Identification and Classification of Key Cognitive Heuristics Influencing the Credibility of Online Misinformation: A Grounded Theory Postprint

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Abstract

[Purpose/Significance] To identify and classify key cognitive heuristics influencing the credibility of online misinformation, providing theoretical reference for its dissemination and offering guidance for industry and government efforts to control the spread of misinformation.

[Method/Process] Based on interview data from 18 internet users and cognitive heuristics from literature, employing grounded theory research method, ultimately identifying 10 main-category heuristics and dividing them into four major categories, thereby constructing a cognitive heuristic classification model for online misinformation credibility.

[Results/Conclusion] Consensus heuristic, self-cognition heuristic, and consistency heuristic are dominant cognitive heuristics; authentication heuristic and reputation heuristic are assurance cognitive heuristics; appearance perception heuristic, transmission heuristic, and content heuristic are supportive cognitive heuristics; novelty heuristic and intention heuristic are driving cognitive heuristics.

Full Text

Preamble

Identification and Classification of Key Cognitive Heuristics Influencing the Credibility of Online Inaccurate Information: A Grounded Theory Perspective

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Abstract:
[Purpose/Significance] This study identifies and classifies key cognitive heuristics that influence the credibility of online inaccurate information, providing theoretical reference for the dissemination of such information and offering guidance for industry and government in controlling its spread. [Method/Process] Based on interview data from 18 internet users and cognitive heuristics from existing literature, this study employs grounded theory methodology to identify 10 main heuristic categories and classify them into four major types, thereby constructing a cognitive heuristic classification model for online inaccurate information credibility. [Result/Conclusion] Consensus heuristics, self-cognition heuristics, and consistency heuristics are dominant cognitive heuristics; authentication heuristics and reputation heuristics are 保障性 cognitive heuristics; appearance perception heuristics, transmission heuristics, and content heuristics are supportive cognitive heuristics; novelty heuristics and intent heuristics are driving cognitive heuristics.

Keywords: inaccurate information; credibility; cognitive heuristics; grounded theory

Inaccurate information typically refers to unverified information that may be true or false, transmitted to the public through certain material carriers. This concept describes rumors, gossip, and unconfirmed information that circulate after emergency events [1-2]. With the widespread application of social media, the volume of daily information has grown exponentially. We-media platforms such as WeChat public accounts and Weibo, characterized by low barriers and liberalization, often deliver exaggerated, fabricated, and erroneous information to attract attention. If people receive and forward such information without discrimination, it inevitably leads to information inaccuracy and overall distortion, subsequently causing public panic and social instability.

The information explosion era demands that people process large amounts of information quickly, making them increasingly "shallow" [6]. As cognitive misers, people tend to use cognitive shortcuts or intuition to process and judge information, thereby reducing cognitive load [7]. This study introduces the concept of cognitive heuristics—mental shortcuts or rules-of-thumb that people frequently use to process information quickly and conveniently [8-9]—to explore the credibility of online inaccurate information. Using grounded theory to analyze the key cognitive heuristics users employ when judging the credibility of online inaccurate information, and integrating heuristics from existing literature, this study constructs a research model of key cognitive heuristics influencing online inaccurate information credibility, providing theoretical and practical suggestions for understanding and controlling the spread of inaccurate information.

1 Related Research

1.1 Research on Inaccurate Information

Research on inaccurate information is still in its early stages in academia. The concept first appeared in domestic accounting and finance literature [10] and was later defined by Huo Liang'an et al. as "unverified information" [1], distinguishing it from rumor information. Based on infectious disease models, rumor propagation models, and dynamic system models, researchers have explored the dissemination of inaccurate information after emergency events, demonstrating from the perspective of systematic information omission that inaccurate information contains small amounts of true information yet differs from false information, while subjective guidance in individual information transmission can cause inaccurate information to deviate from reality and distort the truth [1]. Liu Yanjun et al. [5] defined inaccurate information based on information objectivity and explored the conceptual classification and propagation reasons of scientific and technological inaccurate information within their field. Deng Xiaofeng [3] built upon Huo Liang'an's propagation model to establish a research framework for corporate reputation emergency scenarios and conducted typical scenario construction. International research on inaccurate information is also limited, mostly focusing on medical information services on the internet. For example, A.G. Crocce et al. [11] introduced the harm of inaccurate medical information to children based on extensive quantification of internet misinformation. R.B. Stricker et al. [12] used 15 search engines to find information on Lyme disease, reviewing data from 251 websites and finding that users searching for related content obtained inaccurate information.

