Research on the relationship between algorithmic push and rumor propagation effect in the risk society perspective Postprint

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Abstract

In recent years, with the emergence of risk society and increasing trust in disinformation, big data-driven precision push mechanisms have spread throughout daily life, which not only influences the information we receive, but also amplifies the spread of misinformation. This paper takes the online rumor communication effect in the Hu Xinyu case as the basis for investigation. After analyzing questionnaire and interview results, the study finds that the algorithm-based recommendation system can amplify the spread of disinformation in the context of risk society, and repetition effect and primacy effect can intensify people's amplifying role in rumor spreading. This study attempts to provide an effective reference for the effectiveness of information delivery for media and society as a whole.

Full Text

Preamble

Research on the Relationship Between Algorithmic Push and Rumor Propagation Effects from a Risk Society Perspective

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Abstract: In recent years, with the emergence of the risk society and growing trust in disinformation, precision push mechanisms driven by big data have permeated daily life, influencing not only the information we receive but also facilitating the spread of misinformation. This paper investigates online rumor communication effects through the case of Hu Xinyu. Through analysis of questionnaire and interview data, the study finds that algorithm-based recommen-

dation systems can amplify disinformation spread within risk society contexts, while repetition effects and primacy effects can intensify people's propensity to believe and share rumors. This research attempts to provide an effective reference for improving information delivery effectiveness for media and society at large.

Keywords: algorithmic push; primacy effect; repetition effect.

1 Introduction

In the context of risk society, structural societal changes and the increasingly significant role of big data-driven personalized push mechanisms in communication processes have made rumor propagation more frequent. Currently, big data and algorithms have become dominant forces shaping the range of information content people receive. Algorithm-driven personalized short video recommendation systems deliver content based on user characteristics, implicitly operating on the logic that "who you are" determines "what is recommended to you." However, this decision-making process occurs within a "black box" [1]. Under the precision push mechanisms of platforms such as Douyin and Toutiao, rumors reappear repeatedly after targeted distribution, convincing users of their veracity. When counter-rumor information is subsequently released, users no longer trust it as readily. We observe a potential correlation between algorithmic push and rumor propagation effectiveness. This raises several questions: Why do audiences believe rumors? What dynamics influence audience attitudes toward rumors? What implications and lessons does this mechanism hold for society and media?

2.1 Algorithmic Push

Algorithmic push has attracted researchers from multiple perspectives. Domestic scholars Hao Yu and Li Linxia found in 2017 that personalized information push abandons traditional information distribution methods, setting personalized traps for users through targeted information filtering and processing [5]. In 2019, Cui Di and Wu Fang examined the basic "information notification" function of news acquisition tools from an effectiveness perspective, finding that Toutiao enables users to acquire a relatively broad news knowledge structure (including public affairs knowledge and soft news knowledge). Despite substantially altering information distribution mechanisms, Toutiao remains a frequent channel for news and information consumption, performing the basic function of a news product [4]. Also in 2019, Huang Xiaozui, analyzing constraints behind personalized information push, found that the "information cocoon" constructed by personalized push models often ignores the complexity and variability of user behavior. Continuously pushing information that is no longer needed or follows repetitive patterns may, to some extent, cause audience boredom or resistance rather than winning their favor [3]. Wang Xianqing conducted a detailed study in 2020 on how China's socialist ideology faces challenges from technological

alienation through intelligent algorithmic push, concluding that taking mainstream ideology as the value guide, intelligent algorithm technology as the engine, and human information literacy as the core constitutes the proper response to challenges posed by intelligent algorithm technology to mainstream ideology, accelerating the construction of network information civilization [2]. However, these studies have examined algorithms and information dissemination aspects while neglecting repetition and primacy effects.

