# THREE STUDIES INTO USER ENGAGEMENT BEHAVIORS ON SOCIAL MEDIA: THE DYNAMICS OF FAKE NEWS AND RUMOR-DEBUNKING

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PhD

The Hong Kong Polytechnic University

This programme is jointly offered by The Hong Kong Polytechnic University and Harbin Institute of Technology

2025

The Hong Kong Polytechnic University

Department of Management and Marketing

Harbin Institute of Technology

School of Economics and Management

# Three Studies into User Engagement Behaviors on Social Media: The Dynamics of Fake News and Rumor-Debunking

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A thesis submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy

December, 2024

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# Abstract

This thesis investigates user engagement behaviors on social media platforms affected by fake news dissemination through three studies. These three studies collectively enhance our understanding of user engagement behaviors on social media across two dimensions. First, they elucidate the influence process of fake news on user engagement behaviors, from initial impact to the effects of subsequent interventions. The first two studies specifically investigate how news related factors impacts user engagement, while the third study delves into the effects of rumor-debunking content on user engagement behaviors. Second, the studies investigate the factors influencing user engagement behaviors by analyzing both the overall environment and detailed features. The first study explores how overall news quality on social media influences user engagement behaviors, while the second and third studies examine how specific features of online news and rumor-debunking content impact user engagement behaviors.

**Study 1** utilized the Social Amplification of Risk Framework and Structural Equation Modeling to assess how news quality influences users' risk perceptions, perceived believability, and news-sharing behaviors. Additionally, I explored the moderating effects of fake news awareness and social tie variety. The findings indicated that the influence of news quality on users' news-sharing behavior is mediated by risk perception and perceived believability. Individuals with a heightened awareness of fake news or a diverse social tie are more inclined to perceive greater risks associated with news-sharing behavior and question news authenticity.

**Study 2** applied Media Richness Theory and negative binomial regression model to investigate how textual and pictural information richness influence

user engagement. I also explored the moderating effects of the type of discussed travel destination (natural or cultural landscape), complexity of discussed travel destination, and poster level in social media (common or VIP), using data crawled from Weibo platform. The results showed that textual information richness exhibits a significantly positive influence on user engagement and pictorial information richness demonstrates a significantly negative effect on user engagement. The complexity of discussed travel destination and poster level positively moderate the impact of both pictural and textual information richness on user engagement. Additionally, when the topic under discussion is the natural landscape, both the positive influence of textual information richness and the negative influence of pictural information richness will decrease.

**Study 3** draws on theories of Impression Management and Source Credibility, conducting a polit study and three experiments to investigate how fact-checkers affect user engagement with rumor-debunking content. The study identifies a dual mediation process involving innovation image and perceived source credibility, moderated by AI literacy and confirmation bias. Fact-checkers indirectly boost engagement through these mediators, with AI literacy and confirmation bias altering the mediation paths. The results indicated a significant indirect effect of fact checkers on user engagement through the mediating roles of innovation image and perceived source credibility. AI literacy primarily moderates the path of innovation image, while confirmation bias moderates the path involving perceived source credibility.

These findings contribute to the literature on user engagement with news and AI-generated rumor debunking, offering practical insights for curbing fake news spread and enhancing fact-checking effectiveness.

**Keywords**: Social media, fake news, user engagement, news quality, information richness, AI fact-checker

# Publications Arising from the Thesis

1. **Wu Y**, Ngai E W T, Wu P, Wu C. Fake news on the internet: a literature review, synthesis and directions for future research. Internet Research, 2022, 32(5): 1662-1699. (Chapter 2 of the thesis)

2. **Wu Y**, Ngai E W T, Wu P. Understanding users' news-sharing behaviors: roles of risk perception, believability, fake news awareness and social tie variety. Industrial Management & Data Systems, 2024, Doi: 10.1108/IMDS-01-2024-0039. (Chapter 3 of the thesis)

# Acknowledgements

I would like to seize this opportunity to convey my heartfelt gratitude to everyone who has supported me throughout my Ph.D. experience. Especially, I am deeply grateful to my supervisors, Prof. Eric W.T. NGAI and Prof. Chong WU, for their unwavering support and patient mentorship throughout my academic journey. Completing this thesis would not have been possible without their assistance. Additionally, I extend my thanks to the BOE members for their insightful recommendations that significantly enhanced my thesis. I also appreciate the support and collaboration from my colleagues. Finally, I would like to express my gratitude to my family—my parents, my husband, and my child—for their unwavering support throughout this journey.

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# Chapter 1 Introduction

## 1.1 Research motivation

The Macquarie Dictionary (Shu *et al.*, 2017), Oxford English Dictionary (Colombo *et al.*, 2017; Ozeke *et al.*, 2018), American Dialect Society and Collins Dictionary (Meza, 2017) consecutively designate “fake news” and “post-truth” as the words of the year.

In the realm of social media, fake news and real news coexist, and the prevalence of fake news has led to substantial negative impacts across multiple domains. The United States (US) presidential election (Creech and Roessner, 2019) and the United Kingdom (UK) vote to leave the European Union (“Brexit”) (Bennett and Livingston, 2018) have attracted great attention to the political influence of fake news. Apart from the political context, fake news has also been documented in promulgating information in other areas, such as social issues (Grech and Masukume, 2017), medicine (Brady *et al.*, 2017), and economics (Lazer *et al.*, 2018). During the COVID-19 pandemic, the proliferation of fake news exacerbates the challenges confronting health policy and emerges as a significant determinant for the decline in immunization rates by fostering public skepticism towards vaccines. Severe viral spread of fake news made the World Economic Forum consider it one of the main threats to human society (Herrero-Diz *et al.*, 2019).

The spread of fake news is modelled as the spread of a viral contagion to emphasize extensive spreading, as the assistance of social media (Evolvi, 2018; Kucharski, 2016; Silverman, 2016) and lack of awareness among the users (Khurana *et al.*, 2019; Neo, 2020; Tandoc *et al.*, 2020). The influential combination of fake news and social media has been attracting a great deal of concern and attention in

academic research (Chen *et al.*, 2015). It is of highly important to investigate user engagement behaviors on social media infested with fake news.

The proliferation of fake news on social media allows all users to easily disseminate misleading information, resulting in a plethora of low-quality news content, including attention-grabbing headlines and fabricated videos. The impact of news quality has become crucial in shaping user engagement behaviors within the online environment inundated with fake news (Wang *et al.*, 2022a; Wu *et al.*, 2022). While some studies have examined the effects of news quality on user engagement behaviors, there remains limited understanding regarding the role of risk perception and perceived believability. Furthermore, in a social media infested with fake news, specific user characteristics such as fake news awareness and social tie variety may influence user engagement behaviors; however, their moderating roles have not been explored. Therefore, this thesis initially aims to investigate the underlying mechanisms through which overall news quality affects user engagement behaviors within social media platforms plagued by fake news.

In addition to the overall news environment, user engagement behaviors are also influenced by specific news features, such as news type (Chua and Banerjee, 2018; Wang *et al.*, 2022b; Zhou *et al.*, 2021b), credibility of news sources (Kim and Dennis, 2019; Kim *et al.*, 2019; Pennycook *et al.*, 2021), presentation format of news (Kim and Dennis, 2019), and other specific characteristics. Specifically, trolling in the news (Buchanan and Benson, 2019; Fichman and Vaughn, 2021) as well as persuasive or uncertain language use (Zhou *et al.*, 2021a), along with a high number of Facebook 'likes' (Ali *et al.*, 2022) are more likely to be disseminated among users. Despite these efforts, there is still limited understanding about how textual and pictorial information complexity (IC) affects user engagement behaviors on social media platforms where some fake news may deliberately provide richer information to increase perceived credibility or usefulness. Therefore, this thesis also investigates the impact of textual and pictorial IC on user engagement behaviors, while examining the moderating effects of news topics and user characteristics.

To combat the dissemination and detrimental effects of fake news, various stakeholders contribute debunking information to counteract fake news. Previous studies have shown that the provision of debunking information (Chua and Banerjee, 2018; Chung and Kim, 2021) and the flagging of news (Mena, 2020) reduce individuals' intention to share by undermining the credibility of such news. With the widespread use of AI tools, certain AI accounts, like "Review Robert" on Weibo, have become active in social media platforms. It is anticipated that if an online news article is automatically identified as fake, AI accounts can promptly provide rumor-debunking information. Therefore, this thesis further investigates the impact of AI fact-checkers on user engagement behaviors towards rumor-debunking information while examining the mediating roles played by innovative image and perceived source credibility, as well as the moderating roles influenced by users' AI literacy and confirmation bias.

## 1.2 Research objectives and questions

The objective of this thesis is to investigate user engagement behaviors on social media platforms plagued by the dissemination of fake news. In order to accomplish this objective, three studies were conducted (refer to Figure 1-1). The initial two studies (Chapters 3 and 4) explored user engagement behaviors on social media platforms affected by fake news dissemination, while Study 3 (Chapter 5) examined user engagement behavior with rumor-debunking content.

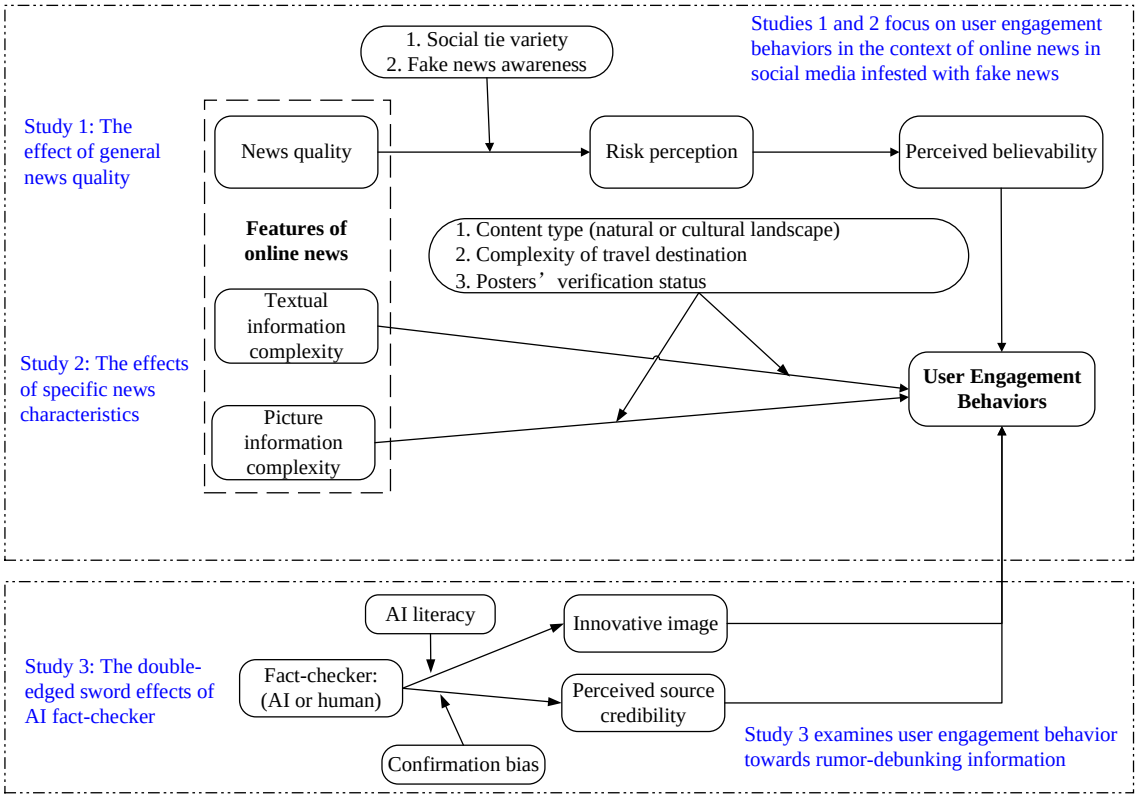



**Figure 1-1** Research framework of the thesis

Specifically, Study 1 aims to address three research questions: *(1) What role does risk perception play in shaping the relationship between news quality, perceived believability, and users' news-sharing behavior? (2) How does fake news awareness moderate the impact of news quality on users' news-sharing behavior through the mediation of risk perception and perceived believability? (3) How does social tie variety moderate the effect of news quality on users' news-sharing behavior via the mediation of risk perception and perceived believability?* To investigate these research questions, I draw upon the Social Amplification of Risk Framework and employ Structural Equation Modeling to analyze data collected from an online survey.

Study 2 aims to answer three research questions: *(1) How do textual and pictorial information complexity differentially impact user engagement on social media platforms? (2) How do the effects of textual and pictorial IC on user engagement vary between posts about natural landscapes and those about cultural landscapes? (3) How do the complexity of the discussed travel*

*destinations and a poster's verification status influence the effects of textual and pictorial IC on user engagement?* To investigate these research questions, I draw upon the Media Richness Theory and employ the negative binomial regression model and the Tobit model to analyze data crawled from Weibo platform.

Study 3 aims to answer three research questions: *(1) Will the persuasive effects of fact-checking remain consistent when AI intervenes in the fact-checking process, whether to a greater or lesser extent? (2) Whether and how do the different fact-checkers affect individual innovation image and perceived source credibility, thereby affecting the intention to engage with the message (e.g., share and recommend the debunking message)? (3) How do AI literacy and confirmation bias moderate the effect of AI fact-checker on user engagement toward rumor-debunking information via the mediation of innovative image or perceived source credibility?* To investigate these research questions, I draw upon the Theories of Impression Management and Source credibility and employ ANOVA to analyze data collected from two experiments.

These three studies collectively enhance our understanding of user engagement behaviors on social media across two dimensions. First, they elucidate the influence process of news related factors on user engagement behaviors, from initial impact to the effects of subsequent interventions. The first two studies specifically investigate how fake news impacts user engagement, while the third study delves into the effects of rumor-debunking content on user engagement behaviors. Second, the studies investigate the factors influencing user engagement behaviors by analyzing both the overall environment and detailed features. The first study explores how overall news quality on social media influences user engagement behaviors, while the second and third studies examine how specific features of online news and rumor-debunking content impact user engagement behaviors.

## 1.3 Structure of the thesis

This thesis is structured as follows: Chapter 2 provides a comprehensive conceptualization of user engagement behaviors and fake news, presents a concise literature review, and analyzes the underlying theoretical foundations.

In Chapter 3, a survey is conducted to examine the influence of news quality on user engagement behaviors, while also investigating the mediating effects of risk perception and perceived believability in this relationship. Additionally, the moderating effects of users' awareness towards fake news and diversity in social ties are explored.

In Chapter 4, I conduct a comprehensive analysis of real data obtained from the Weibo platform to investigate the impact of specific news features, namely textual and pictorial information complexity, on user engagement behaviors. Additionally, this study examines the moderating effects of the type of discussed travel destination, complexity of discussed travel destinations, and poster level in social media.

Subsequently, Chapter 5 employs a pre-test and three experiments to investigate the impact of AI fact-checkers on user engagement behaviors towards rumor-debunking information. Additionally, it examines the mediating effects of innovative image and perceived source credibility, as well as the moderating effects of AI literacy and confirmation bias.

Finally, Chapter 6 concludes this thesis.

# Chapter 2 Literature Review and Theoretical Foundations

This chapter initially outlines the pivotal notions explored in my thesis, namely user engagement behaviors on social media and fake news. Subsequently, I conduct a comprehensive review of pertinent literature from two perspectives: fake news on the Internet and the factors influencing user engagement behaviors on social media. Finally, I summarize the theoretical foundations encompassing the social amplification of risk framework, media richness theory, impression management theory, source credibility theory and nudge theory.

## 2.1 User engagement

User engagement refers to the extent of an individual's cognitive, temporal, affective, and behavioral investment when interacting with a digital system, thereby reflecting the quality of their user experience (O'Brien *et al.*, 2018). This metric quantifies the level and frequency of user engagement with a product, service or content, indicating their interest and involvement. The study of engagement is crucial as it facilitates the establishment and sustenance of robust relationships for citizen inquiry and participation in domains, such as e-health, web search, e-learning. Engaged users are more likely to exhibit frequent usage patterns, provide valuable feedback, and advocate for its adoption among others.

Existing research on measurement approaches for user engagement can be categorized into three methods (Lalmas *et al.*, 2014). The first method focuses on self-reports, such as interviews, think aloud/think after protocols and questionnaires (O'Brien and Toms, 2010). A common user engagement scale consisted of 31-items and purported to measure six dimensions of engagement: aesthetic appeal, focused attention, novelty, perceived usability, felt involvement, and endurability (O'Brien *et al.*, 2018). The second method focuses on behavioral metric based on web analytics, such as web page visits, dwell time

and user actions (e.g., like clicks, shares, and comments) (Hughes *et al.*, 2019; Kim and Dennis, 2019; Lee *et al.*, 2018). The third method applies neurophysiological techniques, such as eye tracking, face expression, and electrodermal activity (EDA) (Huang *et al.*, 2011; Navalpakkam and Churchill, 2012). From a single user-computer interaction to vertical observation, all methodological approaches have their advantages and limitations in terms of specific populations, environments, and time scales. With the wide application of user-generated content, many scholars have paid attention to the effects of users' engagement on different platforms, such as Weibo and Facebook.

Considering the research objectives and questions, I have employed the first approach in Studies 1 and 3, utilizing questionnaires to gather users' self-reported engagement behaviors. Study 1 employs items to assess the construct, namely sharing news, while Study 3 measures a construct referred to as user engagement behaviors. In Study 2, where I analyze the impact of specific news features on user engagement behaviors using Weibo data, the second method is adopted to measure such behaviors by aggregating the data of clicks, shares, and comments on Weibo.

## 2.2 Fake news

Fake news had been part of history long before Internet media entered the public lexicon (Banerjee and Haque, 2018). It originated in the 19th century (Gelfert, 2018) and transformed from its initial satirical literary form into a fervently debated phenomenon on the Internet (Klein and Wueller, 2017). At present, fake news causes controversies among the public, scholars, and politicians, due to the widespread use of social media, such as Weibo, Facebook, Twitter and others (Banerjee and Haque, 2018; Dennis *et al.*, 2021).

Since 2017, some studies have discussed and attempted to define fake news. Rini (2017) stated that fake news adopts the formatting and style of conventional media reporting to depict real-world events, but its creators are aware that it contains substantial inaccuracies. It is disseminated with two primary objectives: to achieve widespread sharing and to mislead at least a portion of its audience.

Lazer *et al.* (2018) defined fake news as misinformation that mirrors the format of legitimate news media but lacks the authentic editorial processes and intentions behind it. Some scholars have provided a more precise conceptualization of fake news. Bakir and McStay (2018) averred that fake news can be entirely fabricated or include elements that are intentionally misleading in either the content or context. Against a broad background of different definitions, we summarized three elements of fake news: verified false information, intentional motivation with clear goals, and genre blending combining elements of traditional news with normative professional journalism.

In addition to these three features, Zhang and Ghorbani (2020) focused on the primary host of fake news and defined fake news as all kinds of false information mainly published or distributed on the Internet to purposely mislead, fool, or lure readers for financial, political, or other gains. By summarizing these four factors, we conceptualized fake news on the Internet (FNI) and proposed a working definition: FNI is the deliberate presentation of verifiably false news on the Internet by mimicking the formats of traditional news or normative professional journalism.

Particularly, Shin *et al.* (2018) pointed out that the terms misinformation, disinformation, and rumor are often used synonymously to refer to information that is not factual. Lazer *et al.* (2018, p.1094) held that 'fake news overlaps with other information disorders, such as misinformation (false or misleading information) and disinformation (false information that is purposely spread to deceive people)'. Since fake news conceptually overlaps with a few similar terms, we included the following four widely adopted terms in our literature search process: 'fake news', 'misinformation', 'disinformation' and 'rumor'. Our working definition of FNI can help to identify relevant articles.