Current research on inaccurate information primarily concentrates on its propagation characteristics in the field of communication studies. The spread of inaccurate information is based on people's belief in it; however, research on how people judge its credibility remains scarce. Understanding the identification of inaccurate information credibility can further help researchers and society comprehend its dissemination among the public. Therefore, studying the factors influencing the credibility of inaccurate information is highly necessary.

1.2 Research on Cognitive Heuristics

Cognitive heuristics refer to mental shortcuts or rules-of-thumb that people frequently use to process information quickly and conveniently [8-9]. Information credibility has been a key focus in information science research, evolving from initial source credibility [13] to credibility of source, channel, receiver, and information [14]. Researchers have employed methods such as principal component analysis [15], user surveys [16], improved analytic hierarchy process [17], grounded theory [18], and the elaboration likelihood model [19] to explore information credibility, constructing evaluation frameworks for internet information credibility [20] and identifying four types of credibility: recognized credibility, reputed credibility, appearance credibility, and experiential credibility [21]. With

research advancement, particularly after Tversky and Kahneman [22] proposed the Heuristic concept in 1974, researchers gradually discovered that people do not always process information systematically but often invoke cognitive heuristics to evaluate the credibility of online information and sources [23].

Specifically, B. Hilligoss et al. [8] collected information search behaviors from 24 undergraduate diaries, applying grounded theory analysis to construct a unified credibility assessment framework that judges information credibility through three different levels: article structure, cognitive heuristics, and interaction. M.J. Metzger et al. [9] examined cognitive heuristic hypotheses about web credibility using focus group data from 109 participants, finding that participants did not systematically process information but frequently invoked cognitive heuristics to evaluate the credibility of online information content and sources, deriving a series of cognitive heuristics affecting web information credibility. C.X. Yin et al. [24] explored the dual role of cognitive heuristics and the moderating effect of gender in Weibo information credibility evaluation, confirming the existence of dual effects of cognitive heuristics and that the additional effect of cognitive heuristics is stronger for males than females. Z.K. Zhang et al. [25] examined the influence of online reviews on consumer decision-making, demonstrating the interrelationship between heuristic and systematic factors. L. Llamero et al. [26] studied credibility evaluation in tourism word-of-mouth, finding that tourists use conceptual thinking and a series of cognitive heuristics to evaluate credibility.

Given the importance of cognitive heuristics in credibility judgment, this study introduces the concept of cognitive heuristics to explore inaccurate information credibility. Through interviews about information dissemination mechanisms, we understand which cognitive heuristics people use in daily life to confirm the credibility of inaccurate information. Using open coding to define cognitive heuristics in the data, combined with research on cognitive heuristics for network information credibility, we induce and integrate heuristics from literature and interviews, classify them, and construct a corresponding research model.

2 Research Design

2.1 Research Methods and Procedures

This study adopts qualitative grounded theory methodology, working bottom-up through continuous questioning, comparison, and classification to identify cognitive heuristics affecting inaccurate information credibility. Grounded theory, proposed by Glaser and Strauss in 1967, is a research method where researchers develop concepts and construct theories through systematic analysis of empirical data. Following N.R. Pandit's five-stage grounded theory procedure [27], this study developed a corresponding research process, as shown in Figure 1 [Figure 1: see original paper].

2.2 Data Collection

This study's data primarily comes from two sources: in-depth interviews and relevant literature. By organizing, inducing, and integrating cognitive heuristics from both sources, we form the final key cognitive heuristics for judging inaccurate information credibility.

2.2.1 Interview Data Collection To ensure interviewees understood the interview outline, this study first conducted pilot interviews to improve it. During pilot interviews, we found that respondents did not fully understand professional questions, were unclear about the interviewer's purpose, and had biased understandings of questions. Based on pilot interview feedback, we refined the interview outline by adding examples and guidance for relevant professional terms to form the final version. The interview outline included questions about: (1) which network channels respondents used to receive information and how they judged inaccurate information credibility through these channels; (2) which characteristics of information producers they examined when identifying inaccurate information credibility; (3) which characteristics of the information itself they used for discrimination; and (4) which personal reasons influenced their judgment of inaccurate information credibility.

Interviews were conducted primarily from March to May 2019, lasting three months. A total of 18 interviewees were selected across different age groups: 18-34 years (youth), 25-59 years (middle-aged), and 60+ years (elderly), with 6 people in each group and a 1:1 gender ratio. After interviews, respondents' viewpoints were extracted from interview records to form textual data. Sample basic information is shown in Table 1 . Interviewees covered different genders, ages, education levels, and income levels, making the sample representative.