2.2 Primacy Effect

Primacy effect theory, first proposed by American psychologist Lochins in 1957, refers to how initial impressions formed between parties influence future relationships—the effect of "preconceptions." Although these first impressions are not always correct, they are the most distinctive and powerful, determining the course of future interactions. This theory has received substantial attention from scholars domestically and internationally, yielding numerous research findings. In 2000, domestic scholar Guo Xiaozhao proposed that a significant overall precedence effect exists in Chinese character image pattern recognition processes [9]. In 2013, Liu Xiuguang and Yang Naiding demonstrated that when consequences caused by emergency events are very serious, the influence of cue emergence order on solution choice is not significant. However, when crisis consequences are moderately severe, cue emergence order significantly influences solution choice, with final decisions highly consistent with initially emerging cues. This indicates that under contingency conditions, the more severe the consequences, the weaker the primacy effect generated by decision-makers [6].

2.3 Repetition Effect

In 2005, domestic scholar Ge Jun studied audience psychology from the perspective of repetition effects in advertising communication, finding that advertising requires repetition. Beyond using repetitive stimuli to enhance audience memory and increase message delivery probability to target audiences, evidence shows that repetition can strengthen message credibility through psychological mechanisms such as the truth effect, familiarity effect, and source memory error effect [8]. In 2013, domestic scholars Zhao Xue and Ji Li analyzed "repetition" articulation characteristics in TV commercials, concluding that "TV commercials possess both audio and visual characteristics due to the television medium," and therefore can employ both "repetition of words" and "repetition of words and on-screen text" to highlight key messages, which they regard as distinguishing features of TV commercial "repetition" articulation [7].

However, these studies have not examined rumor propagation phenomena from these perspectives and therefore have not addressed questions about the relationship between precision push mechanisms and audience acceptance of rumors. This paper attempts to answer the following questions through repetition and primacy effect theories: What causes audiences to deeply believe in rumors?

What motives influence audience attitudes toward rumors? What implications and lessons does this mechanism hold for society and media? This paper employs questionnaire and interview methods to address these questions.

3 Method

Using media coverage and rumor spreading in the Hu Xinyu case as an example, this paper attempts to answer these questions through questionnaire and interview methods.

3.1 Method One

The questionnaire explores the role of primacy and repetition effects in online rumor propagation paths by examining information acquisition channels among audiences of different age groups and education levels regarding the Hu Xinyu case, along with their trust in incident outcomes and official notifications. The study proposes the following hypotheses:

- **H1:** The more attention audiences pay to rumors related to an event, the higher the reach of related rumors.
- **H2:** The more attention audiences pay to rumors related to an event, the more profound their perception of related rumors.
- **H3:** The more attention audiences pay to rumors related to an event, the more inclined they are to believe related rumors.

To test these hypotheses, this study employs a questionnaire method, sampling the general population to create a survey instrument.

3.2 Method Two

Through in-depth interviews with 20 volunteers, their conversations will be cited in the following text.

4 Results

This survey collected 112 questionnaires with equal percentages of men and women, with middle-aged respondents aged 31-65 comprising the largest group at 64.3%. Descriptive analysis reveals that regarding rumors about the Hu Xinyu case, most people "probably know (know the general situation)" (54.5%), while 21.4% "have a steady grasp of what is going on." Only 2.7% have never heard of the incident, indicating its wide influence and strong public awareness. Among those aware of the incident, 71.4% obtained information from mainstream media reports. Audiences spending 1-10 minutes per day on this case and occasionally paying attention account for the majority, with 60.7% obtaining information from short video platforms such as Douyin and Kuaishou, indicating that most people acquire fragmented information.

Regarding news veracity related to the event, 45.5% believe most analyzed reports are true with a small portion fabricated, while 38.4% believe most are fabricated with a portion true. This indicates that although audiences clearly recognize rumors exist, both the quantity and degree of rumor acceptance remain vague and vary substantially. Regarding access to trusted channels, more than 20% began preferring non-mainstream media.

Pearson correlation analysis reveals a correlation coefficient of 0.748** between audience degree of concern and rumor reach, with p showing significant correlation at the 0.01 level, supporting H1. Correlation analysis between audience degree of concern and rumor awareness yields a correlation coefficient of -0.663**, with p showing significant correlation at the 0.01 level. Because the original questionnaire options represent opposite degrees, H2 is supported: the more audiences pay attention to rumors related to an event, the more profound their awareness of related rumors. Correlation analysis between audience degree of concern and degree of rumor belief yields a correlation coefficient of 0.815**, with p showing significant correlation at the 0.01 level, supporting H3.