## 2.3 Literature review

### 2.3.1 Fake news on the Internet

Although most studies emphasize the detection of FNI, understanding the antecedents and consequences of FNI is equally important. In recent decades,

studies have implemented and advanced the Input-Process-Output (IPO) framework to describe the studied objects (Ilgen *et al.*, 2005; Stewart and Barrick, 2000; Yoo *et al.*, 2020). This framework portrays the current state of knowledge in investigating the antecedents and consequences of FNI (Figure 2-1).

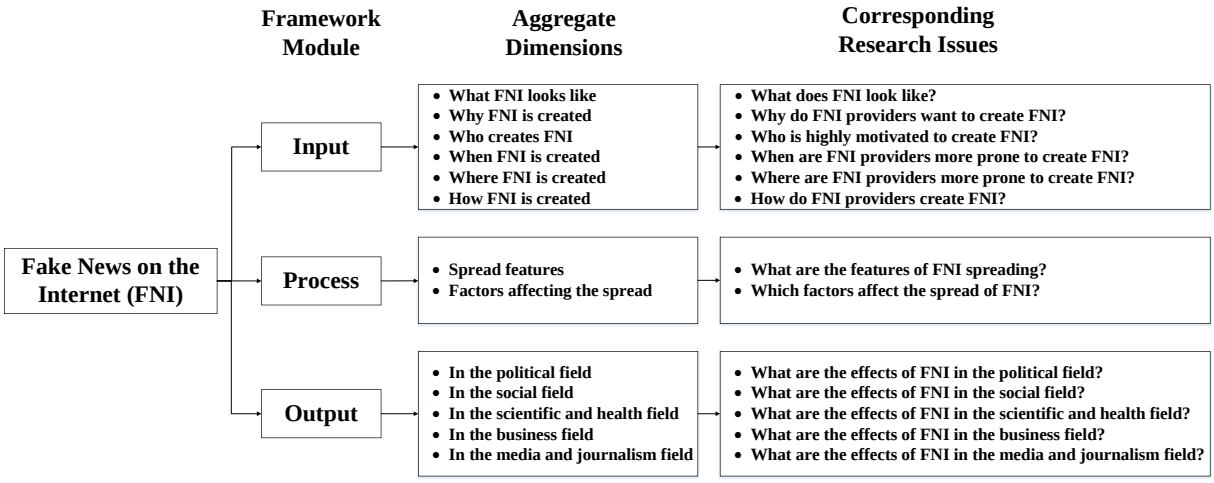



**Figure 2-1** The IPO conceptual framework for investigating the FNI.

'Input' in this framework refers to the antecedents of FNI, that is, the starting point of FNI development. We explored the 'what', 'why', 'who', 'when', 'where' and 'how' (5W1H) of creating FNI.

'Process' focusses on the spread of FNI. The widespread adoption of information and communication technologies, especially the Internet media, provides unique features of FNI spreading. In this process module, we also ascertained the factors that affect the spread of FNI.

'Output' in this framework refers to the consequences of FNI. The effects of FNI cover diverse fields, including the political, social, scientific, health, business, media, and journalism fields.

To address these research issues, we coded the identified literature using a mix of open, axial, and selective coding. First, open coding was used to assign theoretical labels to the first-order concepts and evidence; then, axial coding was used to identify and validate new and existing second-order themes aligned

with the dimensions; finally, selective coding was used to group the second-order themes into new and existing aggregate dimensions (Gioia *et al.*, 2012).

#### 2.3.1.1 Input of FNI

This part realizes the 5W1H information about the input of FNI, including what FNI looks like, why FNI is created, who creates FNI, when and where FNI is created, and how FNI is created.

**(1) What FNI looks like**

Notably, FNI usually originates from real events (Biancovilli *et al.*, 2021; Chen *et al.*, 2021b), such as elections, earthquakes, and bombings, and it contains information about these events (Mourão and Robertson, 2019). Moreover, FNI acts as a mirror to reflect national news agendas. For instance, immigrants are most targeted by FNI in German-speaking countries, while FNI in English-speaking countries frequently attacks political actors (Humprecht, 2019).

As it is distributed and spread on the Internet, FNI is conceptualized as a type of syntactic digital object comprising content and structure and characterized by attributes of editability, openness, interactivity, and distributedness (Khan *et al.*, 2022). Owing to the widespread use of FNI in politics, it is often considered as a digitally politicized term (Brummette *et al.*, 2018). Mourão and Robertson (2019) report that FNI is more akin to partisan viewpoints and closely related to identity politics and partisanship.

**(2) Why FNI is created**

The main motivations regarding the emergence of FNI are pecuniary or ideological in nature or both (Tandoc *et al.*, 2018). The FNI phenomenon is largely economically motivated (Rini, 2017; Tandoc *et al.*, 2019). Essentially, FNI generates a significant amount of clickbait content to appeal to a wide range of audiences (Munger, 2020), and the attracted traffic and clicks are then transformed into advertising income (Carlson, 2020; Tandoc *et al.*, 2019). As long as the traffic is real and the advertisements are being served to real people, Internet media platforms

would profit from and accept FNI (Silverman *et al.*, 2017b), and brands may profit from and fund FNI (Berthon and Pitt, 2018).

Ideologically, some FNI providers deliberately obscure public discussions or undermine specific individuals to advance the political or ideological agendas they endorse (Tandoc *et al.*, 2019; Tejedor *et al.*, 2021).

In addition to pecuniary and ideological motivations, providers may create FNI for other reasons, such as sensationalism (Robledo and Jankovic, 2017), sarcasm and education (Metzger *et al.*, 2021), persuading/informing others, debating, and entertaining/trolling (Chadwick *et al.*, 2018).

**(3) Who creates FNI**

FNI is frequently employed by political actors, including government and partisan third parties (Benham, 2020), to persuade their supporters to oppose rival parties or to promote favored candidates (Bennett and Livingston, 2018). Internet users from opposing political parties are contextually homophilous and use FNI to discredit the opposition (Brummette *et al.*, 2018; Hameleers, 2020).

As young people are relatively immature and impulsive, students with high-level political engagement frequently create and share political FNI (Madrid-Morales *et al.*, 2021). Similarly, young people with low knowledge generate FNI to make money. For instance, in Veles, a small town in central North Macedonia that generated many viral posts during the 2016 US presidential election, mostly young people in their early twenties with little English fluency created and disseminated substantial volumes of FNI (Hughes and Waismel-Manor, 2021).

From the literature, it is evident that a significant amount of FNI is generally created and shared by a small, disloyal group of heavy Internet users (Nelson and Taneja, 2018); however, even a small population of FNI providers can cause tremendous harm (Kopp *et al.*, 2018). Waszak *et al.* (2018) found that more than 20% of dangerous links in their material are generated by one source.

**(4) When and where FNI is created**

Notably, FNI has very strong timeliness. When the targeted topics emerge, FNI quickly emerges to attract traffic to achieve pecuniary or ideological goals or seek self-satisfaction (Talwar *et al.*, 2020) and is more likely to disappear than real news after the targeted events (Bastos, 2021). Moreover, FNI is likely to recur repeatedly following the initial release until the issues surrounding the target are resolved (Shin *et al.*, 2018).

Promulgators prefer to Establish FNI in nations where there is limited confidence in professional news media and governmental institutions or those without sufficient public service broadcasting, such that the citizens' levels of public affairs knowledge are poor (Humprecht, 2019). There are significant differences in the FNI topics in Western democracies (Humprecht, 2019). Therefore, FNI should be understood within its particular context of production and consumption, and investigations into FNI in different environments should consider local specificities (Wasserman, 2020).

When creating FNI, the promulgators usually and purposely create websites and adopt names that are similar to those of legitimate news organizations and then intentionally publish FNI on these websites (Allcott and Gentzkow, 2017).

**(5) How FNI is created**

When creating FNI, the promulgators elaborately design it and may even satirize politicians or political organizations by impersonating them (Ferrari, 2020). Although FNI usually originates from real events (Mourão and Robertson, 2019), real and fake news have more significant differences than similarities in terms of news content, images, and other links.

Regarding news content, FNI usually exaggerates scientific findings and hypes new therapies and uncritical optimism (Jang *et al.*, 2019; Marcon *et al.*, 2017; Robledo and Jankovic, 2017), and it is more topically autonomous (Vargo *et al.*, 2018). During the spreading process, the content of FNI usually undergoes significant modifications to achieve specific goals (Jang *et al.*, 2018). In terms of image distribution patterns, images in real news are more diverse and denser than those in fake news (Jin *et al.*, 2017).

#### 2.3.1.2 Spread process of FNI

The spread of FNI is modelled as the spread of a viral contagion to emphasize extensive spreading. Usually, FNI returns multiple times after the initial publication with textual changes, whereas real news does not (Jang *et al.*, 2018; Shin *et al.*, 2018), and is propagated for a longer period gradually but constantly (Jang *et al.*, 2019). Generally, FNI receives more attention (Clarke *et al.*, 2021) and is shared and viewed substantially more than real news (Clarke *et al.*, 2021; Waszak *et al.*, 2018). Waszak *et al.* (2018) found that 40% of the most commonly shared text links consist of false information. A small group of FNI providers, even when temporarily interacting with a much larger population of typical users, can significantly influence the overall equilibrium behavior and trigger the rapid dissemination of FNI (Kopp *et al.*, 2018).

Unlike its extensive spreading scope, the propagation speed of FNI has not been consistent. Vosoughi *et al.* (2018) concluded that FNI spreads more rapidly and penetrates more deeply and widely across all types of information compared to factual content. In contrast, Jang *et al.* (2018) demonstrated that tweets pertaining to genuine news also achieve wide and rapid dissemination.

Current efforts to stop the spread of FNI have not produced satisfactory results, highlighting the challenge faced by all stakeholders to model its spread and identify the influencing factors to halt or decelerate it (Giglietto *et al.*, 2019).

#### 2.3.1.3 Output of FNI

Extant studies have explored the effects of FNI in various fields. As disclosed by the third-person effect, FNI is likely to exert more significant influences on individuals from out-groups compared to those from in-groups (Jang and Kim, 2018; Mena, 2020), meaning that the effects of FNI would not be restricted to a limited group. The significant effects of FNI are also described as the agenda-setting power of FNI (Vargo *et al.*, 2018). Figure 2 describes the influencing mechanisms of FNI.

Since the 2016 US presidential campaign and Brexit, the effects of FNI in politics have been widely explored. For instance, FNI delegitimizes the electoral

process and disrupts the normal democratic order (McKay and Tenove, 2020) through two pathways. First, FNI pollutes iconoclastic political discourse (Richey, 2018; Smith, 2019), which reduces citizen confidence in institutions; erodes the trustworthiness of official information and the legitimacy of institutions; and destabilizes center parties and elections (Bennett and Livingston, 2018). Second, the direct impact of FNI results in adverse sentiments, including a sense of powerlessness, disconnection, and skepticism regarding political candidates. This relationship is modulated by how realistic FNI is perceived to be (Balmas, 2014). By affecting citizens' attitudes, FNI interferes with voting decisions and delegitimizes the electoral process (Jones-Jang *et al.*, 2020; Ncube, 2019; Neyazi *et al.*, 2021). For instance, Clinton lost many votes in 2016 because of FNI (Gunther *et al.*, 2019). Allcott and Gentzkow (2017) estimated that FNI, with its similar persuasiveness to TV advertising, would change vote shares by approximately hundredths of a percentage point.

Moreover, FNI leads the public away from accurate information and polarizes public discourse (Marcon *et al.*, 2017), and thus, it is recognized as a social problem (Tandoc *et al.*, 2019). Additionally, FNI imposes social costs (Allcott and Gentzkow, 2017), destroys honesty and interpersonal trust (Duffy *et al.*, 2020), causes unconscious behavior (Bastick, 2021; Wani *et al.*, 2021), and leads to information panic (Carlson, 2020; Creech and Roessner, 2019). However, FNI may have the potential to interpret the underlying social bonds that are at stake (Inwood and Zappavigna, 2021).

Furthermore, FNI highlights the challenges confronting science development and healthcare management by creating distrust in scientific enterprises (Iyengar and Massey, 2019) and causing misperceptions of scientific knowledge (Marcon *et al.*, 2017). Misleading health-related content is frequently disseminated without consideration for patient safety or accountability (Brady *et al.*, 2017; Robledo and Jankovic, 2017). Propagated FNI is a primary cause of vaccine hesitancy and a reduction in immunization rates (Islam *et al.*, 2021; Romer and Jamieson, 2021). Regarding COVID-19, FNI causes more resistance to pandemic

management measures (Forati and Ghose, 2021) and engenders an infodemic (Himelein-Wachowiak *et al.*, 2021).

Moreover, FNI is a matter of concern for business and marketing research and practice. A major reason for the emergence of FNI is that it generates a wave of attention-grabbing content to appeal to a wide range of audiences (Munger, 2020), and the attracted traffic and clicks are converted into advertising revenues (Carlson, 2020; Flostrand, 2020; Tandoc *et al.*, 2019). Although FNI can attract traffic for brands, FNI has exposure risks and may negatively affect brand reputation (Berthon and Pitt, 2018), particularly for service brands (Flostrand, 2020). Once FNI is exposed, the credibility and trustworthiness of the involved brands would be seriously undermined, and consumer behaviors would ultimately be affected (Song *et al.*, 2019; Visentin *et al.*, 2019). Additionally, FNI is used to attack opponents. However, This approach has been deemed a suboptimal strategy (Song *et al.*, 2019), particularly because the negative impact on the offending company—in terms of reduced advertising effectiveness and adverse media coverage—is more severe compared to the harm experienced by the victim company. Moreover, FNI affects trading activity and price volatility in stock markets. Clarke *et al.* (2021) found that the stock price reaction to FNI is discounted when compared to legitimate news articles, although FNI generates more attention than a control sample of legitimate articles.

It is important to highlight that the prevalence of FNI erodes public confidence (Bennett and Livingston, 2018), posing a significant threat to mainstream media, which relies on credibility as its key asset (Al-Rawi, 2021). Additionally, it undermines balanced journalism by eliminating the role of verified gatekeepers (Benham, 2020; Whipple and Shermak, 2020). Although FNI is considered a critical problem confronting journalism (Tandoc *et al.*, 2019), it is usually regarded as an opportunity to develop media and journalism (Creech and Roessner, 2019). Thus, FNI ushers in a new era for news and journalism by reinterpreting the concept of 'truth' (Jukes, 2018) and fostering the development of 'empathic media' (Bakir and McStay, 2018).

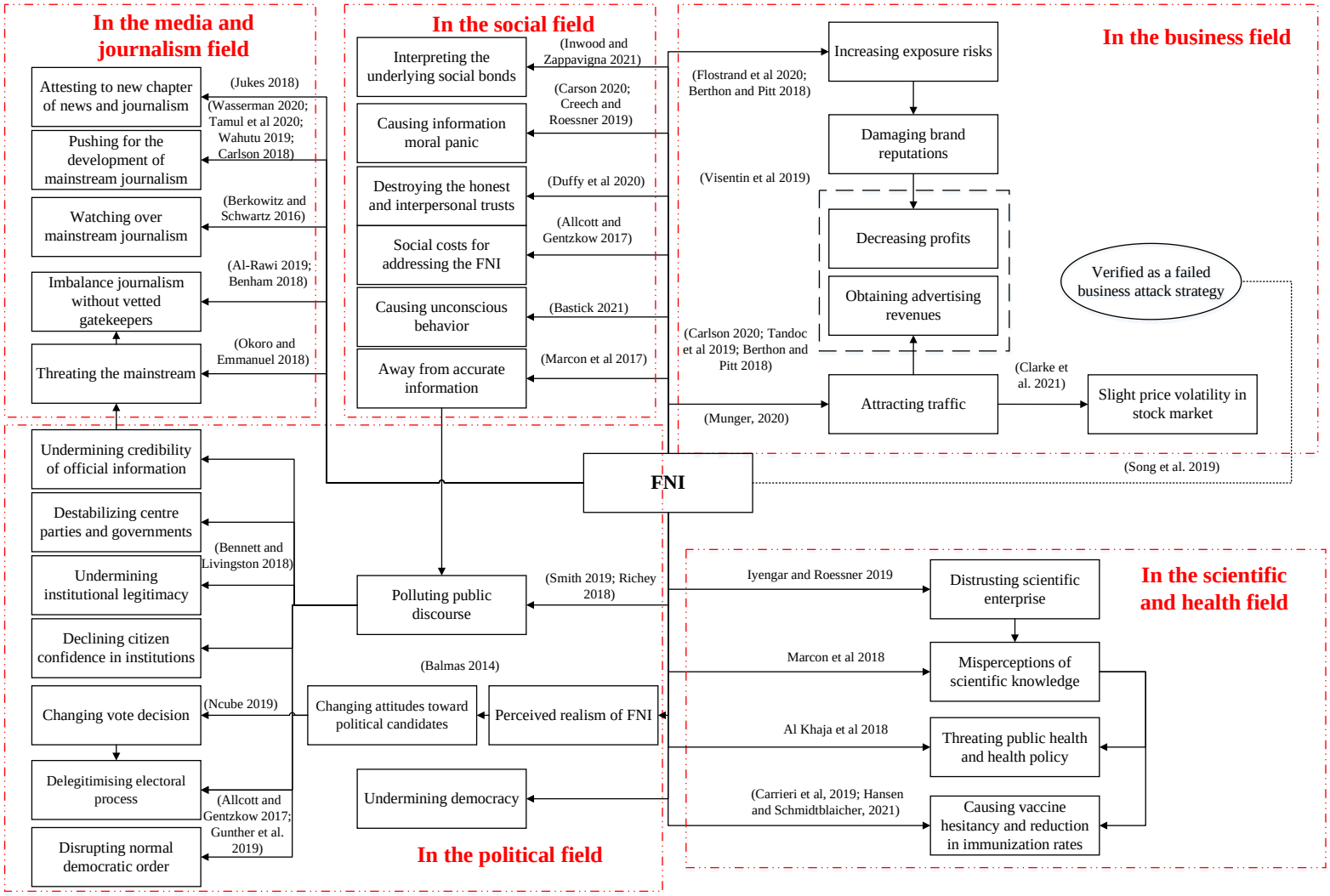



**Figure 2-2** The influencing mechanisms of FNI.

To reduce the dissemination of fake news, most literature explored ways through three types of intervention measures: education, regulation, and automation (Rubin Victoria, 2019). To control the spread of fake news, the reward for recreating or promoting fake news should be minimized, and individuals should be empowered and encouraged to evaluate the news they encounter (Lazer *et al.*, 2018; Pedersen and Burnett, 2018). As external detection labels cannot always help consumers perceive news effectiveness (Mourão and Robertson, 2019; Pennycook *et al.*, 2018), individuals need tools to accurately assess the credibility of online newsmakers (Duffy and Tan Rui Si, 2018). Moreover, technology can be combined with psychological principles (Musgrove *et al.*, 2018; Tsipursky *et al.*, 2018), and cyber-security can be improved (Richey, 2018). In addition to individuals, various institutions also need to understand and address these problems (Connaway *et al.*, 2017; Landon-Murray *et al.*, 2019; Peterson, 2019; Wenzel, 2019), such as mainstream media and journalists, librarians, health professionals, government, and so on. Furthermore, certain automatic classification systems were used to distinguish fake news from real news (Boididou *et al.*, 2018; Shu *et al.*, 2019).

However, the current efforts to stop the spread of fake news still have not obtained satisfactory results (Silverman *et al.*, 2017a; Silverman and Pham, 2018), highlighting the challenge faced by all stakeholders to model the spread of fake news, and find out deeper influencing factors and influencing mechanisms to halt or slow the spread of fake news (Spinney, 2017).

### 2.3.2 Factors affecting user engagement behaviors on social media

Factors that influence the spread of user engagement behaviors in social media are generally divided into individual-related factors, FNI-related factors, debunking content, and information context. Perceived trust in news usually plays a mediating role between these influencing factors and spread behaviors (Giglietto *et al.*, 2019; Hopp, 2022; Laato *et al.*, 2020; Pedersen and Burnett, 2018).