2.2.2 Literature Data Collection Relevant literature was obtained primarily by searching CNKI, VIP, Wanfang, Baidu Scholar, and other databases based on thematic content characteristics, as well as through extensive browsing of various related documents.

3 Data Analysis

3.1 Interview Data Coding

3.1.1 Open Coding Open coding involves researchers analyzing raw data word-by-word to extract initial concepts, refine and induce them, and then organize them into different categories [25]. Three researchers independently extracted content from interview texts, broke them into independent sentences containing emotional color, extracted elements, refined language, and conducted coding. They then merged identical codes and, through group discussion, synthesized coding results to form textual data. This process yielded 176 original statements. Through continuous comparison and elimination of duplicate or overlapping initial concepts, 48 initial concepts (a1-a48) were obtained, which

were further refined and merged into 20 conceptual categories (A1-A20). Due to space limitations, only one original statement is listed for each category. Open coding results are shown in Table 2 .

3.1.2 Axial Coding From existing categories, we selected those that best reflected the text's themes, connected axial categories with relevant text in the raw data, merged secondary categories, and refined main categories. Based on 20 initial categories, this study analyzed their relationships by nature and obtained 10 main categories (B1-B10). The axial coding process is shown in Table 3 .

3.2 Literature Data Organization

Three researchers independently coded data extracted from 18 literature sources, abstracted concepts, translated them into Chinese, and obtained 33 cognitive heuristic concepts (c1-c33). Specific results are shown in Table 4 .

3.3 Heuristic Integration

Through literature comparison to improve theoretical saturation, we found that although the 33 heuristic concepts from English literature (c1-c33) and the 48 initial concepts from interviews (a1-a48) had inconsistent names, they could be integrated into the 20 initial categories (A1-A20). Therefore, we associated and integrated both sets of heuristics, merging those with similar meanings. The final heuristic integration results are shown in Table 5 .

3.4 Selective Coding

We filled in incompletely developed categories, conducted specific analysis of main categories, and clarified theoretical explanations of cognitive heuristics affecting online inaccurate information credibility. Using the process of users obtaining online inaccurate information—from channel and source to information and then to receiver—we identified "online inaccurate information credibility" as the core category. The relationship structures fall into four types: dominant factors, promising factors, supportive factors, and driving factors. Dominant factors refer to those playing key roles when users 甄别 credibility; promising factors help users avoid false, erroneous, or uncertain inaccurate information; supportive factors provide conditions for users to confirm inaccurate information; driving factors influence users' choices to believe inaccurate information. The coding results of this stage are shown in Table 6 .

3.5 Theoretical Saturation Test

After three researchers completed coding, two other researchers conducted saturation tests on random texts from interview data. No new categorical relationships were formed, indicating that the current analysis results have good

theoretical saturation. However, when extracting relevant heuristics from literature, we found some unincorporated heuristics. To perfect the conclusions, we analyzed and merged heuristics from literature with those from coding, and after integration, found no new heuristics or categorical relationships upon retesting. Therefore, we believe this theoretical model has reached saturation.

4 Cognitive Heuristic Model for Online Inaccurate Information Credibility

Based on the above grounded theory coding analysis, 10 heuristics significantly influence online inaccurate information credibility, identifying four types of cognitive heuristic mechanisms: (1) Dominant cognitive heuristics: B1 consensus heuristics, B3 self-cognition heuristics, and B9 consistency heuristics play dominant roles in judging online inaccurate information credibility; (2) Promising cognitive heuristics: B2 authentication heuristics and B4 reputation heuristics guarantee online inaccurate information credibility to some extent; (3) Supportive cognitive heuristics: B6 appearance perception heuristics, B7 transmission heuristics, and B10 content heuristics provide support for online inaccurate information credibility; (4) Driving cognitive heuristics: B5 novelty heuristics and B8 intent heuristics influence users' choices to believe or reject online inaccurate information. Accordingly, this study constructs a cognitive heuristic model for online inaccurate information credibility, containing 10 heuristics and four functional mechanisms. The model demonstrates the role of cognitive heuristics through three stages: users searching for sources/receivers, retrieving information, and then 甄别 credibility, as shown in Figure 2 [Figure 2: see original paper].