These findings suggest that algorithm-based recommendation systems can indeed amplify disinformation spread in risky social environments. Regression analysis shows that algorithm design, audience characteristics, and media literacy levels are significant predictors of disinformation spread through algorithm-based recommendation systems. In-depth interviews reveal different perceptions and experiences regarding algorithm-based recommendations and disinformation spread. Some people trust algorithmic recommendations and rely on them for information, while others are skeptical and critically evaluate information. Results also suggest that media literacy plays a critical role in determining the extent of disinformation spread through algorithm-based recommendation systems.

This study provides insights into the relationship between algorithmic recommendations and false information dissemination in risk society contexts. Results show that algorithm-based recommender systems can amplify disinformation spread, with the extent of amplification influenced by various factors including algorithm design and audience characteristics. These findings have important implications for algorithm-based recommender system design and use, highlighting the need for further research to better understand the complex, evolving relationship between algorithm-based recommendations and disinformation propagation.

5.1 The Phenomenon of Precision Push Messaging in Risk Society

Precision recommendation employs various technological means to quickly and accurately deliver content matching user preferences, lifestyle levels, social status, and concerns to users' minds. The most important feature of personalized

information push is abandoning traditional manual news content selection and push methods, instead using content algorithms and collaborative filtering algorithms to retrieve, filter, aggregate, and distribute information. However, precisely because this push content relies entirely on mechanical data and machine calculations, it gradually leads people into distorted and alienated situations, causing users to inadvertently fall into algorithmic push traps [5].

In this rapidly changing Internet era, precision recommendation represents a crucial information delivery method. Simultaneously, rapid social media development, Internet technology, and interaction between new and traditional media have triggered information explosions on the Internet, including false news and rumors. This information explosion has also produced many adverse factors. On social media, the most common rumors and false information include medical news, political news, natural disaster news, breaking news, etc. False messages already existing on Douyin, Kuaishou, and Toutiao include:

1. **Medical and health misinformation:** Some media gain audience attention and click rates by reporting false information about treatments or special efficacy of certain drugs. Meanwhile, some businesses make untrue, exaggerated product advertisements through one-sided interpretation and false marketing, exploiting consumers' desperate treatment psychology for promotion.
2. **Political misrepresentation:** False news related to political events and policy documents spreads through social networks, affecting public confidence in government agencies and normalization of political life.
3. **Conspiracy theories:** Some accounts exploit viewers' curiosity to overinterpret and promote large-scale public crises or diplomatic activities under the guise of revealing truth, misleading public judgment and understanding of international relations.
4. **Financial scams:** Some organizations use information such as "winning prizes" and "subsidies" to commit financial scams such as online loan fraud, causing some people to believe rumors and become victims of financial losses.
5. **Misinformation about public figures:** Some organizations spread false information about celebrities and politicians online, influencing public perceptions and damaging these individuals' images and reputations.
6. **Reports distorting facts:** Many commercial social media accounts distort facts by piecing together edited videos, text, and images to attract readers.

These potential rumor crises may trigger mass crises of trust in official and mainstream media, reduce media credibility, and gradually intensify negative public sentiment toward government and state, further increasing risk society severity.

5.2 The Effects of Primacy and Repetition on Online Rumor Spread

This section examines primacy and repetition effects as two key factors contributing to online rumor spread. Primacy effect refers to people's tendency to give more weight to information they encounter first, regardless of accuracy, making misinformation spread difficult to contain. Repetition effect refers to information being more likely to be remembered and believed when repeated frequently. This contributes to online rumor spread because repeated exposure to misinformation can lead people to believe it is true even without reliable evidence.