Individual factors that affect the acceptance and spread of FNI are demographics, personality traits, personal involvement, confirmation bias, and so on. Specifically, individuals who are inclined to trust and disseminate FNI often possess lower educational qualifications (Schaewitz *et al.*, 2020; Scherer *et al.*,

2021) or engage in basic-level occupations (Bapaye and Bapaye, 2021). They may also be younger individuals (Allcott and Gentzkow, 2017) or those aged 65 and above (Bapaye and Bapaye, 2021). Moreover, age, not gender nor education, has a greater influence on particular cultures (Rampersad and Althiyabi, 2020). Some personality traits characterize users who share FNI: agreeableness (Buchanan and Benson, 2019) or conscientiousness, higher extraversion and neuroticism (Buchanan, 2020), altruism (Apuke and Omar, 2021a; Apuke and Omar, 2021c; Balakrishnan *et al.*, 2021) or overconfidence (Lyons *et al.*, 2021), and religious beliefs (Islam *et al.*, 2020). Political beliefs are highly related to users' sharing behaviors (Lobato *et al.*, 2020; McPhetres *et al.*, 2021; Neyazi *et al.*, 2021; Osmundsen *et al.*, 2021; Tandoc *et al.*, 2021). Individuals with a high cognitive ability are less trustful of FNI (Tandoc *et al.*, 2021), including deepfakes (Ahmed, 2021a; Ahmed, 2021b). Cognitive elaboration serves as a mediator between perceived credibility and sharing intention (Ali *et al.*, 2022). Cognitive-perceptual schizothyme directly affects sharing intention (Buchanan and Kempley, 2021). People usually trust and share news that they have touched before (Choi and Lee, 2022; Pennycook *et al.*, 2018) or that aligns with their beliefs (Kim and Dennis, 2019), perceived relevance (Chua and Banerjee, 2018), and perceived importance (Tully, 2022), but their intention to share would be reduced after exposure to others' critical comments (Colliander, 2019). Social norms significantly affect users' intention and spread behaviors (Andı and Akesson, 2021). Anxiety (Freiling *et al.*, 2023), negative emotions (Wang *et al.*, 2020), and death-related thoughts (Lim *et al.*, 2021) are driving factors in users' willingness to share FNI. Media use habits are relevant to sharing behaviors on Facebook and Twitter (Neyazi *et al.*, 2021). Users with decreased news consumption, high Internet use (Bringula *et al.*, 2022), and high trust in the news on the Internet (Filkukova *et al.*, 2021) easily trust and spread FNI. Tie strength and news-find-me perception (Apuke and Omar, 2021b) are strong predictors of FNI sharing. Network size on the Internet media affects deepfake sharing (Ahmed, 2021b).

The FNI-related factors affecting the acceptance and spread of FNI are information cues, news type, credibility of news sources, and the presentation format of news. News containing trolling (Fichman and Vaughn, 2021) and

persuasive and uncertain words (Zhou *et al.*, 2021a), and that accompanying a high number of Facebook 'likes' (Ali *et al.*, 2022) are more likely to be disseminated. The nature of the news content serves as a moderating factor in how an individual's level of engagement influences their willingness to trust and disseminate information (Chua and Banerjee, 2018). The topics of FNI matter are consequential, as conspiracy theories are most likely to be shared (Wang *et al.*, 2022b). The trustworthiness of the news source directly affects users' intention to share (Buchanan and Benson, 2019), and unverified and unreliable sources often play a significant role in the dissemination of false information(Kim and Dennis, 2019; Kim *et al.*, 2019). Kim and Dennis (2019) further demonstrated that emphasizing the source through specific presentation formats tends to increase users' skepticism toward all articles, irrespective of the actual credibility of the source.

Furthermore, users' intention to share FNI is significantly affected by debunking information. The presence of debunking information (Chua and Banerjee, 2018; Chung and Kim, 2021) and the flagging of news (Mena, 2020) reduce the intention to share by diminishing the credibility of the news. Sometimes, FNI plays a small part in the overall conversation, but community-based debunking and shaming responses to FNI overwhelm the initial FNI by orders of magnitude. Even if the response information is neither debunked nor unsuitable, the negative reaction to FNI can also spread at significant speeds (Babcock *et al.*, 2019). Therefore, effectively debunking FNI is very important.

The extensive spread of FNI cannot be achieved without the Internet media (Brady *et al.*, 2017; Kopp *et al.*, 2018; Nelson and Taneja, 2018). Based on the echo chamber effect, the network is strongly segregated along the types of information circulating in it (Shao *et al.*, 2018). Owing to the presence of filter bubbles, surgeons may be unaware of the FNI that patients read, and thus, it is difficult to counteract the FNI shared around the patient in a timely manner (Brady *et al.*, 2017). The newly emerging automated bots also accelerate the diffusion of FNI. Al-Rawi (2019) disclosed that the majority of the top 50 Twitter users involved were likely automated bots. Nevertheless, internet regulations have failed to advance at the same rapid pace as the development of online

media. Without the existence of traditional gatekeepers, information quality on the Internet cannot be guaranteed (Benham, 2020). Information from traditional gatekeepers is shared much less than the content from other nonprofessional organisations (Bradshaw *et al.*, 2020). If platforms can assume the gatekeeper role, FNI spreading can be significantly controlled. As regulations have become more stringent, the severity of the FNI issue on Facebook has significantly decreased since 2016. However, this problem has been on the rise on Twitter (Allcott *et al.*, 2019).

Some studies blame the information environment and the development of platforms for the rise of FNI (Humprecht, 2019). Significantly, FNI disseminates at a much faster rate due not only to the technological capabilities of Internet media but also to the integration of these platforms into users' everyday lives (Tandoc *et al.*, 2019). Culture plays a crucial role in influencing the dissemination of fake news (Chen *et al.*, 2021b), with this effect being facilitated by how understandable the news content is to the audience (Rampersad and Althiyabi, 2020). A culture with mutual support can restrict the spread of FNI. In Singapore, most Internet users ignore the FNI they come across and provide corrections only when the issue is highly relevant to them and to individuals with whom they have strong and close personal connections (Tandoc *et al.*, 2020). The conduct of a political figure could have impacted the public's sharing of misinformation or unverified information related to COVID-19 (Wang *et al.*, 2022b).

## 2.4 Theoretical foundations

### 2.4.1 Social amplification of risk framework

Considering the detrimental effects of low-quality online news, users are likely to perceive amplified risks and exercise caution not only towards such news but also towards all online news. Therefore, this study employed the social amplification of risk framework (SARF) to analyze how risk perceptions regarding news quality influence users' news-sharing behaviors.

The SARF aims to incorporate pertinent factors that shape public reactions towards specific risks or risk events (Bearth and Siegrist, 2022). According to the

SARF, it elucidates the intricate social processes underlying risk perception and response, as well as the interplay between risk signals and psychological, social, institutional, and cultural perspectives on risk perception and behavior (Masuda and Garvin, 2006). Risk amplification occurs in two stages: during the transmission of risk information and through social responses (Kasperson *et al.*, 1988). The transmission stage involves individuals and social entities known as "amplification stations", such as opinion leaders, personal networks, and social media platforms (Wirz *et al.*, 2018). This stage analyzes how risk information is communicated, framed, and interpreted by individuals and communities. Our focus lies in analyzing news quality's impact on users' perception of risks. Without the amplification of risks, users would solely perceive the risks associated with specific low-quality news sources. For instance, when encountering an email claiming a security issue with their account and requiring verification through a link click, users may only consider the risk involved in such clicking behavior. However, through the process of risk amplification, users might become concerned about potential virus-infected attachments in their emails and even opt to delete all messages from unfamiliar senders. Similarly, within the highly interconnected realm of the internet, users would experience an amplified perception of risks and exercise caution not only towards apparent low-quality news but also towards all online news.

The stage of social responses examines how the perception of amplified risk influences behavioral responses, resulting in secondary impacts or "ripples" (Kasperson *et al.*, 2022), including emotional reactions, behavioral changes and societal consequences. This particular stage focuses on the influence of perceived risks on users' news-sharing behaviors mediated by their perception of believability. In our study 1, we employ SARF to analyze users' news-sharing behaviors by considering news quality as a risk indicator and user sharing behaviors as response actions. Specifically, we reveal that individuals with high levels of fake news awareness and greater diversity in their social ties exhibit heightened concerns regarding perceived risks associated with user sharing activities. The inclusion of these two novel constructs enriches the SARF by

highlighting user characteristics that may serve as significant risk amplification stations on the Internet.

### 2.4.2 Media richness theory

The Media Richness Theory (MRT), sometimes referred to as information richness theory, is a significant theory in the field of organizational communication and information systems, aiming to elucidate the factors influencing individuals' choice of communication media for different tasks. It posits that task performance can be enhanced by aligning the processing demands of task-related information with the information richness capacity of a given medium (Suh, 1999).

According to MRT, the effectiveness of a communication medium depends on its "richness". The richness of media is determined by four key factors: the ability to provide instant feedback, the capability to convey multiple cues, the diversity of language used, and the medium's capacity to maintain a personal connection (Daft *et al.*, 1987). According to these criteria, in descending order of communication richness, Researchers categorize the communication channels commonly utilized in everyday life, including face-to-face, telephone, personal documents (such as letters or memos), non-specific recipient documents (such as reports or announcements), and digital reports (such as spreadsheets) (Sun and Cheng, 2007). Face-to-face communication is regarded as the most enriching medium due to its ability to provide instant feedback and offer various clues via non-verbal cues and vocal intonation. Similarly, Researchers adopt a comparable methodology to categorize other forms of media, including video, images, and text (Rice, 1992). In other words, the media richness can be assessed by considering various cues, including visual, auditory, and tactile information that contribute to minimizing ambiguity and uncertainty during communication. The more complex or diverse a task is, the greater the uncertainty in its communication content becomes. Therefore, it requires more information to minimize uncertainty and make better decisions.

In addition, the fitness between media and task characteristics is also important. The utilization of highly engaging media for simple tasks may lead

to distraction or a loss of focus, whereas the use of simplified media for tasks characterized by high uncertainty and ambiguity may inadequately convey information, resulting in diminished communication effectiveness (Tseng and Wei, 2020). In the information system area, scholars apply media richness theory to explore the effects of media richness on task satisfaction and loyalty (Ogara *et al.*, 2014; Tseng *et al.*, 2019), review behavior (Liu *et al.*, 2024d), sharing behavior (Lee *et al.*, 2021c), and decision quality (Kahai and Cooper, 2003).

In our study 2, we extend media richness to user engagement on social media platforms affected by fake news dissemination. We introduce one contextual factor—content type. We employ MRT to analyze the relationship between information complexity (textual or pictorial) and user engagement by considering content type as a moderating variable. Specifically, we reveal that the effectiveness of media richness in driving engagement depends on whether the content aligns with user expectations—such as richer media (e.g., picture) being more impactful for natural destinations, while simpler media (e.g., text) may suffice for cultural destinations. Therefore, this study extends MRT by showing that the effectiveness of media richness is context-dependent and varies with the type of content and user expectations.

### 2.4.3 Impression management theory

Impression management (IM) refers to the strategies employed by individuals to influence, preserve, safeguard, or modify the perception that a target audience has of them (Bozeman and Kacmar, 1997). o achieve this objective, individuals employ a range of impression management strategies—specific actions (such as praising the target)—that are intended to cultivate a desired perception (Jones, 1982). It is not a new topic to those interested in studying human behavior (Tedeschi, 2013). The theory is that in interpersonal communication, people design or change their behavior to induce the other person to form the impression they want. Image concerns frequently influence a wide range of behaviors within organizations, extend beyond individual efforts in impression management, and manifest at various levels (Bolino *et al.*, 2008). For example, scholars explore effective IM tactics in the context of interviews

(Higgins and Judge, 2004), performance appraisal (Harris *et al.*, 2007), and organizational citizenship behavior (Yun *et al.*, 2007).

Social interactions may be viewed as a form of performance, wherein individuals display certain aspects of themselves to create intended impressions (Berger, 2014). Consumers frequently select products to project their desired self-image while avoiding the expression of undesired identities (Berger, 2014). Therefore, users on social media sharing specific content is also an effective strategy of impression management, and by sharing behavior may reflect a belief, attitude to others and the identity of the active signal.

In study 3, based on the theory of impression management, I propose that the image of technological innovation is a mediating role that influences user engagement of AI-generated content. It means that sharing content labeled with "AI-generated" will make oneself appear more innovative, technologically aware, avant-garde, and willing to accept new things. This helps enhance one's image of technological innovation in front of others.

### 2.4.4 Source credibility theory

Source credibility is defined as an information reader's perception of the expertise and trustworthiness of a source (Luo et al. 2013, P94). Based on source credibility theory (Hovland and Weiss, 1951), a credibility source affect the effectiveness of communication and opinions toward the issue. Sternadori and Thorson (2009) found that the use of unnamed sources can negatively influence how readers perceive the credibility and reliability of the information. Pornpitakpan (2004) concluded that commercials associated with highly trustworthy sources were perceived as more credible and honest. A high-level credibility of source commonly induce persuasion toward the advocacy and positive attitude (Johnson and Izzett, 1969; Maddux and Rogers, 1980; Powell, 1965; Tormala and Petty, 2004). Therefore, source credible theory is usually used to explain how the persuasiveness of a communication is determined in part by the perceived credibility of the source (Lowry *et al.*, 2014). Additionally, the credibility of information sources is becoming an ever more crucial factor to assess within social media environments. This shift in importance arises as the

abundance of information accessible via new channels grows, transferring the role of gatekeeper from content creators to the consumers of that content (Westerman *et al.*, 2014). In the era of traditional media, numerous individuals served as gatekeepers, such as journalists, editors, and even advertisers (Shoemaker *et al.*, 2009). These gatekeepers were responsible for verifying the authenticity of information, thereby playing a crucial role in maintaining the credibility of the media. However, in the age of digital media, the ability to generate content has become ubiquitous, leading to a significant reduction in the presence of gatekeepers. This, combined with the phenomenon of information overload, has shifted the focus of consumers towards assessing the credibility of sources when evaluating the authenticity of information (Westerman *et al.*, 2014).

On the social media context, a news article can see as information communication. The goal of the news, i.e., expected persuasion, is that readers believe the news and eventually, generate sharing behaviors, such as clicking the news for more details, bookmarking the news, or recommending the news. In this thesis, I employ source credibility theory to investigate the moderating influence of posters' VIP status on the relationship between information complexity and user engagement in Study 2, as well as to examine the impact of the fact-checker type (human vs. AI) on user engagement with debunking information in Study 3.

# Chapter 3 The Effect of News Quality on Users' News-Sharing Behaviors (Study 1)

This chapter aims to investigate the impact of news quality on users' risk perceptions towards online news, and its subsequent influence on perceived believability and user engagement in sharing news. Additionally, we explore the moderating effects of fake news awareness and social tie variety. An online questionnaire involving 399 eligible participants was employed for hypotheses testing, and the structural equation model served as the main analytical method. Our findings indicate that the influence of news quality on users' news-sharing behavior is sequentially mediated by risk perception and perceived believability. Individuals with a heightened awareness of fake news or a diverse social tie are more inclined to perceive greater risks associated with news-sharing behavior and question news authenticity. This chapter contributes to the existing literature on users' news-sharing behaviors and SARF. Unraveling the influence of risk perceptions would enable a deeper understanding and intervention into users' intrinsic motivations. It also refutes the possibility that perceived believability precedes risk perception in the context of news-sharing activities. Our analysis on the moderating effects of fake news awareness and social tie variety contributes to a deeper understanding of users' news-sharing behavior. Our findings also offer valuable insights into comprehending user inclinations towards news sharing and mitigating the dissemination of fake news.

## 3.1 Introduction of study 1

On the Internet, users are provided with convenient access to online news and seamlessly engage in sharing and discussing it with others. As user engagement increases, there has been an exponential growth in the volume of online information. However, internet regulators lack sufficient resources to

monitor the quality of all information. Consequently, online users encounter a plethora of low-quality news content, including attention-grabbing headlines and even fabricated videos. The quality of news has emerged as a pivotal determinant influencing users' inclination to share news, particularly in the online environment inundated with fake news (Wang *et al.*, 2022a; Wu *et al.*, 2022).

The proliferation of such low-quality online news engenders adverse repercussions for those who disseminate them (Dennis *et al.*, 2023). Numerous cases serve as exemplars of the potential risks associated with low-quality online news, thereby indicating that the presence of low-quality content can act as an indicator for users' potential losses from such specific instances of substandard news. For instance, unhealthy diet or fitness advice is widely circulated on various platforms without scientific validation, promoting extreme weight loss methods or unproven fitness programs. If users believe and adopt these suggestions without caution, they may jeopardize their health inadvertently. In one scenario, an attacker impersonated a bank via email claiming that the user's account had a security issue requiring verification by clicking on a link; unknowingly, users clicked on the link and divulged their bank account details resulting in funds being stolen from their accounts. Additionally, false news stories about new vaccines that can supposedly cure cancer have been disseminated through social media platforms; when users unquestioningly forward such messages without verifying their authenticity first-hand not only misleads the public but also encourages people to disregard formal medical advice thereby posing potential health threats.

Despite the recognition of risks associated with sharing low-quality news, our understanding of the relationship between news quality and users' news-sharing behaviors remains limited in terms of the role played by risk perceptions. Previous studies have examined how news quality directly influences users' news-sharing behavior and explored its mediation through perceived believability (Kumar *et al.*, 2023) and perceived usefulness (Bhagat and Kim, 2023), but they have overlooked the significance of risk perceptions (Lin and Wang, 2020). Disseminating high-quality news not only provides recipients with valuable and

timely information but also enhances senders' status, reputation, and image (Zheng *et al.*, 2013). Conversely, when disseminating low-quality news, spreaders may face various risks such as a decline in personal social status (Thompson *et al.*, 2020) or reputational harm (Bhagat and Kim, 2023). This implies that losses incurred by spreaders from sharing low-quality news are not confined to potential losses related to specific pieces of information being spread; instead, they may experience an amplification of risks within the highly interconnected internet. Therefore, we focus on the social network level of the respondent to investigate the effect of news quality on user's sharing behavior, rather than an individual news level (i.e., upon receipt of a news item).

