Li Shasha combines the actual phenomenon of brand cognitive transformation in China with the theory of the primacy effect, and proposes that public opinion and other factors will be integrated from all aspects in an attempt to reshape the audience's psychological image[7]. It is believed that in the primacy effect, this preconceived priority effect will affect consumers' brand choices.

However, these studies did not study the proliferation of epidemic rumors from the perspective of algorithm recommendation, so they did not answer the question that why rumors would be accurately recommended repeatedly to users, making users convinced, and users did not believe much when the rumor was rejected.

3.Research methods

This paper uses the audience research method and interviews to try to answer the above questions.

3.1 Audience survey method

3.1.1 Hypothesis established

Based on the above question, the corresponding assumptions are proposed here:

H1:The more people pay attention to the rumors about the COVID-19 during the pandemic, the more relevant rumors are recommended in their information streams.

H2:The more people pay attention to the rumors of the COVID-19 during the epidemic, the deeper their awareness of the rumors is.

H3:There is significant variability in the profundity of rumor perception among audiences with different education levels. The higher the education level, the lower the perception of rumors.

To prove the hypothesis, this study used an audience survey method, sampled the population, and produced a questionnaire.

3.1.2 Sampling method

This hypothesis corresponds to the study of netizens.

The data collection, collation, and analysis process of this survey was completed on April 4, 2023, and the survey was mainly based on open-ended and closed questions, and the main contents were: (1) Basic information confirmation: including age and gender. (2) The dimensionality reduction statement part of the independent variable "rumor contact frequency" (3) The dimensionality reduction statement part of the dependent variable "Audience's cognitive

attitude to the rumor". This questionnaire contains 9 questions, including 7 single-choice questions, 1 multiple-choice question, and 1 matrix multiple-choice question. It is distributed online through WeChat Moments, QQ Space and Questionnaire Star Library.

3.2 Sample characterization

A total of 189 valid samples were collected in this survey. Through descriptive analysis, we found that Internet users' exposure to rumors was mostly through information media, short video apps and social media. The frequency of their exposure to rumors is "occasionally" with the highest percentage of 47%, and the degree of their concern about rumors is "more concerned" with the highest percentage of 47%. It can be seen that the exposure of respondents to rumors in this questionnaire survey is at a medium to high level.

3.3 Results of structural analysis

Through Pearson's correlation analysis, the perception analysis of rumor contact frequency and rumor information cascade effect shows that people's contact frequency of rumors is positively correlated with the number of rumors recommended by their perceived platforms ($R=0.28$, $P<0.05$), and the research hypothesis that H1 is supported. Similarly, the analysis of three related statements of rumor contact frequency and rumor perception found that people's contact frequency of rumors was significantly positively correlated with the perception of stereotypes after exposure to rumors ($R=0.209$, $P<0.05$), and the contact frequency of rumors was significantly positively correlated with their perception of objective facts after exposure to rumors ($R=0.154$, $P<0.05$), indicating that the more netizens came into contact with epidemic-related rumors, the more vulnerable their own ideas were to the influence of rumors. The hypothesis H2 is supported.

4 Description of structural analysis results

4.1 The number of rumors recommended by the platform is directly proportional to people's attention to rumors

The research hypothesis H1 is supported. The frequency of people's contact with rumors is significantly positively correlated with the number of rumors recommended by the platform ($R=0.28$, $P<0.05$), and the audience's attention to epidemic rumors and contact frequency are the key to the number of rumors recommended by the platform, which will directly affect the number of rumors recommended by the platform. According to the hypothesis that H1 is based on the theory of information flow waterfall, the frequency of people's exposure to rumors is significantly positively correlated with the number of rumors recommended by the platform they perceive. People's attention to epidemic rumors has greatly increased the frequency of audience contact with epidemic rumors, thereby significantly affecting the number of relevant epidemic rumors recommended by the platform. So the research hypothesis that H1 is supported.

Rumor propagation is accomplished by information cascades and overlapping group polarization. Information cascade occurs because people themselves lack relevant information, especially when people do not know the content of a rumor, and their hearts are more inclined to believe in the things that others trust. When the COVID-19 event breaks out, the audience does not have the relevant knowledge and experience. In this case, the audience will involuntarily want to know the truth of the matter, through communication with others or search for epidemic-related events on the Internet, so as to pay attention to the COVID-19. Social media platforms will begin to recommend relevant videos to the audience at this time. Specifically, the public's herd imitation behavior is the social basis for the creation of information cascade[8]. Audiences are often confused and overwhelmed due to the lack of relevant knowledge, so they will carry out simple and labor-saving responses, that is, being unconscious and making conditional reflexes to directly imitate the behavior of others around them. Everyone imitates each other. Group hints and group infections are reflected in mutual imitation. And people involuntarily participate in forwarding social media information under the hints and influence of herd psychology, and then produce information cascade.

There are three key points in the formation of information cascades. First, people's lack of knowledge or cognition of the content involved in rumors, which is the premise of the formation of information cascades. Second, at the beginning of the spread, a certain number of people begin to believe a rumor, which is the key to the formation of the information cascade. Only if a certain number of people or enough people around them believe it, will the attention of rumors be increased and public awareness or collective cognition will be formed. The third is social media platform-based technological means[9]. With the help of social media platforms, the spread of rumors has gradually spread on a large scale, and relevant videos have begun to be recommended to audiences who are concerned about the epidemic. If the above three key points are met, then the information cascade of online rumors about the COVID-19 can form.