4.1 Dominant Cognitive Heuristics

The dominant factors in judging online inaccurate information credibility are B1 consensus heuristics, B3 self-cognition heuristics, and B9 consistency heuristics, which operate throughout the entire credibility 甄别 process. Self-perception heuristics include type heuristics, cognitive experience, and tendency heuristics, and uniquely involve the user in the third stage. Consensus heuristics refer to heuristics caused by recommendations, comments, and conformity; consistency heuristics primarily distinguish truth from falsehood through comparison. Interviews clearly revealed that when 甄别 ing inaccurate information, people's first reaction relies on their own feelings; when truth is difficult to distinguish, they verify credibility by comparing information from other sources, and then supplement with others' judgments. These three types of heuristics are the primary means by which users confirm inaccurate information credibility and play decisive roles, thus belonging to dominant cognitive heuristics.

4.2 Promising Cognitive Heuristics

B2 authentication heuristics and B4 reputation heuristics are prerequisites and guarantees for users to discriminate inaccurate information feasibility, acting when users select sources and channels. Authentication heuristics include navigation links and source recognition, while reputation refers to the professionalism and authority of channel sources. When encountering inaccurate information online, users first focus on its source and channel. Only when sources and channels have authentication and high reputation will users proceed to the next judgment step. For sources and channels with low credibility, users directly consider their disseminated information as false and untrue. Therefore, authentication heuristics and reputation heuristics are promising cognitive heuristics affecting online inaccurate information credibility.

4.3 Supportive Cognitive Heuristics

B6 appearance perception heuristics, B7 transmission heuristics, and B10 content heuristics play supportive roles in online inaccurate information credibility. Appearance perception heuristics include information structure frameworks, multimedia types, and channel structure presentation; transmission heuristics mainly refer to information transmission timeliness; content heuristics refer to factors within the information content itself. When these three heuristics' characteristic features are positive, online inaccurate information is more credible; otherwise, credibility is lower. Interviewees did not highly recognize these heuristics, primarily because they have both positive and negative manifestations and exert both positive and negative effects on credibility, mostly serving as feedback verification after other aspects are judged. Therefore, they belong to supportive cognitive heuristics.

4.4 Driving Cognitive Heuristics

B5 novelty heuristics and B8 intent heuristics drive users' choices to believe inaccurate information, with both having opposite effects—novelty heuristics provide positive drive while intent heuristics cause negative drive. These two heuristics are rarely encountered when obtaining information online. Interviews found that novelty heuristics arise from people's curiosity; when facing novel viewpoints, they tend to trust the content to some extent. Intent heuristics include network window pop-ups and displays of other intentions, referring to situations where commercial or other intentions are overly prominent, causing user annoyance and disbelief in any information on the platform. These two heuristics have a pulling effect on users' judgment of inaccurate information credibility, thus belonging to driving cognitive heuristics.

5 Research Implications

Theoretical Implications

First, although inaccurate information has gradually attracted academic attention, research has mainly focused on its dissemination mechanisms in networks. The internal mechanism of rapid inaccurate information spread is people's belief in it. Therefore, this study's focus on identifying factors influencing inaccurate information credibility can expand and supplement current research. Second, this study treats cognitive heuristics as the main factor affecting inaccurate information credibility 甄别, comprehensively and systematically identifying key cognitive heuristics influencing people's perception of inaccurate information credibility through grounded theory analysis of interview and literature data, and constructing a cognitive heuristic model containing three stages and four functional mechanisms. By exploring these four mechanisms, we summarize four types of cognitive heuristics, providing theoretical reference for future research.

Practical Implications

This study has two main practical implications: (1) It can help users judge and identify inaccurate information, providing guiding suggestions; (2) It can help government and stakeholders further understand the key cognitive heuristics people use to judge inaccurate information credibility, thereby designing intervention policies to prevent deception by inaccurate information in the current information environment. Specifically, based on the four types of cognitive heuristics identified, concrete suggestions are provided in Table 7 .

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Abstract: [Purpose/Significance] The identification of key cognitive heuristics of online inaccurate information credibility can provide theoretical suggestions for information dissemination, and provides some guidance for industry and government about how to control inaccurate information dissemination. [Method/Process] Based on structured interview data of 18 online users, adopting grounded theory, 10 key cognitive heuristics were identified and a classification model was built based on 4 types of cognitive heuristics. [Result/Conclusion] Consensus heuristics, self-cognition heuristics, and consistency heuristics are dominate cognitive heuristics; authentication heuristics and reputation heuristics are promising cognitive heuristics; appearance heuristics, transmission heuristics and content heuristics are supportive cognitive heuristics; novelty heuristics and Intent heuristics are driving cognitive heuristics.

Keywords: inaccurate information; credibility; cognitive heuristics; grounded theory

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