The significance of risk perception in users' news-sharing behavior can be elucidated by the Social Amplification of Risk Framework (SARF), which is designed to encompass factors relevant to public reactions towards specific risks or risk events (Bearth and Siegrist, 2022). News quality serves as a risk indicator that influences users' perception of risk associated with low-quality news, and subsequent behavioral responses. According to SARF, risk amplification occurs in two stages: during the transmission of risk information and through social responses (Kasperson *et al.*, 1988). In the transmission stage, the highly interconnected internet may amplify the perceived risks as spreaders may worry about reputational losses and social status implications. Subsequently, when individuals perceive heightened levels of risk, their perceived believability towards all online news diminishes (Bearth and Siegrist, 2022), suggesting that risk perception may overshadow perceived believability (Seyd and Bu, 2022) thereby impacting users' news-sharing behavior (Schneider *et al.*, 2021). Therefore, drawing upon the SARF, this study incorporates risk perception to analyze the underlying mechanism and poses the following research question: *What role does risk perception play in shaping the relationship among news quality, perceived believability, and users' news-sharing behavior?*

The SARF focuses on how low-quality characteristics contribute to users' risk perception through risk amplification stations (Wirz *et al.*, 2018). The efficacy of risk amplifications is significantly affected by information dissemination

channels and user characteristics. The significant consequence of low-quality news is attributed to the highly interconnected social network on the Internet, which varies among users with different levels of engagement in social media, such as their frequency of engagement in online discussions (Zhang and Cozma, 2022) and exposure to fact-check information (Ho *et al.*, 2022). Given our focus on news quality amidst the widespread dissemination of fake news on the Internet, users' awareness about the presence of low-quality or fake news is directly relevant to their risk perceptions. Recognizing the existence of fake news enhances users' skepticism towards encountered information while encouraging active participation in verification endeavors (Torres *et al.*, 2018). When users adopt a more skeptical mindset towards news, they recognize higher levels of risk and uncertainty associated with sharing such content, leading them to refrain from doing so (Omar *et al.*, 2024). While acknowledging the moderating role of fake news awareness in the relationship between news quality, users' evaluations of perceived believability, and their sharing behavior, our understanding regarding its influence on the association between news quality and risk perception remains limited. Therefore, we propose our second research question: *How does fake news awareness moderate the effect of news quality on users' news-sharing behavior, mediated by risk perception and perceived believability?*

As depicted in the SARF, the information dissemination channel plays a crucial role in amplifying risks. Online news is typically disseminated through users' social networks, and the efficacy of risk amplifications can be influenced by various characteristics of these networks. One such characteristic is social tie variety, which captures the overall pattern of relationships among individuals (Omar *et al.*, 2024) and measured as the diversity within users' social networks due to its significance in intra-network relationships and involvement in news verification behaviors (Torres *et al.*, 2018). As this diversity increases, individuals are exposed to diverse viewpoints from different backgrounds within their network, prompting them to critically evaluate the risks associated with disseminated news within that particular network (Torres *et al.*, 2018). The users

with a higher diversity of social ties are more likely to perceive greater reputation losses when they share low-quality news. Furthermore, conflicting viewpoints may lead at least one piece of information to appear false to users, thereby increasing their perception of risk associated with news sharing. However, our understanding of the impact of social tie variety on the relationship between news quality and users' news-sharing behavior remains limited when incorporating users' risk perceptions. Therefore, we propose the third research question: *How does social tie variety moderate the effect of news quality on users' news-sharing behavior, mediated by risk perception and perceived believability?*

To address our aforementioned research questions, we employed a questionnaire to collect data and utilized the structural equation model to examine the relationships among constructs. This study contributes to both information system research and fake news studies by providing a comprehensive analysis of the mediating role of risk perception in influencing users' news-sharing behavior based on varying levels of news quality. Furthermore, this study employs the SARF framework to analyze the roles of fake news awareness and social tie variety as risk amplifications, while examining their moderating effects on the indirect effect of news quality on users' news-sharing behavior through risk perception and perceived believability.

The structure of this paper is as follows: Section 3.2 provides a comprehensive review of the relevant literature to identify the research gap. In Section 3.3, we propose a research model and formulate research hypotheses. Section 3.4 outlines the research methodology employed in this study. Subsequently, in Section 3.5, we present the data analysis and corresponding results obtained from our investigation. Finally, in Section 3.6, we engage in an extensive discussion and draw conclusions based on our findings.

## 3.2 Literature review

The issue of news sharing has garnered significant attention due to the proliferation of fake news on the Internet. The rapid dissemination of fake news

is widely recognized as a primary threat to societal well-being, as emphasized by the World Economic Forum (Wu *et al.*, 2022). Previous studies investigating factors influencing users' news-sharing behaviors can be broadly categorized into two groups: those focusing on news-related factors and those examining sharer-related factors.

The quality, type, and presentation format of news play critical roles in influencing users' news-sharing behavior. Previous studies have confirmed the impact of news quality on users' news-sharing behavior (Shin *et al.*, 2024), while also exploring the mediating effects of perceived believability (Kumar *et al.*, 2023) and perceived usefulness (Bhagat and Kim, 2023). News quality is conceptualized in terms of normative news values, including perceived factuality and perceived public importance, as well as social media values, such as perceived popularity (Shin *et al.*, 2024). It is also considered a moderating factor (Bhagat and Kim, 2023; Bi *et al.*, 2021; Thompson *et al.*, 2020) and mediating factor (Lee and Kim, 2023) in the relationship between user characteristics and users' news-sharing behavior. Furthermore, additional factors such as the moderating influence of rumor type on the association between personal involvement, trust, and intention to share have been examined (Chua and Banerjee, 2018). Specifically, dread-inducing online health rumors were found to elicit stronger share intention among medical professionals compared to wish-related rumors. It has been established that users' intention to share is directly influenced by perceived trustworthiness (Buchanan and Benson, 2019), with false information often propagated by unknown or low-rated sources (Kim *et al.*, 2019). Additionally, altering presentation formats emphasizing source credibility would impact users' news-sharing behavior through the mediating role of perceived believability (Kim and Dennis, 2019). Integrating intuitive icons in source evaluations to indicate the credibility of news sources can effectively mitigate the dissemination of false information (Kim *et al.*, 2023).

The proliferation of fake news can largely be attributed to user behavior, as individuals encounter a plethora of information through social media and unconsciously propagate it. Therefore, in addition to the factors associated with

the news itself, scholars also focus on sharer-related factors, such as exposure to fact-check information, frequency of engagement in online discussions (Ho *et al.*, 2022), fake news awareness, social tie variety, and users' knowledge and attitudes. Specifically, users' understanding and perspectives on the subject had a substantial positive influence on their tendency to share. (Schaewitz *et al.*, 2020). Fake news awareness and social tie variety significantly enhance users' inclination to verify news (Torres *et al.*, 2018). Fake news awareness has also been considered a moderator and it has been observed that an increase in awareness weakens the relationship between user factors and online environmental factors in relation to users' news-sharing behavior (Omar *et al.*, 2024).

Table 3-1 provides a comprehensive overview of current research investigating various factors that influence users' news-sharing behavior. Previous studies have predominantly focused on the mediating roles of perceived believability and perceived usefulness in the relationship between news quality and users' news-sharing behavior, while neglecting the analysis of risk perception. Unraveling the influence of risk perceptions would enable a deeper understanding and intervention into users' intrinsic motivations for disseminating online news in an environment with abundant low-quality news. Additionally, although there has been partial examination of fake news awareness and social tie variety, it remains unclear whether these variables moderate the impact of news quality on risk perception and subsequent users' news-sharing behavior. Examining these two moderators would enhance our understanding of the risk amplification process and facilitate targeted intervention strategies to mitigate excessive sharing of fake news.

**Table 3-1** A summary of factors impacting users' news-sharing behavior

| Factors | | The roles affecting user sharing behavior | | Articles |
|---|---|---|---|---|
| News related factors | News quality | As IV | Mediated by perceived believability and perceived useful. | Kumar et al. (2023); Bhagat and Parrish (2018) |
| | | As MO | Status seeking gratification is IV. | Thompson et al. (2020) |
| | Presentation format | As IV | Mediated by perceived believability. | Kim and Dennis (2019) |
| | News source | As IV | n/a | Buchanan & Benson (2019); Kim et al., (2019) |
| | Information type | As MO | Personal involvement is IV. | Chua and Banerjee (2018) |
| Sharer related factors | Fake news awareness | As IV | n/a | Torres et al. (2018) |
| | | As MO | User factor and online environment factor are IVs. | Omar et al. (2023) |
| | Social tie variety | As IV | n/a | Torres et al. (2018) |
| | Users' knowledge and attitude | As IV | n/a | Schaewitz et al. (2020) |

## 3.3 Research model and hypotheses

Building upon the SARF, this study investigates the influence of news quality on users' news-sharing behavior through a sequential mediation process involving risk perception and perceived believability, while also exploring the moderating effects of fake news awareness and social tie variety. The research model is presented in Figure 3-1.

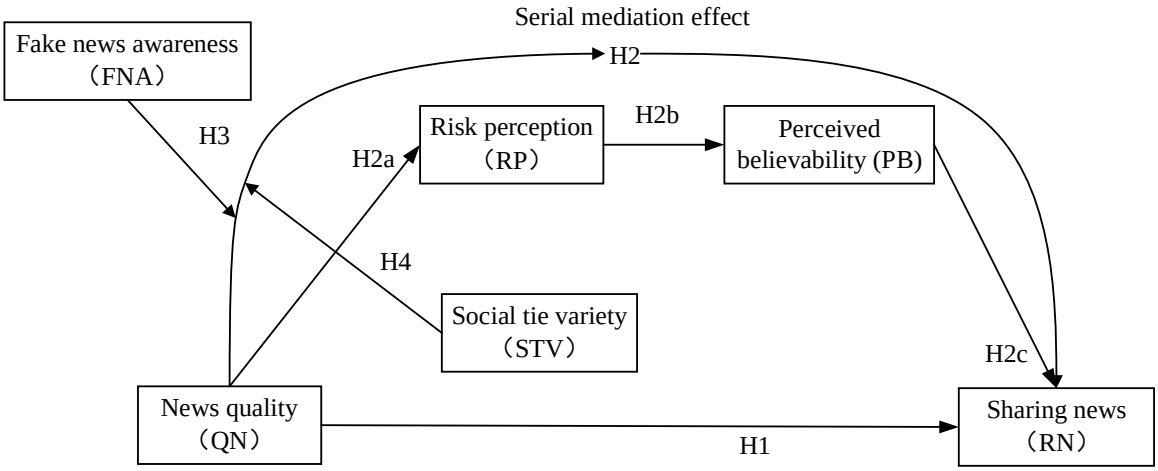



**Figure 3-1** Research model of study 1

### 3.3.1 News quality and users' news-sharing behavior

In an era marked by the prevalence of fake news, news quality becomes a concerning factor that impacts users' news-sharing behavior. News quality is characterized by essential elements such as precision, promptness, and comprehensiveness, all of which contribute to the relevant and reliable of news (Nicolaou and McKnight, 2006). Moreover, high-quality information is devoid of errors and fulfills user's needs (Gelle and Karhu, 2003). Building upon the Elaboration Likelihood Model, several studies have regarded news quality as a central processing cue (Bhagat and Kim, 2023) and have substantiated its direct impact on users' attitudes and behaviors (Chen *et al.*, 2024; Zhou *et al.*, 2010). The provision of high-quality news offers pertinent, credible, timely, and precise information that enhances users' confidence in making optimal decisions (Jiang *et al.*, 2021). For instance, within the context of electronic information usage environment, news quality positively influences users' adoption of information (Jiang *et al.*, 2021; Zhou *et al.*, 2023), purchase decisions (Fu *et al.*, 2020) and intention to recommend it to others (Shin and Cheng, 2023). Similarly, in the domain of news dissemination, Cheng *et al.* (2019) affirmed that sharing quality-assured news exerts a positive impact on trust formation and intention for social shopping. Disseminating high-quality news not only provides recipients with valuable and

timely information but also enhances senders' status, reputation, and image (Zheng *et al.*, 2013). However, when disseminating low-quality news items, spreaders may face numerous risks such as erosion of personal social status (Thompson *et al.*, 2020) and reputational harm (Bhagat and Kim, 2023), thus making them more inclined towards sharing high-quality content rather than low-quality ones due to concerns about compromising their reputation through time-wasting activities. Therefore, we propose the following hypothesis:

*H1: News quality is positively associated with users sharing behavior; indicating that when the perceived quality of a piece of news is sufficiently high, it will motivate users to share it.*

### 3.3.2 Risk perception and perceived believability as mediators

We employ the SARF to further investigate the impact of risk perception and perceived believability on the relationship between news quality and users' news-sharing behavior, wherein risk amplification manifests in two distinct stages: during the dissemination of risk information and through subsequent social responses (Kasperson *et al.*, 1988).

Risk perception refers to individuals' subjective expectations of potential losses associated with a specific risk event, such as news sharing activities in this study (Forsythe and Shi, 2003). It plays a crucial role in shaping the perspective on risk and subsequently influencing decision-making (Chen *et al.*, 2020; Yang *et al.*, 2015). High-quality news is characterized by its relevance, timeliness, accuracy, and comprehensiveness (Yi *et al.*, 2013), which helps reduce risks and uncertainties related to social status (Thompson *et al.*, 2020) and reputations (Bhagat and Kim, 2023) during news-sharing activities. A strong belief in the accuracy, currency, and relevance of the news increases its value when shared and consequently mitigates risk perception (Nicolaou and McKnight, 2006). Therefore, in an era marked by the prevalence of fake news, news quality is considered a signal of risk that influences users' perceptions of believability and their

behaviors regarding news sharing. Therefore, we propose the following hypothesis:

*H2a: News quality is negatively associated with users' risk perception.*

Perceived believability reflects the extent to which users place trust in news content (Kukar-Kinney and Walters, 2003). The relationship between risk perception and perceived believability has been a subject of debate in prior research, with conflicting views on the direction of this relationship (Yi *et al.*, 2013). While some studies argue that perceived believability influences risk perception (Kim *et al.*, 2008; Nicolaou and McKnight, 2006), others assert that risk perception affects perceived believability (Koller, 1988; Nooteboom *et al.*, 1997; Ortega Egea and Román González, 2011). Mitchell (1999) provides a potential explanation for this apparent contradiction by emphasizing that risk perception is a prerequisite for trust to be operative, and one of the outcomes of building trust is a reduction in the perceived transactional or relational risk. According to this perspective, the impact of perceived believability on risk perception arises when users critically evaluate the construction of perceived believability and become conscious of potential risks during this process. However, since this study does not investigate the specific mechanisms underlying the formation of perceived believability, we do not consider the possibility that perceived believability directly influences risk perception.

Moreover, building upon the SARF, this study examines perceived believability as a user attitude during the process of how risk perception affects users' news-sharing behavior. We posit that risk perception drives users to evaluate news and their sharing behavior. Drawing from decision-making literature under risky conditions, we emphasize the pivotal role played by risk perception in shaping individuals' attitudes and response behaviors (Chen *et al.*, 2011). When users perceive potential risks, they engage in further evaluation of the source. For example, when consumers perceive risks associated with online shopping, they invest more time evaluating products and may refrain from future shopping activities (Forsythe and Shi, 2003). Similarly, when users perceive risks

associated with email activities, they develop negative attitudes towards commercial emails and avoid reading them (Chen *et al.*, 2011). Likewise, when users perceive high levels of uncertainty and risks related to user sharing activities, they engage in identifying severity levels of these risks including verifying news credibility (Torres *et al.*, 2018). Therefore, this study considers risk perception as a precursor to perceived believability, and proposes the following hypothesis:

*H2b: Users' risk perception is negatively associated with users' perceived believability.*

Perceived believability is a prevalent psychological characteristic that detrimentally impacts user engagement (Jin and Atkinson, 2021). In the context of news sharing, believability holds significant importance as users tend to refrain from sharing news they find unconvincing (Zhang and Cozma, 2022). Users only adopt news to aid decision-making if they perceive it as credible (Jiang *et al.*, 2021). If users do not believe the news to be true, their likelihood of sharing it diminishes (Kim and Dennis, 2019). Therefore, we propose the following hypothesis:

*H2c: Users' perceived believability is positively associated with users' news-sharing behavior.*

In summary, news quality serves as a risk indicator that directly triggers users' risk perceptions, which act as antecedents for assessing news believability (Koller, 1988) and subsequently influencing user intentions to share news. Based on this rationale, we propose the following hypothesis:

*H2: News quality has a positive influence on sharing behavior through a serial mediating role of risk perception and perceived believability. The sequential pathway is defined as follows: news quality →risk perception→ perceived believability→ sharing news.*

### 3.3.3 Fake news awareness as a moderator

Fake news awareness encompasses users' comprehension of the characteristics of fake news and their ability to discern them (Apuke *et al.*, 2022). Variations in individuals' awareness of fake news arise from their unique capacities and experiences (Torres *et al.*, 2018). Individuals lacking critical thinking skills and fake news awareness are more susceptible to fake news (Pennycook and Rand, 2019). When users possess heightened levels of fake news awareness, they adopt a more skeptical mindset towards online disseminated news (Majerczak and Strzelecki, 2022). The quality of news is determined by its accuracy and reliability, which translate into potential risks and uncertainties (Nicolaou and McKnight, 2006). In the context of low-quality news, individuals with enhanced fake news awareness tend to assign lower ratings to its accuracy and reliability compared to those with limited awareness, who may face challenges in assessing associated risks when disseminating such content (Torres *et al.*, 2018). Those with high levels of fake news awareness exhibit greater concern for reputational harm, leading them to perceive higher risks and uncertainties associated with user sharing activities compared to those with low levels of awareness (Apuke *et al.*, 2022). Consequently, individuals with high levels demonstrate significantly increased sensitivity towards declining quality when perceiving elevated dissemination risks.

Additionally, while fake news awareness moderates the impact of news quality on risk perception, it also influences subsequent perceived believability and leads to consequential behavioral changes. When users possess a high level of fake news awareness, they are more likely to perceive greater risks from low-quality news and have lower levels of news believability, resulting in a decreased likelihood to share such content. Therefore, we propose the following hypotheses:

*H3: The indirect effect of news quality on users' news-sharing behavior through risk perception and perceived believability is negatively moderated by fake news*

*awareness; this indirect effect is stronger for those with high levels of awareness and weaker for those with low levels.*

### 3.3.4 Social tie variety as a moderator

Social media plays a pivotal role in amplifying social phenomena and exerting significant influence on individuals' risk perceptions by facilitating their exposure to risk information (Dai *et al.*, 2022). The advent of internet applications, such as social network sites, has empowered individuals to freely and expeditiously exchange information, establish networks based on shared interests, and enhance their social capital through the dissemination of information (Shen *et al.*, 2016).

Social tie variety, a structural dimension capturing the overall pattern of relationships among individuals (Omar *et al.*, 2024), is defined and measured as the diversity of users' social network (Torres *et al.*, 2018). An individual's online network encompasses family members, work colleagues, friends, and netizens sharing similar interests. As the diversity within these networks increases, there is a corresponding augmentation in the representation of diverse backgrounds within the network. This implies an enhanced exposure to divergent viewpoints (Torres *et al.*, 2018). According to SARF, contradictory risk messages amplify perceived risk and subsequently influence user behaviors. In other words, the proliferation of contrasting perspectives may prompt users to question news veracity disseminated within their networks (Majerczak and Strzelecki, 2022). Furthermore, conflicting viewpoints render news at least appear false or unreliable to users; thereby amplifying their perception regarding risks associated with sharing news. Consequently, compared with situations characterized by low social network diversity when users possess socially homogeneous ties only, their perceived risk pertaining to dissemination significantly escalates upon deterioration in news quality.

Furthermore, akin to the influence mechanism of fake news awareness, social tie variety not only moderates the impact of news quality on risk perception but also influences subsequent perceived believability and leads to

consequential behavioral changes. When a user's social tie variety is high, they are more inclined to perceive greater risks from low-quality news and exhibit lower levels of news believability, resulting in a decreased likelihood to share such content. Therefore, we propose the following hypotheses:

*H4: The indirect effect of news quality on users' news-sharing behavior through risk perception and perceived believability is negatively moderated by social tie variety; this indirect effect is stronger for individuals with high social tie variety and weaker for those with low social tie variety.*

## 3.4 Research methodology

### 3.4.1 Measurement development

The measurement items for all constructs were adapted from previous literature to suit the specific context of this study. Specifically, the measurement of news quality as an independent variable was adapted from Nicolaou and McKnight (2006). The measurements for fake news awareness and social tie variety as moderators were adapted from Torres *et al.* (2018). The measurements for perceived believability as an underlying mechanism were adapted from (Kim and Dennis, 2019), while the measurements for risk perception were adapted from (Chen *et al.*, 2011). Additionally, we measured users' news-sharing behavior by adapting the measurements for sharing news from (Choi *et al.*, 2017).

Previous studies have indicated that individuals with lower levels of education (Schaewitz *et al.*, 2020), younger age groups (Allcott and Gentzkow, 2017), and male gender (Filkukova *et al.*, 2021) tend to actively participate in the dissemination of online news. To ensure the robustness of our findings, we included gender, age, and education as control variables in this study. Specifically, these variables were categorized as follows: Gender: 1 = Male; 0 = Female. Age: 1 = Below 20; 2 = Between 21-30; 3 = Between 31-40; and 4 = Above 40. Education: 1 = Junior middle school or below; 2 = Senior middle school; 3 = Undergraduate; 4 = Postgraduate.