4.2 The frequency of exposure to rumors is proportional to the probability of stereotype formation

The hypothesis H2 is supported. There was a significant positive correlation between people's exposure frequency and stereotype formation after exposure to rumors ($R=0.209$, $P<0.05$). In the context of the COVID-19, whether out of curiosity or self-preservation, people began to constantly pay attention to the various events about the epidemic on the Internet. While some of these events are certainly true, the number of rumors is also uncountable. As the frequency of exposure to epidemic rumors increases, people's stereotypes are also subtly changing. In the media environment, stereotypes can spread more rapidly and widely. Social media has a rapid transmission speed of information. Whenever the media reports information that has the potential to expose the relevant audience to stereotype threat, it quickly and widely affects the psychology of the relevant audience, which in turn has a stereotypical impact on the relevant audience. According to the conclusions of this study, people's exposure frequency of rumors is significantly positively correlated with the formation of stereotypes after exposure to rumors. The more attention is paid to epidemic rumors, the more the number of relevant epidemic rumors

recommended by the platform will increase, and the frequency of contact will increase relatively more. And the higher the frequency of people's contact with epidemic rumors, the more likely it is to influence some stereotypes of the audience, so the study assumes that H2 is supported.

At the same time, in the repeated reproduction of epidemic rumors on social platforms, audiences continue to contact and pay attention to epidemic rumors. They constantly emphasize issues that are influenced by stereotypes about the attributes of specific groups. In this context, audiences who are influenced by social platforms will also choose stereotypes for value judgment and value choice as a result. The stereotypes generated by long-term exposure to rumors will make audiences deepen their negative perceptions of the rumors, thus reinforcing the stereotypes. Through reinforcement, individuals' thinking patterns and behaviors are also influenced. Even if the audience's initial perception is neutral, when people are indoctrinated with the same information for a long time, they are bound to subconsciously accept the views embedded in this information. And when the audience accepts these views, the possibility of reversal through the information becomes smaller, which in turn has irreversible consequences [10]. People’s frequency of exposure to epidemic rumors increases the probability of stereotyping by the audience to some extent.

On the other hand, during the epidemic, the audience's different attention to epidemic rumors will also affect the audience's perception of epidemic rumors. The frequency of exposure to rumors was positively correlated with the change in cognition of objective facts after exposure to rumors ($R=0.154$, $P<0.05$).

5 Conclusion and reflection

This study theorizes the spread of epidemic rumors under algorithmic recommendation through audience survey, and attempts to find the impact of this phenomenon on audience. Algorithmic recommendation technology is a recommendation mechanism that recommends the desired information to the target user by speculating on the content that may be of interest to him/her.[11]. It is widely used in information transmission, advertising, news production, etc. This completely user-centered information dissemination method that links the user's individual needs with the information inner palace has changed the information structure of society. The communication subject can accurately deliver information by profiling and analyzing users' usage behaviors (including reading length, commenting, reposting and other interactive behaviors) [12]. The study found that "H1: The more audiences pay attention to the rumors of the COVID-19 during the epidemic, the more relevant rumors recommended in their information streams" and "H2: The more the audience pays attention to the rumors of the COVID-19 during the epidemic, the deeper the understanding of the rumors" are established. And "H3: There are significant differences in the depth of audience perception of rumors by audiences with different educational qualifications, and the higher the education, the lower the awareness of rumors" is not true. This is mainly because the perception of rumors is more reflected in the degree of attention to rumors and the frequency of exposure to rumors. In the collected questionnaire, it can be seen that because college students use media platforms more often and are exposed to epidemic rumors,

their perception of objective facts will change accordingly. On the contrary, some people who are less connected to the Internet use media platforms less often, their exposure to epidemic rumors is less frequent, and their perception of objective facts does not change. Therefore, H3 is not true, in the spread of epidemic rumors, academic qualifications are not a key factor affecting audience perception.

This study not only proposes the role of primacy effect in rumor propagation in the era of epidemic, but also provides a medium for algorithmic recommendation in the context of big data in modern China. In social media platforms, users can browse by searching for the content they are interested in, and then the big data will record the content that each audience is interested in through calculations, and recommend relevant content to users in the process. For example, in an era of pandemics, users will search for how many new cases are being added each day or focus on what drugs can treat emerging corona-virus. Through these search content, the media platform calculates that the user is interested in the content related to the current epidemic event, and will recommend relevant content to the user when the user uses the media platform in the future.

However, it is worth noting that this study also found that this phenomenon of algorithm recommendation in the era of big data will bring the negative impact of information isolation. Under this algorithm recommendation, users will pay more and more attention to the content recommended by the media platform, and will continue to contact this content, and lose contact with other things. For example, in the COVID-19 epidemic, users search for what drugs can treat the new corona-virus every day, and the media will continue to recommend relevant content, and users will pay more attention to and be convinced that these drugs can indeed treat the new corona-virus, ignoring the fact that experts such as Zhong Nanshan said that "there is currently no specific drug for the new corona-virus". Users will only see this small part of the content recommended by the platform and will not see more messages. The American scholar Sunstein first used "Information Cocoons" to describe this phenomenon in his book Information Utopia in 2006[13], which is worthy of vigilance and reflection.

However, Due to the timing of the questionnaire collection, the number of valid questionnaires is not large, this study is still insufficient. In future research, researchers in the field of journalism and communication may need to pay more attention to the phenomenon of the impact of rumor dissemination on audience cognition, as well as the research and practice of expanding algorithm recommendation and primacy effect.

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