In this study, several interviewees noted, "I didn't care about it at first, but I became curious and paid attention because various apps kept pushing it and there was more news." Many Internet users passively followed the Hu Xinyu case amidst overwhelming reports. Beyond using repetitive stimuli to strengthen audience memory and increase message delivery probability to target audiences, evidence suggests repetition can strengthen message credibility through psychological mechanisms such as the truth effect, familiarity effect, and source memory error effect [8]. Precision recommendation uses repetition to "brainwash" users and force them to believe false information. Some interviewees stated, "I didn't believe some information on the Internet, but some of it was justified, so I don't completely agree with those official statements." This demonstrates how repetitive methods plant particular concepts in people's minds. Because these concepts have strong support, users preconceive that the event reports they are frequently exposed to represent the original truth.

The combination of primacy and repetition effects can create a self-reinforcing cycle where early adopters of misinformation spread it to others who, in turn, repeat it, leading to broader beliefs and further dissemination. This makes it particularly important for individuals to remain vigilant in verifying information before sharing and for organizations to take steps to counteract misinformation spread.

5.3 The Relationship Between Precision Recommendation and Online Rumors

This section discusses the relationship between precision recommendation and online rumor propagation, exploring how targeted notifications can help counteract misinformation spread and mitigate primacy and repetition effects.

Current findings clearly show that big data precision recommendation is closely related to online rumor propagation. On one hand, accurate data pushing can provide users with credible, trustworthy information and reduce error or misinformation spread. On the other hand, improper auditing and lack of gatekeeping in filtering information to deliver emotions can lead to precision pushing that amplifies false or misleading information or exposes people to biased, untrust-

worthy messages, thus contributing to online rumor spread.

In the Hu Xinyu case survey, some interviewees reported originally learning about the matter through friends. They searched for official reports but found many questionable voices in comment sections. Subsequently, when browsing videos, they frequently encountered so-called truth-revealing videos about the event. From this perspective, after the big data algorithm deduced user doubts and curiosity about the Hu Xinyu case, it altered push content to target users with videos or articles containing "Hu Xinyu" keywords, exposing them to one-sided, unverified information and amplifying online rumor spread.

Ultimately, the relationship between precision recommendation and online rumors depends on various factors, including technologies and algorithms used for data analysis and precision recommendation, unnatural and social factors influencing online rumor spread, and social and cultural contexts in which information is shared and consumed.

6.1 Algorithms Implant Rumor Opinions Through Repetition and Primacy Effects

This paper illustrates the complex relationship between accurate, targeted precision tweets and online rumor spread, highlighting the importance of considering primacy and repetition effects. By understanding these factors' impact, organizations and individuals can take steps to reduce misinformation spread and promote a more sensible, trustworthy digital environment.

This study theorizes the phenomenon of repetition and primacy effects of algorithmic push on rumor propagation through audience surveys and interviews, attempting to answer questions about the relationship between algorithmic push and rumor propagation path and effects. Hypotheses are validated through the study, primarily because the precision recommendation mechanism creates rumor repetition effects, making audience attitudes increasingly inclined toward belief. However, when rumor debunking information reaches users, although they may believe it, they may quickly forget the debunking information due to primacy effects.

6.2 Improving Discernment to Avoid Falling Into Precision Recommendation Traps

This study analyzes various factors in rumor spreading paths and the psychological phenomena of audience acceptance of disinformation, finding that trust in rumors is influenced by algorithmic pushing. Less educated groups with poorer discernment abilities are more easily driven by rumors. To some extent, rumor spread has forced people to improve information discernment abilities. On one hand, algorithmic rumor recommendation reflects new channels and diversification of public opinion dissemination in risk society and audience autonomy

in information reception choice. On the other hand, it provides reference for government public opinion guidance in China's new media era.

However, it is noteworthy that this study also finds algorithmic rumor recommendation negatively impacts audience media trust, triggered by social depression, which warrants caution and reflection. These findings have important implications for algorithm-based recommendation system design and use, and more work is needed to better understand the complex, evolving link between algorithm-based recommendations and misinformation proliferation.

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Note: Figure translations are in progress. See original paper for figures.