Given that Credamo is a Chinese questionnaire platform, we recruited participants from China and administered the questionnaire in Chinese. Similar to (Chen *et al.*, 2023), we translated the original English measurements into Chinese and made slight modifications to ensure their appropriateness for our study. Prior to distributing the Chinese version of the questionnaire on Credamo, we conducted a pretest involving five respondents and made necessary adjustments to enhance its readability. Subsequently, during the writing process of this paper, we employed an English-Chinese-English translation procedure to render these revised measurements back into English. Table 3-2 presents definitions and measurement items for each construct within our research model, which were assessed using a seven-point Likert scale ranging from “strongly disagree” (1) to “strongly agree” (7).

**Table 3-2** Definitions and measurement items for constructs

| Construct (Abbreviation) | Definition | Measurement items (1-7 Likert scale) | References |
|---|---|---|---|
| News quality (NQ) | Cognitive beliefs about the favorable or unfavorable characteristics of the currency, accuracy, completeness, relevance and reliability of news. | NQ1: The news in my social network is complete.<br>NQ2: The news in my social network is clear and understandable.<br>NQ3: The news in my social network is well structured. | Nicolaou and McKnight (2006) |
| Fake news awareness (FNA) | Users' awareness of the existence of fake news in their social networks. | FNA1: I am aware of the existence of fake news.<br>FNA2: I have heard about fake news.<br>FNA3: I am aware that some news in social network is fake.<br>FNA4: I know some of the news in social network is not true. | Torres et al., (2018) |
| Social tie variety (STV) | The diversity of offline groups and contexts represented in one's online social network. | STV1: People I am connected to on my social network represent various activities I am involved in.<br>STV2: People I am connected to on my social network represent multiple stages of my life.<br>STV3: People I am connected to on my social network are diverse in how I met them. | Torres et al., (2018) |
| Perceived believability (PB) | The extent to which news are regarded as true, real, and credible. | PB1: The news in my network is believable to me.<br>PB2: The news in my social network is credible to me.<br>PB3: The source of news in my social network is credible.<br>PB4: The source of news in my social network is trustworthy. | Kim and Dennis (2019) |

| | | | |
|---|---|---|---|
| Risk perception (RP) | Subjective expectations of potential losses associated with specific risk events (e.g., news sharing activities in this study). | RP1: My decision to share news in my social network is risky.<br>RP2: There is a high potential for loss involved by sharing news in my social network.<br>RP3: Sharing news in my social network will lead to considerable risks. | Chen et al., (2011) |
| Sharing news (SN) | A fundamental aspect of news-related activities on social media, facilitating the dissemination of news to users' social networks through the act of posting, forwarding, and sharing links. | SN1: I often share news in my social media.<br>SN2: I often recommend news in my social media.<br>SN3: I always share news to my friends. | Choi et al., (2017) |

### 3.4.2 Data collection

Questionnaires were distributed and participants were recruited through Cremado, a specialized Chinese survey platform featuring a sample size of over three million, comparable to Amazon Mechanical Turk. Previous studies have shown that the findings from surveys conducted using the Cremado data platform do not exhibit statistically significant differences when compared to those obtained through in-person interviews or email questionnaires. This establishes the reliability of data gathered via the Cremado platform (Chen *et al.*, 2023). Notably, several recent studies utilizing data from Credamo.com have been published in prestigious journals such as *Journal of Consumer Research*, *Journal of Marketing Research*, and *Production and Operations Management.*

All questions were set as mandatory, and the Credamo platform exclusively returned completed questionnaires, ensuring no missing values in our data. We finally collected 399 valid questionnaires, and the sample profiles of the responses are presented in Table 3-3. Among the 399 applicable participants, the majority (63.4%) were female. More than half of them (56.1%) fell within the age range of 21 to 30, while a substantial majority (82.7%) had achieved high levels of education through university attendance. Notably, this demographic comprised an active cohort on social networks.

**Table 3-3** Respondents' demographics

| | | Number | Percent |
|---|---|---|---|
| Gender | Male | 146 | 36.6% |
| | Female | 253 | 63.4% |
| Age | ≤20 | 12 | 3% |
| | 21-30 | 224 | 56.1% |
| | 31-40 | 137 | 34.4% |
| | ≥41 | 26 | 6.5% |
| Education | Junior high school or | 1 | 0.3% |
| | Senior high school | 10 | 2.5% |
| | Undergraduate | 330 | 82.7% |
| | Postgraduate | 58 | 14.5% |

## 3.5 Data analysis and results

We employed a two-step approach to examine the proposed model. Firstly, we conducted an exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) using MPLUS to evaluate our measurement model based on multiple fit criteria, reliability, and validity. Subsequently, we assessed the structural model and tested the hypothesized relationships.

### 3.5.1 Measurement model

#### 3.5.1.1 Unidimensionality and reliability

To ensure the reliability of our constructs, we employed the method proposed by (Narasimhan and Jayaram, 1998). Firstly, EFA was conducted to confirm the unidimensionality of our constructs. We utilized the maximum likelihood method and Geomin Rotation for EFA (Table 3-4).

**Table 3-4** Geomin rotated loadings for constructs in EFA

| Construct | Item | NQ | FNA | STV | PB | RP | SN |
|---|---|---|---|---|---|---|---|
| News quality | QN1 | **0.60** | -0.04 | 0.06 | 0.31 | -0.002 | 0.07 |
| | QN2 | **0.82** | -0.01 | -0.03 | -0.01 | 0.01 | 0.05 |
| | QN3 | **0.60** | -0.01 | 0.01 | 0.2 | -0.13 | -0.05 |
| Fake news awareness | FNA1 | -0.04 | **0.82** | -0.05 | -0.13 | -0.02 | 0.01 |
| | FNA2 | 0.03 | **0.87** | 0.03 | 0.01 | 0.05 | -0.05 |
| | FNA3 | -0.06 | **0.91** | 0.02 | -0.02 | -0.04 | 0.02 |
| | FNA4 | 0.02 | **0.88** | 0.03 | 0.04 | 0.07 | -0.02 |
| Social tie variety | STV1 | 0.08 | 0.07 | **0.72** | -0.05 | -0.04 | -0.002 |
| | STV2 | 0.02 | 0.04 | **0.60** | 0.12 | 0.14 | 0.03 |
| | STV3 | -0.1 | -0.09 | **0.72** | -0.01 | -0.02 | -0.01 |
| Perceived believability | PB1 | -0.01 | -0.09 | 0.04 | **0.84** | 0.03 | 0.02 |
| | PB2 | -0.03 | 0.04 | -0.08 | **0.93** | -0.01 | 0.01 |
| | PB3 | 0.05 | -0.08 | 0.07 | **0.70** | -0.08 | 0.06 |
| | PB4 | 0.10 | 0.04 | -0.05 | **0.77** | -0.10 | 0.01 |
| Risk perception | RP1 | 0.02 | 0.03 | -0.05 | -0.11 | **0.84** | 0.06 |
| | RP2 | -0.05 | -0.04 | 0.02 | -0.02 | **0.83** | 0.01 |
| | RP3 | -0.02 | 0.02 | 0.02 | 0.01 | **0.83** | 0.06 |
| Sharing news | RE1 | 0.04 | 0.01 | 0.03 | -0.04 | -0.04 | **0.90** |
| | RE2 | 0.001 | 0.01 | -0.02 | 0.06 | -0.03 | **0.87** |
| | RE3 | -0.01 | -0.05 | 0.003 | 0.06 | 0.04 | **0.87** |

The results revealed that all items exhibited higher loadings on their respective measured constructs and lower loadings on unmeasured constructs, indicating the unidimensionality of the constructs. Secondly, Cronbach's alpha and composite reliability (CR) were computed for each construct to assess construct reliability. As presented in Table 3-5, all Cronbach's alpha and composite reliability values exceeded the critical threshold of 0.70, demonstrating a high level of internal consistency for each construct. Additionally, the corrected item-total correlation (CITC) for each construct significantly surpassed the critical value of 0.3. Consequently, all examined constructs in this study exhibited satisfactory levels of reliability.

**Table 3-5** Reliability analysis

| Construct | Standardized loading | Cronbach's alpha | C.R. | AVE | CITC |
|---|---|---|---|---|---|
| News quality | | 0.83 | 0.84 | 0.63 | 0.693-0.704 |
| NQ1 | 0.84 | | | | |
| NQ2 | 0.75 | | | | |
| NQ3 | 0.79 | | | | |
| Fake news awareness | | 0.938 | 0.94 | 0.79 | 0.835-0.877 |
| FNA1 | 0.87 | | | | |
| FNA2 | 0.88 | | | | |
| FNA3 | 0.92 | | | | |
| FNA4 | 0.89 | | | | |
| Social tie variety | | 0.71 | 0.71 | 0.45 | 0.476-0.544 |
| STV1 | 0.74 | | | | |
| STV2 | 0.60 | | | | |
| STV3 | 0.67 | | | | |
| Perceived believability | | 0.935 | 0.94 | 0.79 | 0.840-0.854 |
| PB1 | 0.87 | | | | |
| PB2 | 0.88 | | | | |
| PB3 | 0.90 | | | | |
| PB4 | 0.90 | | | | |
| Risk perception | | 0.925 | 0.93 | 0.81 | 0.843-0.86 |
| RP1 | 0.89 | | | | |
| RP2 | 0.89 | | | | |
| RP3 | 0.92 | | | | |
| Sharing news | | 0.939 | 0.94 | 0.84 | 0.867-0.879 |
| SN1 | 0.91 | | | | |
| SN2 | 0.93 | | | | |
| SN3 | 0.91 | | | | |

Notes: C.R. = composite reliability; AVE = average variance extracted; CITC = corrected item-total correlation.

### 3.5.1.2 Construct validity

Construct validity refers to the degree to which a measurement accurately captures a theoretical concept, encompassing content, convergent, and discriminant validity. To ensure the content validity of our scale, we conducted a comprehensive review of relevant literature and adapted established measures for the independent variable, moderators, dependent variables, and mediators. The measurement model consists of 6 factors with their corresponding 20 items presented in Table 3-2.

To establish convergent and discriminant validity, we conducted CFA using multiple fit criteria including the root mean square error of approximation (RMSEA), comparative fit index (CFI), Tucker-Lewis index (TLI), and

standardized root mean square residual (SRMR). Based on previous literature, acceptable levels of fit were defined as follows: RMSEA≤0.06; CFI≥0.95; TLI≥0.95; SRMR≤0.08. Our data met these criteria with satisfactory results for all four indices: $\chi^2(155) = 344.54$, RMSEA = 0.055≤0.06, CFI = 0.972≥0.95, TLI = 0.965≥0.95, SRMR = 0.032≤0.08, indicating good model fit reliability and validity for subsequent tests of our proposed hypotheses. Convergent validity was assessed by computing average variance extracted (AVE) which showed that while the AVE value for society tie variety was marginal at 45%, all other constructs had values higher than 50% (Bagozzi and Yi, 1988; Fornell and Larcker, 1981). Additionally, factor loadings above 0.50 indicated strong convergent validity across all items as shown in Table 3-5. Discriminant validity was established by ensuring that the square root of each construct's AVE value exceeded its correlation coefficients with other constructs as shown in Table 3-6 (Fornell and Larcker, 1981). These results confirmed acceptable discriminant validity.

**Table 3-6** Properties of measurement scales

| | | | Correction | | | | | |
|---|---|---|---|---|---|---|---|---|
| Construct | ME | SD | 1 | 2 | 3 | 4 | 5 | 6 |
| 1.NQ | 5.51 | 1.06 | **0.79** | | | | | |
| 2.FNA | 5.21 | 1.35 | -0.35*** | **0.89** | | | | |
| 3.STV | 6.01 | 0.74 | 0.21*** | 0.01 | **0.67** | | | |
| 4.RP | 3.03 | 1.39 | -0.62*** | 0.41*** | -0.04 | **0.90** | | |
| 5.PB | 5.13 | 1.14 | 0.74*** | -0.45*** | 0.12* | -0.73*** | **0.89** | |
| 7.SN | 4.85 | 1.63 | 0.63*** | -0.41*** | 0.15*** | -0.57*** | 0.71*** | **0.92** |

Notes: 1. ME = mean; SD = standard deviation.

2. The diagonal value in bold print is the square roots of the AVEs.

3. *P<0.05, **p<0.01, ***p<0.001.

Furthermore, preliminary hypothesis testing revealed positive relationships between news quality and users' news-sharing behavior (r=0.63, p<0.001);

negative relationships between news quality and risk perception (r=-0.62, p<0.001); negative relationships between risk perception and perceived believability ((r=-0.73, p<0.001)); and positive relationships between perceived believability and users' news-sharing behavior (r=0.71, p<0.001). The preliminary results of the correlation test have provided support for our hypotheses and established a foundation for subsequent hypothesis testing.

#### 3.5.1.3 Common method bias

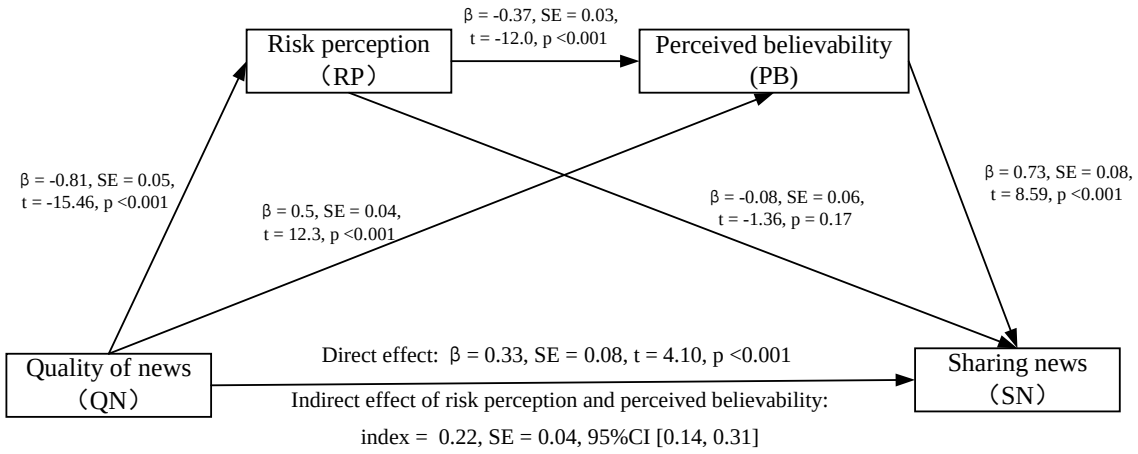
The potential occurrence of common method bias may arise due to the utilization of self-reported data (Podsakoff and Organ, 1986). To address this concern, we initially conducted Harman's one-factor test. The results revealed six distinct factors, with the largest factor explaining 46.69% of the covariance, which is below the threshold of 50% (Howard and Henderson, 2023). Additionally, a common method factor analysis was performed to further assess possible common method bias (Podsakoff *et al.*, 2003). The findings indicated that the loadings of substantive factors were statistically significant at the 5% level ($p < 0.05$), while those of the method factor were not significant. Initial CFA yielded CFI and TLI values of 0.972 and 0.965, respectively, along with RMSEA and SRMR values were 0.055 and 0.032, respectively. When incorporating the common method factor in CFA, revised results showed improved CFI and TLI values (0.977 and 0.968 respectively), as well as reduced RMSEA and SRMR values (0.053 and 0.023 respectively). The changes in CFI/TLI are within an acceptable range (<0.1 increase), and the alterations in RMSEA/SRMR are also minimal (<0.05 decrease). Therefore, we can conclude that common method bias is not a significant concern in this study.

### 3.5.2 Hypothesis testing

#### 3.5.2.1 Serial mediation model

To empirically examine our theoretical model, we conducted a serial mediation analysis using PROCESS Model 6 (Hayes, 2017), with news quality as the independent variable and sharing news as the dependent variable. Figure 3-2 illustrates the path analysis. The findings revealed that the proposed model

accounted for 54% of the variance ($R^2$=0.54, p<0.001) in sharing news. Specifically, regression results confirmed a significant positive effect of news quality on users' sharing behavior (β = 0.33, p<0.001), supporting H1. Additionally, the findings also substantiated a significant inverse impact of news quality on risk perception (β = -0.81, p<0.001), a noteworthy negative influence of risk perception on perceived believability (β = -0.37, p<0.001), and a substantial positive effect of perceived believability on users' sharing behavior (β = 0.73, p<0.001), thereby supporting H2a, H2b and H2c.




Control variables: Gender on SN (-0.16, not significant);
Age on SN (0.01, not significant); Education on SN (0.11, not significant).

**Figure 3-2** The serial mediation role of RP and PB in the relationship between QN and SN

Consistent with our hypothesis 2, the serial mediation model demonstrated significant paths from news quality to risk perception, perceived believability, and sharing news. More specifically, there was an indirect effect of risk perception on users' sharing behavior (indirect effect =0.07, SE = 0.06, 95%CI [-0.05, 0.18]). Additionally, perceived believability had an indirect effect on users' sharing behavior (indirect effect =0.36, SE = 0.05, 95%CI [0.26, 0.47]). Furthermore, the combined indirect effects of risk perception and perceived believability on sharing news were found to be significant (indirect effect =0.22,

SE = 0.04, 95%CI [0.14, 0.31]), thus validating the serial mediation between risk perception and perceived believability. Hypothesis 2 is supported.

To further validate our theoretical framework that posits how news quality influences users' sharing behavior through sequential mediating roles of risk perception and perceived believability, we adjusted these two mediators in a sequential order. The results indicated that this adjusted chain mediating effect was not statistically significant ($\beta$ = 0.05, 95%CI [-0.04, 0.13]), thereby confirming appropriateness of assuming a serial mediation model in this study.

#### 3.5.2.2 Moderating effect of fake news awareness

To test hypothesis 3, we first conducted a moderation analysis using PROCESS Model 1 (Hayes, 2017), with news quality as the independent variable, risk perception as the dependent variable, and fake news awareness as the moderator. Prior to analysis, both fake news awareness and news quality were mean centered. The results revealed a significant interaction effect between news quality and fake news awareness ($\beta$= -0.16, p= 0.002), indicating that fake news awareness significantly moderates the relationship between news quality and risk perception. Figure 3-3 illustrates the moderating effect of fake news awareness, demonstrating that high levels of fake news awareness led to a significant decrease in their risk perception associated with news quality, whereas low levels of fake new awareness weaken the negative relationship between news quality and risk perception.

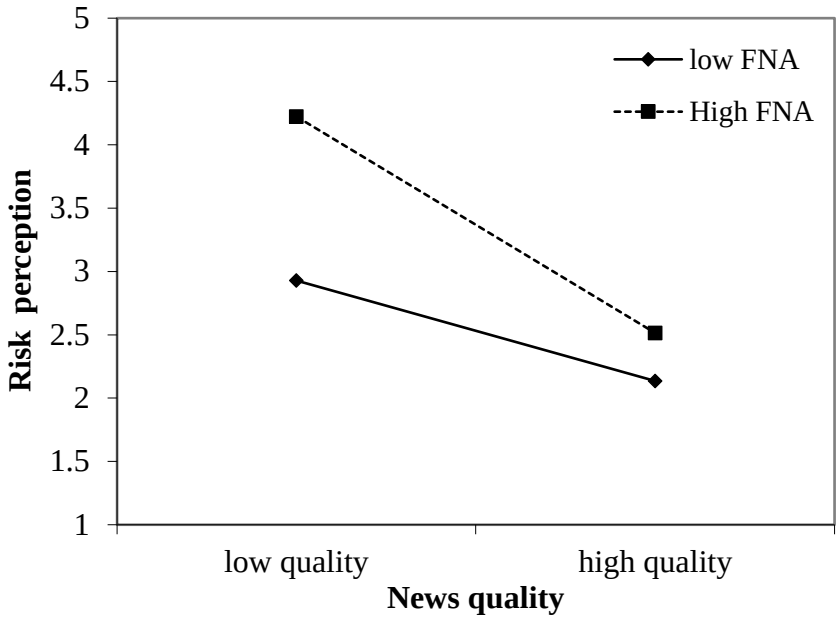
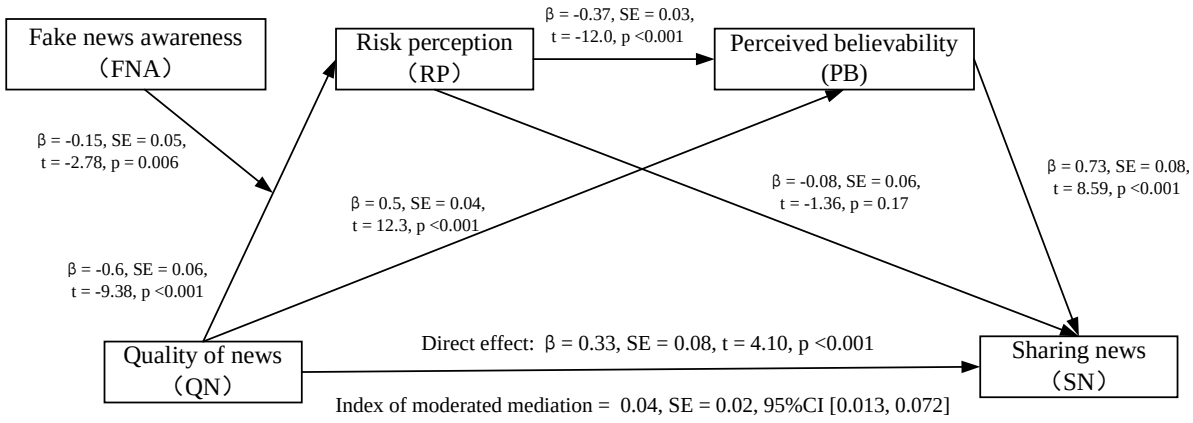



**Figure 3-3** Moderating effect of FNA in the relationship between QN and RP

Furthermore, we conducted a serial moderated mediation analysis using PROCESS Model 83 (Hayes, 2017), with news quality as the independent variable, sharing news as the dependent variable, and fake news awareness as the moderator. Risk perception and perceived believability were included as mediators. Prior to analysis, both fake news awareness and news quality were mean centered. Figure 3-4 illustrates the path analysis. Consistent with our assumption, bootstrapping with 5,000 samples revealed a significant moderated mediation effect of fake news awareness on the relationship between news quality and sharing news (index = 0.04, SE = 0.02, 95%CI [0.013, 0.072]. The robustness of the main effect is compromised from -0.81 to -0.59 when considering the moderating effect of fake news awareness, as it becomes contingent upon varying levels.




Control variables: Gender on SN (-0.16, not significant);
Age on SN (0.01, not significant); Education on SN (0.11, not significant).

**Figure 3-4** Results of moderated mediation analysis of FNA in the relationship between QN and SN

Specifically, as presented in Table 3-7, when users exhibit high awareness of fake news, the serial mediation effect of risk perception and perceived believability on news quality and sharing news is statistically significant (β = 0.21, 95%CI [0.14, 0.30]). Similarly, when users have low awareness of fake news, the serial mediation effect of risk perception and perceived believability on news quality and sharing news remains valid (β = 0.11, 95%CI [0.04, 0.19]). Notably, there are notable disparities in the serial mediation effect across different levels of fake news awareness ($\beta_{(high-low)}$ = 0.11, 95%CI [0.03, 0.19]). Thus, supporting hypothesis 3 that posits fake news awareness moderates the serial mediation effect of risk perception and perceived believability on news quality and sharing behavior.

**Table 3-7** Comparison of serial mediation effects in different levels

| Different level of FNA | Effect | SE | 95%CI | |
|---|---|---|---|---|
| | | | LICI | ULCI |
| High level of FNA | 0.21 | 0.04 | 0.14 | 0.30 |
| Low level of FNA | 0.11 | 0.04 | 0.04 | 0.19 |
| Diff (high-low) | 0.11 | 0.04 | 0.03 | 0.19 |

Notes: High level refers to values that are one standard deviation above the mean; low level refers to values that are one standard deviation below the mean.

### 3.5.2.3 Moderating effect of social tie variety

To test hypothesis 4, we first conducted a moderation analysis using PROCESS Model 1 (Hayes, 2017), with news quality as the independent variable, risk perception as the dependent variable, and social tie variety as the moderator. Prior to analysis, both social tie variety and news quality were mean centered. The results indicated that there was a significant interaction effect between news quality and social tie variety (β= -0.13, p= 0.05), suggesting that social tie variety can moderate the relationship between news quality and risk perception. Figure 3-5 illustrates this moderating effect of social tie variety: when users had high levels of social tie variety, their risk perception decreased significantly in response to higher-quality news; conversely, when users had low levels of social tie variety, the negative association between news quality and risk perception weakened.

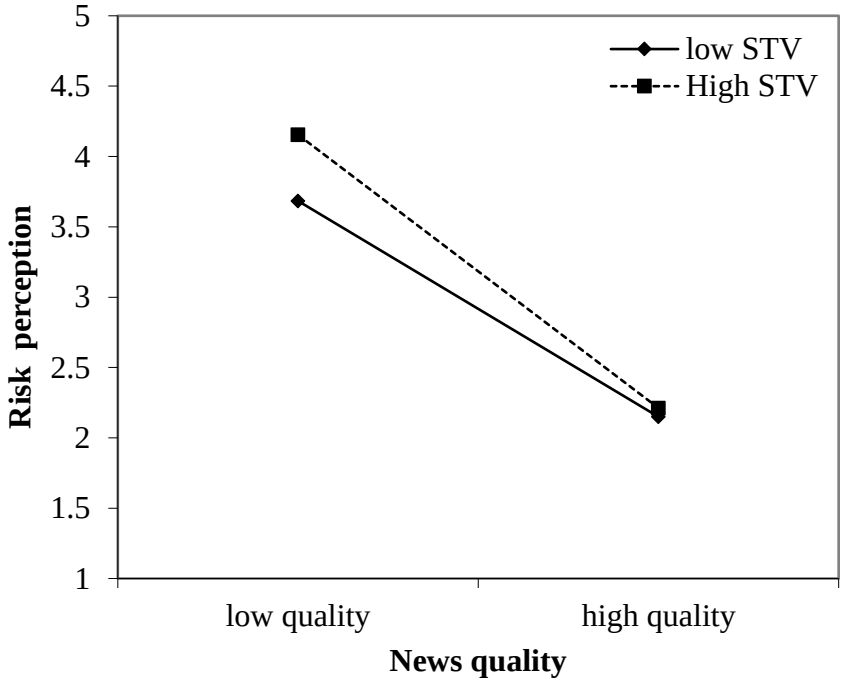
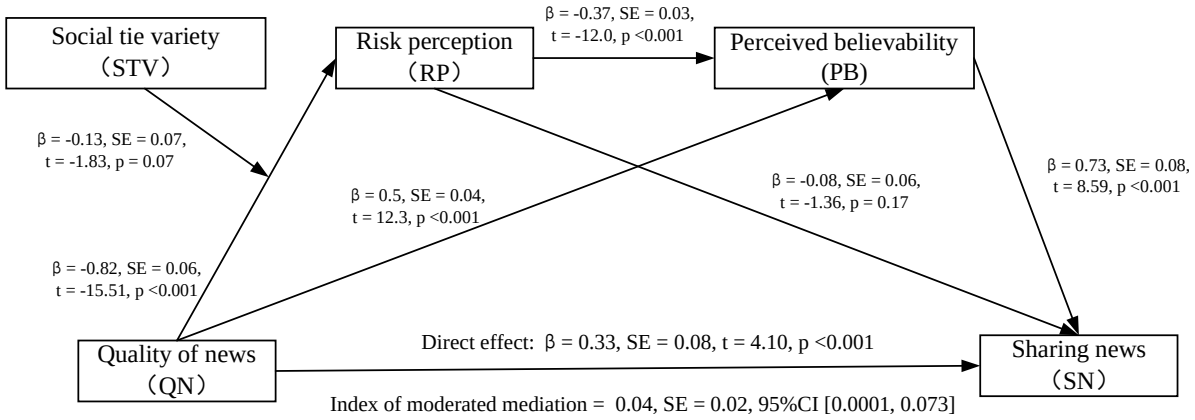



**Figure 3-5** Moderating effect of STV in the relationship between QN and RP

Furthermore, we conducted a serial moderated mediation analysis using PROCESS Model 83 (Hayes, 2017), with news quality as the independent variable, sharing news as the dependent variable, social tie variety as the moderator, and risk perception and perceived believability as mediators. Prior to analysis, both social tie variety and news quality were mean centered. Figure 3-6 illustrates the path analysis. Consistent with our assumption, bootstrapping with 5,000 samples revealed a significant moderated mediation effect of social tie variety on the association between news quality and sharing news (index = 0.04, SE = 0.02, 95%CI [0.001, 0.073]).




Control variables: Gender on SN (-0.16, not significant);
Age on SN (0.01, not significant); Education on SN (0.11, not significant).

**Figure 3-6** Results of moderated mediation analysis of STV in the relationship between QN and SN

Specifically, as presented in Table 3-8, when a user's social tie variety is high, the serial mediation effect of risk perception and perceived believability on news quality and sharing news is significant (β = 0.25, 95%CI [0.16, 0.35]). Similarly, when the variety of a user's social ties is low, the serial mediation effect of risk perception and perceived believability on news quality and sharing news remains statistically significant (β = 0.20, 95%CI [0.12, 0.28]). Notably, there are notable differences observed in the serial mediation effect across different levels of social tie variety ($\beta_{(high\text{-}low)}$ = 0.05, 95%CI [0.001, 0.11]).

Thus, supporting hypothesis 4 that posits social tie variety moderates the serial mediation effect of risk perception and perceived believability on news quality and sharing news.

**Table 3-8** Comparison of serial mediation effects in different level

| Different level of STV | Effect | SE | 95%CI | |
|---|---|---|---|---|
| | | | LICI | ULCI |
| High level of STV | 0.25 | 0.05 | 0.16 | 0.35 |
| Low level of STV | 0.20 | 0.04 | 0.12 | 0.28 |
| Diff (high-low) | 0.05 | 0.03 | 0.0001 | 0.11 |

Notes: High level refers to values that are one standard deviation above the mean; low level refers to values that are one standard deviation below the mean.

## 3.6 Discussion and conclusion

Building upon the SARF, this study employs a questionnaire methodology to conduct moderating and mediating analyses in order to investigate the roles of risk perception, perceived believability, fake news awareness, and social tie variety in shaping the impact of news quality on users' news-sharing behavior. Our findings strongly support the theoretical model proposed in this study. The results of hypothesis testing are summarized comprehensively in Table 3-9.

**Table 3-9** Summary of hypothesis testing

| Hypotheses | Results |
|---|---|
| H1: News quality is positively associated with users' sharing behavior. | Supported |
| H2a: News quality is negatively associated with users' risk perception. | Supported |
| H2b: Users' risk perception is negatively associated with users' perceived believability. | Supported |
| H2c: Users' perceived believability is positively associated with users' news-sharing behavior. | Supported |
| H2: News quality has a positive influence on sharing behavior through a serial mediating role of risk perception and perceived believability. | Supported |
| H3: The indirect effect of news quality on user sharing behavior through risk perception and perceived believability is negatively moderated by fake | Supported |

| | | |
|---|---|---|
| news awareness. | | |
| H4: The indirect effect of news quality on user sharing behavior through risk perception and perceived believability is negatively moderated by social tie variety. | | Supported |

We have observed a positive correlation between news quality and the act of sharing news, which aligns with the assertion made by (Zheng *et al.*, 2013) that sharing high-quality news not only imparts recipients with valuable and timely information but also enhances the sender's status, reputation, and image.

To elucidate the underlying mechanism behind the well-established phenomenon of users' heightened inclination to share high-quality news, we present three novel findings. Firstly, the relationship between news quality and news sharing is sequentially mediated by risk perception and perceived believability. News quality serves as a risk indicator that directly triggers users' risk perceptions, which act as antecedents for assessing news believability (Koller, 1988) and subsequently influencing user intentions to share news. This differs from previous literature that has demonstrated the mediating role of perceived believability in the association between news quality and users' news-sharing behavior but lacks an analysis of risk perception (Kumar *et al.*, 2023). Secondly, the moderating role of fake news awareness was validated, indicating that individuals with a heightened level of fake news awareness demonstrate increased concern regarding perceived risks associated with user sharing activities in comparison to those with lower levels of awareness. This finding diverges from prior research that has primarily examined how fake news awareness moderates the relationship between user factors or online environmental factors and users' news-sharing behavior (Omar *et al.*, 2024), without delving into the interaction effects between news quality and fake news awareness. Thirdly, the moderating role of social tie variety was substantiated, indicating that individuals with a higher diversity of social ties intensify their risk perception associated with news sharing and exhibit skepticism towards news veracity. This finding deviates from previous research primarily focused

on the impact of social tie variety on news verification behaviors while overlooking its influence on users' news-sharing behavior (Torres *et al.*, 2018).

### 3.6.1 Theoretical implications

This study contributes to the existing literature on users' news-sharing behaviors and SARF by making three theoretical advancements. Firstly, this study investigates the influence of risk perception on shaping the relationship between news quality, perceived believability, and users' news-sharing behavior. Previous literature has demonstrated the direct impact of news quality on users' news-sharing behavior while also exploring the mediating role of perceived believability (Kumar *et al.*, 2023). However, it has overlooked the significance of examining risk perception. Unraveling the influence of risk perceptions would enable a deeper understanding and intervention into users' intrinsic motivations for disseminating online news in an environment with abundant low-quality news. Building upon the SARF, this study asserts a serial mediating role of risk perception and perceived believability between news quality and users' news-sharing behavior, while refuting the possibility that perceived believability precedes risk perception in the context of news-sharing activities.

Secondly, our analysis on the moderating effects of fake news awareness and social tie variety contributes to a deeper understanding of users' news-sharing behavior. Previous SARF studies have extensively examined concepts such as risk perception, trust, and user response behaviors (Bearth and Siegrist, 2022). This study incorporates the two innovative constructs of fake news awareness and social tie variety into SARF under new context. The inclusion of these two novel constructs enriches the SARF by highlighting user characteristics that may serve as significant risk amplification stations on the Internet. Specifically, we reveal that individuals with high levels of fake news awareness and greater diversity in their social ties exhibit heightened concerns regarding perceived risks associated with user sharing activities.

Thirdly, previous studies have primarily focused on how fake news awareness moderates the relationship between user factors or online environmental factors and users' news-sharing behavior (Omar *et al.*, 2024),

without exploring the interaction effects between news quality and fake news awareness. Similarly, prior research has mainly examined the impact of social tie variety on news verification behaviors while neglecting its influence on users' news-sharing behavior (Torres *et al.*, 2018). Incorporating considerations of both fake news awareness and social tie variety is crucial for comprehending users' engagement in sharing news, as users' levels of fake news awareness remain relatively low and significantly vary despite the prevalence of fake news within their social networks (Wu *et al.*, 2022).

### 3.6.2 Practical implications

The advent of internet applications, such as social networking sites, has empowered individuals to actively and rapidly engage in sharing encountered information, thereby exacerbating the proliferation of fake news. Despite concerted efforts by public authorities, governmental bodies, and academic institutions to curtail the dissemination, satisfactory outcomes have yet to be achieved. The findings from this study hold significant implications for practitioners aiming to impede the propagation of fake news.

Firstly, the results from this study provide evidence for the positive impact of news quality on sharing behavior by establishing a sequential mediation model involving risk perception and perceived believability. Prior literature has advised key stakeholders including governmental organizations and mainstream media outlets to prioritize high-quality news content given its greater likelihood of being shared by users who value reliability (Kumar *et al.*, 2023). Furthermore, it is recommended that social media platforms proactively participate in fact-checking endeavors due to the influential role played by perceived believability in shaping users' news-sharing behavior (Kumar *et al.*, 2023). This research contributes to existing knowledge by confirming the significance of incorporating risk perception while proposing social media initiatives aimed at fostering users' sense of societal responsibility and awareness regarding the potential risks associated with spreading fake news.

Secondly, our study demonstrates that when users possess a heightened awareness of fake news, their perceived risk of dissemination significantly

increases in the face of declining news quality. Therefore, practitioners should identify individuals with low levels of fake news awareness and prioritize efforts to enhance their understanding in order to mitigate the proliferation of fake news. Consequently, governments can augment the number of informative lectures on the perils associated with sharing fake news to cultivate a broader societal consciousness among social network users, particularly targeting those who exhibit limited fake news awareness, such as young individuals lacking comprehensive knowledge (Wu *et al.*, 2022). Additionally, we can explore various educational settings including schools and workplaces to implement interactive games aimed at enhancing media literacy and fostering greater awareness regarding fake news (Roozenbeek and van der Linden, 2019). Given the limited discernment of users with low fake news awareness, who often fail to recognize the substantial risks associated with low-quality news, we propose that training programs aimed at enhancing fake news awareness should incorporate a greater number of risk statements pertaining to low-quality news.

Thirdly, our findings indicate that users with diverse social networks are more inclined to perceive elevated risks associated with the dissemination of low-quality news. Consequently, it is imperative for practitioners to prioritize individuals with limited social ties and provide them with enhanced training opportunities to comprehend the prevalence of fake news and the potential risks linked to its propagation.

### 3.6.3 Limitation and future research

This study also presents certain limitations, which provide opportunities for future research. Firstly, due to the utilization of survey methodology in this study, we did not establish a direct link between our constructs and specific news items. For example, news quality was operationalized by soliciting participants' evaluations regarding the quality of news within their social network, while sharing news was operationalized by assessing their frequency of news sharing on social media platforms. Employing an experimental design where participants are exposed to specific news items and capturing their responses would have facilitated drawing reasonably robust causal inferences.

Secondly, the generalizability of this study may be affected due to its data collection in China. It is important to consider that culture plays a significant role in the dissemination of fake news. For instance, citizens in Saudi Arabia exhibit a relatively high awareness of COVID-19 and are hesitant to share relevant medical information. It is well-known that Western and Eastern cultures differ in terms of people's information processing, which can lead to variations (Wu *et al.,* 2022). Thirdly, the investigated sample predominantly comprised of highly educated young respondents, who constitute a substantial proportion of the online interaction population. However, future research could enhance the robustness of findings by expanding the sample size to encompass a more diverse range of participants. Fourthly, our research model fails to consider an additional aspect of social ties, namely social tie strength. It is important to note that users with strong or weak social ties may exhibit different preferences and engage in distinct news sharing behavior. Therefore, future research should explore the impact of social tie strength in order to provide deeper insights into news sharing dynamics.

# Chapter 4 The Effects of Textual and Pictorial Information Complexity on User Engagement Behaviors (Study 2)

This chapter investigates the effects of textual and pictorial information complexity on user engagement behaviors. Furthermore, it examines the moderating effects of content type (natural or cultural landscape), complexity of discussed travel destination, and posters' verification status. Data is collected from Weibo for four renowned travel destinations, and negative binomial regression is employed to test the proposed hypotheses. The findings indicate that textual information complexity exhibits a significantly positive influence on user engagement and pictorial information complexity demonstrates a significantly negative effect on user engagement. The complexity of the discussed travel destination and the poster's verification status positively moderate the effects of both textual and pictorial information complexity on user engagement. Moreover, when the topic pertains to natural landscapes, the positive effect of textual complexity and the negative effect of pictorial complexity are both diminished. Our findings carry substantial implications for social media platform managers, content creators, and marketers.

## 4.1 Introduction of Study 2

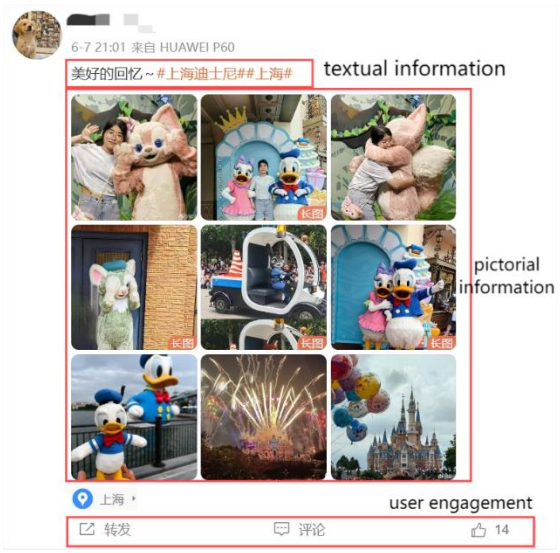
The Internet's rapid evolution has significantly enhanced interpersonal connectivity on social media, while also streamlining information dissemination and business operations. In the process of deriving valuable insights from social media content, users actively participate in a variety of online interactions, including sharing, bookmarking, recommending news articles, and engaging in discussions through comments (O'Brien *et al.*, 2018).

User engagement on social media is influenced by both intrinsic user characteristics and extrinsic news attributes, with the information features of

social media posts playing a crucial role. Research on textual information features demonstrates that complex post titles tend to negatively impact user engagement (Noguti, 2016; She *et al.*, 2022), whereas emotionally charged posts consistently generate significantly higher levels of user engagement(Aldous *et al.*, 2023; Hussain *et al.*, 2024). Prior studies of pictorial information features show that images with greater color variation (Kanuri *et al.*, 2024; Li and Xie, 2020) or featuring warm colors (Yu and Egger, 2021) are associated with higher retweet rates. This indicates that high-quality images can substantially enhance user engagement in social media posts. However, existing studies predominantly focus on the complexity of post titles and richness of pictorial colors, while neglecting the information complexity ("IC") of both textual and pictorial content.

Post titles serve as a key identifier for searched topics, and users generally favor titles that are concise and unambiguous. Once users identify relevant posts, they expect to extract valuable information content, highlighting its importance. Figure 4-1 illustrates several real microblog post pages with varying IC. The textual content in Figure 4-1(a) presents practical travel tips, while the accompanying images vividly depict the diversity of scenery and cuisine. In contrast, the post in Figure 4-1(b) features vivid images of Disneyland but lacks depth and detail in its textual content. The post in Figure 4-1(c) offers information on popular holiday tourism spots; however, the image merely duplicates the textual content without adding new information. Last, the text and images in Figure 4-1(d) are overly simplistic and lack substantial information. As demonstrated in Figure 4-1, social media posts exhibit different levels of textual and pictorial IC; therefore, examining how such complexity influences user engagement is intriguing.


*(a) High textual IC and high pictorial IC*




*(b) Low textual IC but high pictorial IC*


*(c) High textual IC but low pictorial IC*


*(d) Low textual IC and low pictorial IC*

**Figure 4-1** Microblog post pages with different levels of IC

According to the Media Richness Theory (MRT) (Suh, 1999), a communication medium's effectiveness is contingent upon its richness. IC's impact varies across different types of media. A medium's richness can be assessed using four criteria: immediacy of feedback, transmission of multiple cues, language variety, and personal focus (Daft *et al.*, 1987). Scholars classify various communication media based on these criteria, with face-to-face interaction being regarded as the richest due to its capacity for immediate feedback and conveyance of diverse cues through body language and tone of voice. Similarly, researchers apply these criteria to categorize other media such

as video, voice, pictures, and text (Rice, 1992). Different media formats exhibit varying degrees of effectiveness in conveying cues that facilitate message interpretation (Drossos *et al.*, 2024). Textual content excels in providing in-depth and complex analysis and stimulating user discussions. In contrast, pictorial content does not directly provide core information, instead supporting textual content. While MRT provides a framework for assessing communication media's richness, limited empirical research applies this theory to social media contexts. This leads to our first research question: *How do textual and pictorial information complexity differentially impact user engagement on social media platforms?*

Textual content functions as a central cue by providing essential and detailed information, while pictorial content serves as a peripheral cue by offering supplementary or experiential information, in line with the Elaboration Likelihood Model (ELM)(Kanuri *et al.*, 2024; Qiao and Feng, 2024). However, users' information needs vary depending on the type of content they seek(Ji and Fu, 2013). In the context of travel destinations, when travelers visit cultural landscapes, they often require professional guidance to fully appreciate the location's historical and cultural significance; therefore, they rely more heavily on textual content to obtain such information (Bigne *et al.*, 2024; Yu *et al.*, 2024b). Conversely, when exploring natural landscapes, travelers tend to focus on experiencing the scenery's beauty firsthand; consequently, pictorial content is more appealing because it can capture and convey the environment's visual appeal (Lo and McKercher, 2015). Different language styles can guide users to use different routes to process information (central or peripheral) (Syrdal *et al.*, 2023). When seeking information about travel destinations, users' reliance on textual versus pictorial content differs, which in turn may influence the effectiveness of textual and pictorial IC. Therefore, we propose our second research question: *How do the effects of textual and pictorial IC on user engagement vary between posts about natural landscapes and those about cultural landscapes?*

Motivation and ability are pivotal dimensions that characterize the propensity for elaboration within the ELM framework. In our study, significant

determinants of user motivation include travel destinations complexity and posters' verification statuses. When users engage in complex information searches, they tend to exert allocate more cognitive effort to evaluate central cues(O'Brien *et al.*, 2020), such as textual content in social media posts. Conversely, for simpler tasks, users are more likely to focus on peripheral cues(Kool *et al.*, 2010), such as pictorial information. Additionally, users generally have higher expectations of obtaining useful information from high-level posters. On social media platforms like Weibo, user accounts are categorized as verified and unverified. Verified accounts not only post more frequently with higher engagement but also symbolize prestige by granting users privileges and unique identifiers that highlight their status(Wang *et al.*, 2021). Consequently, compared with content from unverified posters, content from verified posters is more likely to attract attention and be perceived as more reliable and richer(Choi, 2024). Users tend to allocate more cognitive effort to evaluating textual content presented by verified uses than that provided by unverified users. Therefore, drawing on the ELM, we examine the moderating effects of task complexity and poster level on user motivation and propose our third research question: *How do the complexity of the discussed travel destinations and a poster's verification status influence the effects of textual and pictorial IC on user engagement?*

To address these research questions, we collected data from Weibo, focusing on social media posts related to travel destinations. We selected four specific travel destinations with diverse characteristics from the top 20 tourist sites listed in the "Online Tourism Asset Index Report" published by the China Tourism Academy. The selected destinations are Jiefangbei, Daocheng Yading, Shanghai Disneyland, and Yulong Snow Mountain. These four travel destinations garner significant popularity and offer geographic diversity, as they are situated in different regions of China. After preprocessing the data, we employed both negative binomial regression and the Tobit models to test our theoretical framework.

Our findings indicate that textual IC significantly enhances user engagement, while pictorial IC has a negative effect. Moreover, when social

media posts have high pictorial IC, the positive influence of textual IC on user engagement is attenuated. Additionally, users tend to use textual content to describe cultural destinations and pictorial information to describe natural destinations. Consequently, compared to posts featuring cultural landscapes, when the topic is natural landscapes, both the positive impact of textual complexity and the negative impact of pictorial complexity are diminished. Furthermore, as the complexity of the discussed subject increases and the poster is verified, users are more motivated to process textual information, strengthening textual IC's positive effect and mitigating negative pictorial IC's effect.

This study advances our understanding of user engagement on social media in three ways. First, by leveraging the MRT framework, this research explores textual and pictorial IC's distinct impacts of on user engagement and the negative moderating effect pictorial IC has on textual IC 's positive influence. Second, this study employs MRT to analyze how the effects of textual and pictorial IC vary between natural and cultural landscapes, where users' information needs differ. Third, drawing on the ELM, the study investigates the moderating effects of travel destination complexity and posters' verification statuses, as these factors significantly influence users' motivations to process central or peripheral information. By analyzing how different levels of textual and pictorial IC influence user behavior, stakeholders can tailor content to better meet audience preferences, enhancing communication effectiveness and user satisfaction. This understanding not only aids in crafting more engaging and relevant content but also contributes to developing algorithms for content recommendation and personalization, ultimately improving user experiences and increased platform loyalty.

The remainder of this paper is organized as follows. Section 2 reviews and analyzes existing literature on factors that influence user engagement on social media platforms. Section 3 introduces our conceptual framework and presents our hypotheses. Section 4 details the research methodology, encompassing data collection, variable definitions, and data preprocessing procedures. Section 5

provides a comprehensive analysis of the results. Finally, Section 6 concludes the paper by summarizing the study's contributions and limitations.

## 4.2 Literature review

User engagement is characterized by the depth of users' investment in a digital application and may be defined temporally, emotionally, or cognitively (O'Brien *et al.*, 2020). Existing research on measuring user engagement focuses on metadata such as likes, comments, and retweets (Gandhi *et al.*, 2024; Li and Xie, 2020; Sui *et al.*, 2023). Channel subscribers on YouTube positively influence user engagement at three levels—views, likes, and comments(Hussain *et al.*, 2024). A composite behavioral metric was employed to assess overall engagement with the brand on Facebook, calculated as the cumulative sum of clicks, likes, comments, reactions, and shares (Kanuri *et al.*, 2024). This metric integrates multiple interaction types to provide a holistic view of user engagement. Prior studies have also measured engagement through individual metrics such as likes, comments, shares, and click-throughs on social media (Gandhi *et al.*, 2024; Lee *et al.*, 2018).

User engagement on social media is significantly influenced by both intrinsic user characteristics and extrinsic content attributes. Intrinsic factors include demographic variables like gender, age, and learning styles, as well as physiological indicators like biofeedback and vocal features (Ferrari *et al.*, 2024). Research has also assessed users' cognitive, affective, and behavioral attributes across five dimensions to elucidate their effects on user engagement (Levesque and Pons, 2023). For example, motivations like fear of missing out, trust, immediacy, and social pressure drive users to engage with ephemeral content for gratification (Chen and Cheung, 2019).

Extrinsic factors include platform-specific attributes, such as the human-like qualities of brand fan pages that exhibit social interactivity, visual appeal, and identity attractiveness (Perez-Vega *et al.*, 2018), and platform-provided peripheral features, including geotagging labels (Chen *et al.*, 2021a) and posting

time labels (Drossos *et al.*, 2024). The characteristics of social media posts also critically influence user engagement (Aldous *et al.*, 2023; Alibakhshi and Srivastava, 2022). Research confirm that a post's topic is a significant factor (Yuan *et al.*, 2024). For example, in the context of flight experiences, personal topics likes flight delays and luggage issues tend to have lower retweet frequencies than public topics like ticket sales, due to their relatively lower informativeness (Li and Xie, 2020). Beyond title complexity, empirical evidence demonstrates that textual emotional features significantly influence user engagement. Emotionally-charged posts tend to inspire significantly higher engagement in terms of likes and shares compared to neutral messages (Aldous *et al.*, 2023).

Information complexity is a theoretical extension of Shannon's classical information theory into the realm of interactive communication (Lin and Luo, 2023). Previous studies have emphasized IC's impact on user engagement. Specifically, complex language in post titles has been shown to negatively affect post attractiveness (She *et al.*, 2022). These intricate titles may reduce readers' willingness to participate in discussions (Noguti, 2016). Compared to text-only posts, those with visual elements such as images, videos, or emojis generally attracts higher levels of user engagement (Drossos *et al.*, 2024). This is attributed to visual content's enhancement of perceived fluency and minimal need for cognitive processing (Lee *et al.*, 2021a). While visual content increases user engagement, the impact of its IC is complex (Gandhi *et al.*, 2024; Li and Xie, 2020). On one hand, images with greater color variation (Kanuri *et al.*, 2024; Li and Xie, 2020) or warm colors (Yu and Egger, 2021) tend to receive more retweets, highlighting the role of high-quality images in boosting user engagement. On the other hand, research finds a negative correlation between visual complexity and both viewership and user votes. This suggests that overly complex visuals can detract from core content relevance (Shen *et al.*, 2022) and diminish viewer interest and interaction.

In summary, existing studies predominantly focus on textual sentiment dimension (Aldous *et al.*, 2023; Hussain *et al.*, 2024) or complexity of post titles (Noguti, 2016; She *et al.*, 2022) when analyzing textual features, while largely

neglecting textual IC. Similarly, previous research that examines pictorial features primarily concentrates on color dimension (Kanuri *et al.*, 2024; Li and Xie, 2020; Yu and Egger, 2021) without sufficiently exploring pictorial IC. Additionally, a significant gap exists in investigating the interactive effects between textual and pictorial IC. To address this gap, we draw upon MRT and the ELM to explore how textual and pictorial IC influence user engagement. While MRT provides a framework for assessing the richness of communication media, limited empirical research applies this theory to social media contexts, particularly for distinguishing between textual and pictorial content. Additionally, the ELM suggests that users process information through both central and peripheral routes; however, little research examines how these routes are influenced by the type of content (cultural vs. natural landscapes) in travel-related posts.

## 4.3 Research model and hypotheses

Building upon MRT and the ELM, this study investigates how textual and pictorial IC influence user engagement on social media. It also explores the moderating effects of the type and complexity of discussed travel destination, and poster verification status. MRT highlights the richness of textual content in conveying detailed information, whereas pictorial content excels in delivering visual immediacy. Meanwhile, the ELM complements this perspective by differentiating the cognitive processing of these modalities: textual cues, due to their complexity, are more likely to be processed through the central route, whereas pictorial cues, driven by visual appeal, are predominantly processed through the peripheral route. This theoretical grounding helps in formulating hypotheses and interpreting findings within a broader communication and psychological context. The research model is presented in Figure 4-2.

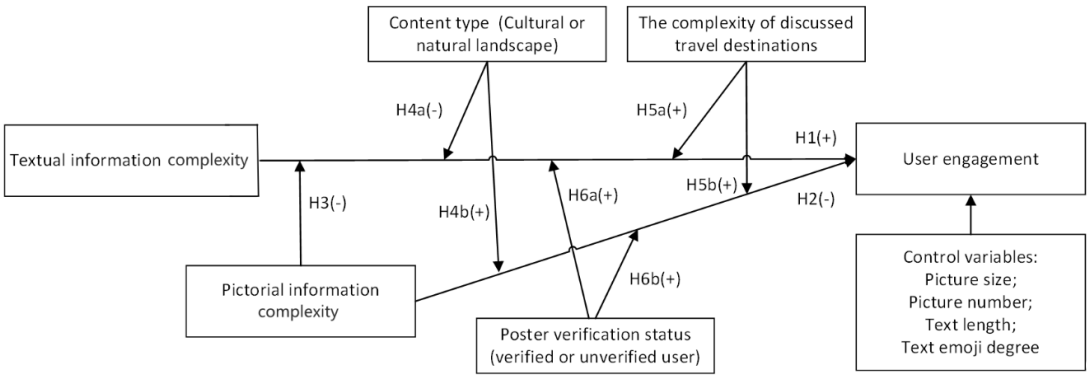



**Figure 4-2** Research model of study 2

### 4.3.1 The impacts of textural and pictorial IC

According to MRT (Suh, 1999), a communication medium's effectiveness depends on its richness, with different media formats demonstrating varying levels of efficacy in conveying information cues (Drossos *et al.*, 2024). In alignment with the ELM, textual content excels in delivering in-depth analyses, fostering user discussions, and providing essential and detailed information. Conversely, pictorial content acts as a peripheral cue, offering supplementary or experiential information.

Individuals consistently categorize and evaluate textual IC based on levels of uncertainty (lack of information) and equivocality (ambiguity) (Lee *et al.*, 2021a). Textual content with high IC is more effective in reducing uncertainty (Chesney *et al.*, 2017), thereby facilitating decision-making (Goh *et al.*, 2013). Consequently, textual IC significantly influences user engagement on social media (Liu *et al.*, 2024d) by reducing uncertainty and providing additional informational cues, fostering social interaction among users (Goh *et al.*, 2013; Li *et al.*, 2022). Therefore, we propose:

***H1:*** *Social media posts with higher textual IC elicit greater user engagement than those with limited textual IC.*

Textual content directly conveys essential information to users, while pictorial content serves a complementary role (Liu *et al.*, 2009). Users tend to process auxiliary visual information using peripheral routes with minimal elaboration, which makes it challenging for them to actively engage cognitively

with visually oriented content (Zhao *et al.*, 2023). Moreover, overly rich pictorial content can weaken user attention, increase cognitive load, and divert visual focus (Xia *et al.*, 2020), ultimately reducing cognitive engagement with the material (Hong *et al.*, 2004; Xu *et al.*, 2015). Therefore, we propose:

***H2:*** *Social media posts with higher degrees of pictorial IC tend to elicit less user engagement than those with lower pictorial IC.*

Human cognitive resources are limited (Sweller, 1988). Therefore, when confronted with a large volume of diverse information that requires simultaneous processing, individuals may opt to simplify their information processing task (Paas *et al.*, 2003). When social media posts include a high degree of pictorial IC, the abundance of visual content can divert users' attention away from central textual elements (Xia *et al.*, 2020). As a result, even if social media posts include rich textual information, users may avoid deep cognitive processing and rely less on textual content for judgments. Message presentation plays a crucial role in understanding the complexity of textual and visual information (Sun *et al.*, 2024). Consequently, valuable textual information may be overshadowed by excessive pictorial content, thereby reducing its impact. Therefore, we propose:

***H3****: Pictorial IC negatively moderates the positive effect of textual IC on user engagement. Specifically, when social media posts have a high degree of pictorial IC, the positive influence of textual IC on user engagement is attenuated.*

### 4.3.2 The moderating effect of content type

Tourism destinations and activities attract distinct populations, requiring descriptions that align with the product's image (Li *et al.*, 2023; Yu *et al.*, 2024b). In the context of travel destinations, visitors generally require professional guides to provide detailed historical or narrative accounts when exploring cultural landscapes (Huang *et al.*, 2015). By comparison, they tend to focus more on experiencing and appreciating natural beauty when visiting natural landscapes (Lo and McKercher, 2015). Accordingly, descriptions of natural landscapes often

use simpler language with vivid imagery (Michaelidou *et al.*, 2013), as opposed to cultural landscapes.

On social media, users' information needs vary by content type. Based on the characteristics of the scenic spots, we categorize the landscapes mentioned in the posts into cultural and natural landscapes (Xu *et al.*, 2018). For cultural landscapes, they prioritize detailed textual explanations, while for natural landscapes, they emphasize visual quality (Michaelidou *et al.*, 2013). Those seeking natural landscapes invest less effort in textual content, reducing their preference for detailed descriptions and minimizing the negative impact of pictorial IC (Hong *et al.*, 2023). In other words, users tended to dislike non-cultural posts with detailed descriptions and overly complex text, which led to low user engagement (Hong *et al.*, 2023; Yu *et al.*, 2024a). Therefore, when posts focus on natural landscapes, the positive effect of textual IC on user participation behaviors may diminish. Conversely, in discussions about natural landscapes, the negative effect of pictorial IC can mitigate. Thus, we propose the following hypothesis:

***H4a:*** *The content type negatively moderates the positive effect of textual IC on user engagement. Specifically, for social media posts, the positive effect of textual IC on user engagement is notably weaker for natural than cultural travel destinations.*

***H4b:*** *The content type positively moderates the negative effect of pictorial IC on user engagement. Specifically, for social media posts, the negative effect of pictorial IC on user engagement is notably weaker for natural than cultural travel destinations.*

### 4.3.3 The moderating effect of complexity of discussed travel destinations

Scholars suggest that what sets tourism consumption apart is that it revolves around interactive experiences which tourists seek out and are willing to pay for, experiences that are exclusive to the destination itself. Therefore, we should pay attention to the complexity of tourism destination, characterized by a greater number of stakeholders and a more involved process of value co-creation (Huang and Choi, 2019). For example, complex attractions like the Norwegian Glacier Museum and the Breheim Center offer more intricate information,

making it evident that visitors must engage in greater cognitive effort (Vittersø *et al.*, 2000).

According to the ELM, destination complexity influences users' motivations to seek information from social media. Visiting time serves as a practical way to measure travel complexity. Because tourists prioritize efficiency—unlike leisure at home, trips involve tight schedules, making time a valuable resource. While some activities (like long hikes) may not be inherently complex, attractions themselves design experiences around estimated visit times. Exceptions exist, but time remains a useful, objective proxy for the "total effort" required in tourism contexts. Therefore, we measure complexity of travel destination by the recommended visit duration.

Specifically, compared to destinations with shorter visiting durations, those that require longer visiting times also require more extensive information gathering and tour suggestions (Pan and Fesenmaier, 2006). When users are highly motivated to exert more cognitive effort, they tend to rely more heavily on textual content for useful information and pay less attention to peripheral pictorial elements. Therefore, when seeking information for complex travel destinations, the positive impact of textual IC is enhanced, while the negative impact of pictorial IC is mitigated. Therefore, we propose:

***H5a:*** *The complexity of the discussed travel destinations positively moderates the positive effect of textual IC on user engagement. Specifically, the positive impact of textual IC on user engagement is more pronounced when the travel destinations are more complex.*

***H5b:*** *The complexity of the discussed travel destinations positively moderates the negative effect of pictorial IC on user engagement. Specifically, the negative impact of pictorial IC on user engagement is notably weaker when the travel destinations are more complex.*

### 4.3.4 The moderating effect of posters' verification status

As users have limited cognitive resources, they tend to allocate more attention to posts with higher message credibility. Based on source credibility theory, a credibility source affects the effectiveness of communication and

opinions toward the issue. A high-level credibility of source commonly induce persuasion toward the advocacy and positive attitude (Johnson and Izzett, 1969; Powell, 1965; Tormala and Petty, 2004). Information sources can influence the way users process information. Social media platforms primarily serve as a means to disseminate information and share knowledge pertaining to specific subjects. Thus, the impact of the information source on the content of social media posts varies.

On social media platforms like Weibo, users can be categorized as verified and unverified. Compared to unverified users, verified users are more engaged and diligent in their posts, which generally present superior content quality (Mousavi and Roper, 2023). The verification label not only signifies a higher volume of publications and increased activity but also serves as an emblem of identity, conferring various privileges and distinctive markers that highlight the user's status. This enhanced credibility engenders greater trust from other users, making it more likely that they will rely on verified users' insights when making decisions (Chakraborty *et al.*, 2024). Consequently, verified users typically command high levels of trust and authority on platforms, making their content more likely to attract attention. Receivers perceive that the content shared by verified users is more reliable than that of unverified users. They invest more cognitive effort processing such posts, focusing more on textual content and less on pictorial elements. This shift in focus increases the positive effects of textual IC and reduces the negative impact of pictorial IC. Therefore, we propose:

***H6a:*** *A poster's verification status positively moderates the positive effect textual IC has on user engagement. Specifically, the positive impact of textual IC on user engagement is more pronounced when social media posts originate from verified accounts.*

***H6b:*** *A poster's verification status positively moderates the negative effect pictorial IC has on user engagement. Specifically, the negative impact of pictorial IC on user engagement is notably weaker when the social media posts originate from verified accounts.*

## 4.4 Research methodology

### 4.4.1 Data

The data for this study were collected from Weibo, China's leading social media platform, which reported 583 million active monthly users and 256 million active daily users at the end of the second quarter of 2024. Data were acquired using automated scraping tools. Since users frequently upload images along with their posts, travel-related social media content is particularly suitable for examining the effects of textual and pictorial IC.

The four travel destinations selected for this study—Jiefangbei, Daocheng Yading, Shanghai Disney, and Yulong Snow Mountain—were chosen based on their inclusion in the top 20 tourist attractions listed in the *Online Tourism Asset Index Report* published by the China Tourism Academy. This ensures that a sufficient volume of relevant social media posts is available for analysis. The selection criteria were based on several factors, including the type of scenic area, geographic distribution, and complexity of the travel experience. The data collection spanned from April to June 2024, a time frame selected due to the favorable climate conditions for tourism and increased online discussion of these destinations during this period. The data were subsequently crawled in August 2024. Notably, the target posts' indicators fluctuated only minimally, ensuring the data's reliability and consistency. Each post included metadata such as user nickname, post content, posting time, number of retweets, comments, likes, user type, and image URL. The resulting dataset includes 14,712 texts and 81,527 pictures.

### 4.4.2 Variables

***Dependent variable.*** The dependent variable in this study is user engagement, which is commonly quantified on social media platforms with metrics such as likes, comments, and retweets (Yang *et al.*, 2024; Zhao *et al.*, 2023). Likes serve as a direct indicator that viewers approve of the posted content. Comments provide more nuanced insights into users' perspectives and emotional responses, while retweets play a crucial role in disseminating information and

fostering broader participation. The cumulative count of likes, comments, and retweets is a comprehensive measure of user engagement.

***Independent variables.*** The independent variables in the model are textural and pictorial IC. The textual IC assessment focuses on the diversity and unpredictability of linguistic elements, including words and sentences. Lexical richness, which refers to the number of distinct words used in the text, encompasses all aspects of vocabulary usage and is a key indicator of textual IC (Shi and Lei, 2022). To measure textual IC, we employ lexical diversity using an information entropy-based metric. This metric evaluates both the breadth of vocabulary and evenness of its distribution within a text, considering the frequency distribution of words, which is crucial for analyzing language use. By integrating vocabulary richness with word usage uniformity, this method provides a more comprehensive characterization of linguistic features and textual content richness (Shi and Lei, 2022). Pictorial IC primarily focuses on color diversity, texture distribution, and other intrinsic features. Images with a rich variety of colors and detailed textures typically contain more information, thereby enhancing their IC. In this study, we employ the Python Imaging Library (PIL) to analyze images, calculating second-order information entropy based on the joint probability of adjacent pixel pairs. When multiple images are included in a single post, the average IC serves as a representative metric for that post. According to Shannon's theory (Shannon, 1948), textual or pictorial IC can be calculated as shown:

$$IC = -\sum_{i=1}^{n} p(x_i) \log_2 p(x_i)$$

where n represents the total number of distinct types in the text or total number of pairs of second-order adjacent pixels in the picture, and $p(x_i)$ denotes the probability of a specific type occurring in the text or picture. High probability indicates that the event is common or expected, thereby providing less new information, which means lower IC. The term $-\log_2 p(x_i)$ denotes the self-information for each type, while $-p(x_i) \log_2 p(x_i)$ is the expected value of self-information. The IC represents the total of the mathematical expectations for all

types. For textual IC, it means that a text with a higher entropy value features a greater diversity of unique words, distributed more uniformly throughout. This increased entropy signifies a higher degree of unpredictability and, consequently, enriches the lexical variety within the text. Essentially, a larger entropy suggests a broader and more evenly spread vocabulary, enhancing the text's overall richness and complexity (Shi and Lei, 2022). For pictorial IC, it means that a more random distribution of adjacent pixel pairs signifies a more complex texture structure within the image, which in turn results in higher pictorial IC.

***Moderators.*** The moderators include content type (natural or cultural landscape), travel destination complexity, and posters' verification status. First, different travel destinations elicit varying information preferences among users. For cultural sites like Jiefangbei and Shanghai Disneyland, engaging and detailed text-based descriptions tend to be more appealing. Conversely, for natural destinations like Yulong Snow Mountain and Daocheng Yading, visual information is likely to attract greater user attention during browsing. By assigning a value of 0 to cultural travel destinations, we obtained a dataset of 7,369 posts; assigning a value of 1 to natural travel destinations yielded a dataset of 6,321 posts. Second, travel destination complexity can be assessed based on the recommended visit duration. Attractions with a visiting time of less than four hours were classified as short-duration attractions (coded 0), resulting in a dataset of 2,762 instances. In contrast, attractions requiring more than four hours for a complete visit were categorized as long-duration attractions (coded 1), leading to a dataset of 10,928 instances. Third, posters' verification status also serves as a moderating variable. Verified users generally command higher levels of trust and authority on platforms, making their posted content more likely to attract attention and prompting users to invest more cognitive effort in processing these posts. Unverified users are denoted by 0, comprising a dataset of 10,177 entries; verified users, denoted by 1, contribute to a dataset of 3,513 entries.

***Control variables.*** The control variables are categorized into two dimensions: pictorial and textual. The pictorial dimension includes picture size

and count, while the textual dimension encompasses text length and the emoji-to-text ratio. Picture size refers to the total storage size of images measured in kilobytes (KB) and serves as an indicator of image clarity. For each post, the average size of all included images is calculated to represent the corresponding picture size. Text length is defined as the total number of characters in a text, reflecting the level of detail in attraction descriptions. The emoji-to-text ratio indicates the proportion of emojis used relative to the total text, providing a more intuitive measure of the post's mood and narrative liveliness. Table 4-1 summarizes the measurement methods of all variables.

**Table 4-1** Variable measurements

| Variable type | Variable name | Measures |
|---|---|---|
| DV | *Engagement* | Cumulative count of likes, comments, and retweets per post |
| IV | *Textual IC* | Information entropy obtained by calculating the probability of a word appearing in a text |
| | *Pictorial IC* | Average second-order information entropy obtained by calculating the joint probability of adjacent pixel pairs in the image |
| Moderator | *AttractionType* | "1" denotes natural travel destinations; "0" denotes cultural travel destinations. |
| | *VisitTime* | "0" denotes short-duration attractions; "1" denotes long-duration attractions. |
| | *UserType* | "0" denotes unverified users; "1" denotes verified users. |
| Control variables | *Textlength* | Number of words per post |
| | *EmojiRatio* | Total number of emojis/total length of text |
| | *PicSize* | Average storage size of image files per post |
| | *PicNum* | Number of images per post |

### 4.4.3 Data pre-processing

The descriptive statistics for each variable are presented in Table 4-2. Notably, the distribution of the dependent variable, user engagement (Engagement), exhibits a higher degree of variability specifically in behavioral engagement across posts. The mean value of pictorial information complexity (Pictorial IC) is 10.898, compared to a mean value of 5.006 for textual information complexity (Textual IC). This suggests that pictorial content is a more information-dense and comprehensive source of data.

**Table 4-2** Descriptive statistics

| Variables | Mean | Variance | Maximum | Minimum |
|---|---|---|---|---|
| *Engagement* | 65.291 | 853.983 | 75926 | 0 |
| *Textual IC* | 5.006 | 1.378 | 8.626 | 0 |
| *Pictorial IC* | 10.898 | 1.951 | 14.466 | 0.192 |
| *Textlength* | 118.029 | 217.265 | 5124 | 1 |
| *EmojiRatio* | 0.017 | 0.043 | 1 | 0 |
| *PicSize* | 1688.69 | 1703.46 | 15554.56 | 1.53 |
| *PicNum* | 5.542 | 3.468 | 9 | 1 |

The variable correlation analysis is presented in Table 4-3. The correlation coefficients of the variables are generally low, with variance inflation factors for the independent and control variables ranging from 1.02 to 1.18, indicating minimal multicollinearity concerns. To mitigate potential multicollinearity issues arising from interaction terms after introducing the moderating variables, centering was applied to both the independent and control variables to ensure stable and reliable model estimates. As shown in Table 4-3, textual IC has a significantly positive impact on user engagement, while pictorial IC exhibits a significantly negative effect. These results provide preliminary support for our theoretical model.

**Table 4-3** Correlation analysis

| Variables | *1* | *2* | *3* | *4* | *5* | *6* | *7* |
|---|---|---|---|---|---|---|---|
| *1.Engagement* | 1 | | | | | | |
| *2.Textual IC* | 0.065*** | 1 | | | | | |
| *3.Pictorial IC* | -0.027*** | -0.103*** | 1 | | | | |
| *4.Textlength* | 0.068*** | 0.601*** | -0.080*** | 1 | | | |
| *5.EmojiRatio* | -0.010 | -0.235*** | 0.058*** | -0.106*** | 1 | | |
| *6.PicNum* | 0.009 | -0.0110 | 0.281*** | -0.049*** | 0.174*** | 1 | |
| *7.PicSize* | 0.001 | -0.097*** | 0.185*** | -0.102*** | 0.128*** | 0.275*** | 1 |

## 4.5 Data analysis and results

The study's dependent variable is a count variable with a highly dispersed distribution, characterized by a variance that substantially exceeds the mean (mean = 65.29, variance = 853.98). Given this overdispersion, considering either a negative binomial or zero-inflated negative binomial regression model is appropriate. The zero-inflated model is generally preferred when the dependent variable has an excess of zeros. In this dataset, the proportion of zeros is 17.05%, which is not considered excessively inflated. Additionally, both models have comparable fit based on AIC values (7.097 and 7.071 for the negative binomial

and zero-inflated negative binomial regressions, respectively). Therefore, selecting a negative binomial regression model will yield concise and interpretable results.

### 4.5.1 Impacts of textual and pictorial IC

A negative binomial regression model and STATA software were used to test the research hypotheses. The estimation results are presented in Table 4-4. Model 1 includes only the control variables, while Model 2 incorporates both the independent and control variables to evaluate the effects of textual and pictorial IC. Model 3 adds the interaction term between textual and pictorial IC to examine the moderating effect of pictorial IC. The Model 2 results confirm that textual IC has a significantly positive relationship with user engagement ($\beta = 0.398$, $p < 0.001$), supporting H1. In contrast, pictorial IC demonstrates a significantly negative effect on user engagement ($\beta = -0.149$, $p < 0.001$), supporting H2. Furthermore, the Model 3 results indicate that the interaction between textual and pictorial IC has a significantly negative effect on user engagement ($\beta = -0.054$, $p < 0.001$), supporting H3. This indicates a counteracting effect between textual and pictorial IC. Specifically, when both elements are heightened concurrently, their influence on user engagement does not merely accumulate; instead, it can result in additional negative consequences. In other words, the combination of high textual and pictorial IC may lead to information overload, thereby diminishing users' willingness to engage. In sum, the main results presented in Table 4-4 support our hypotheses H1, H2 and H3.

**Table 4-4** Impacts of textual and pictorial IC

| Variables | Model 1 | Model 2 | Model 3 |
|---|---|---|---|
| *Pictorial IC* | | -0.149*** | -0.125*** |
| *Textual IC* | | 0.398*** | 0.421*** |
| *Pictorial IC * Textual IC* | | | -0.054*** |
| *PicSize* | -3.67e-05*** | 5.74e-06 | 4.05e-06 |
| *PicNum* | 0.048*** | 0.061*** | 0.059*** |
| *TextLength* | 0.004*** | 0.001*** | 0.001*** |
| *EmojiRatio* | -2.568*** | -0.742** | -0.177 |
| N | 14,712 | 14,712 | 14,712 |
| AIC | 7.517 | 7.458 | 7.456 |
| Log likelihood | -55291.106 | -54856.334 | -54838.091 |
| P value chi2 | <0.001 | <0.001 | <0.001 |

### 4.5.2 Moderating effects

We further examined the moderating effects of three factors on the relationship between IC and user engagement. Specifically, we tested content type, complexity of discussed travel destinations, and posters' verification status as potential moderators. The detailed findings are presented in Table 4-5. First, Model 4 reveals that content type significantly moderates IC's impact on user engagement. Specifically, when social media posts focus on natural travel destinations, the negative effect of pictorial IC on user engagement is mitigated ($\beta = 0.189$, $p < 0.001$), while the positive effect of textual IC is also reduced ($\beta = -0.058$, $p < 0.001$). These results support H4a and H4b.

Second, Model 5 indicates that the complexity of discussed travel destinations positively moderates the impact of both pictorial ($\beta = 0.329$, $p <$

0.001) and textual IC (β = 0.249, p < 0.001) on user engagement, supporting H5a and H5b.

Third, Model 6 shows that the posters' verification status positively moderates the effects of pictorial (β = 0.471, p < 0.001) and textual IC (β = 0.113, p < 0.001) on user engagement, supporting H6a and H6b. Finally, Model 7 incorporates all three moderator variables to examine their combined effects. The Model 7 results from are consistent with those from Models 4 to 6, reinforcing the robustness of our findings and indicating that the identified relationships and effects are stable and not significantly altered by including other moderator variables.

**Table 4-5** The results of moderating effect

| Variables | Model 4 | Model 5 | Model 6 | Model 7 |
|---|---|---|---|---|
| *Pictorial IC* | -0.159*** | -0.315*** | -0.366*** | -0.585*** |
| *Textual IC* | 0.415*** | 0.179*** | 0.221*** | 0.0682** |
| *Pictorial IC * Textual IC* | -0.0325*** | 0.00263 | -0.0857*** | -0.00231 |
| *PicSize* | 1.74e-05 | 3.63e-05*** | 2.56e-05** | 3.05e-05*** |
| *PicNum* | 0.065*** | 0.053*** | 0.043*** | 0.033*** |
| *TextLength* | 0.001*** | 0.001*** | 0.000*** | 0.000*** |
| *EmojiRatio* | -0.142 | 0.0513 | 0.865** | 0.817** |
| *AttractionType* | -0.387*** | | | -0.165*** |
| *Pictorial IC *AttractionType* | 0.189*** | | | 0.084*** |
| *Textual IC *AttractionType* | -0.058** | | | -0.054** |
| *VisitTime* | | -0.437*** | | -0.062 |
| *Pictorial IC *VisitTime* | | 0.329*** | | 0.469*** |
| *Textual IC *VisitTime* | | 0.249*** | | 0.120*** |
| *UserType* | | | 2.321*** | 2.486*** |
| *Pictorial IC *UserType* | | | 0.471*** | 0.282*** |
| *Textual IC *UserType* | | | 0.113*** | 0.165*** |
| N | 14,712 | 14,712 | 14,712 | 14,712 |
| AIC | 7.446 | 7.433 | 7.139 | 7.096 |
| Log likelihood | -54763.827 | -54661.812 | -52502.782 | -52177.282 |
| P value chi2 | <0.001 | <0.001 | <0.001 | <0.001 |

Table 4-6 presents the hypothesized paths and corresponding coefficient results for all hypotheses, all of which are supported. The results reveal statistically significant relationships between varying levels of textual and pictorial information complexity and user behavior. These findings offer empirical support for the proposed theoretical framework and provide a more nuanced understanding of media effects.

**Table 4-6** Summary of results for hypotheses

| Hypothesized paths | Coefficient | Remarks |
|---|---|---|
| H1 textual IC → user engagement | 0.421*** | Supported |
| H2 pictorial IC → user engagement | -0.125*** | Supported |
| H3 textual IC*pictorial IC → user engagement | -0.054*** | Supported |
| H4a textual IC*attraction type → user engagement | -0.054** | Supported |
| H4b pictorial IC* attraction type → user engagement | 0.084*** | Supported |
| H5a textual IC*visit time → user engagement | 0.120*** | Supported |
| H5b pictorial IC*visit time → user engagement | 0.469*** | Supported |
| H6a textual IC*user type → user engagement | 0.165*** | Supported |
| H6b pictorial IC*user type → user engagement | 0.282*** | Supported |
| **Note(s):** *p<0.05, **p<0.01, and ***p<0.001 | | |

### 4.5.3 Robustness tests

This study employed a negative binomial regression model due to its suitability for count data and ability to effectively address over-dispersion issues. To verify the robustness of our findings, we conducted a series of model specification tests to ensure that the baseline results of an alternative method and alternative dependent variables are consistent. To further ensure the results' reliability, robustness checks were performed using a Tobit model. The Tobit regression model was constructed using the same variables as those in Models 3 and 7. The findings are summarized in Table 4-7. Given the prevalence of zero values for the dependent variable, left truncation of the Tobit model was set to 0. This approach yielded consistent results for the independent variables and two

moderator variables when comparing Models 3 versus 8, as well as Models 7 versus 9. Overall, the negative binomial regression results exhibit robustness. However, importantly, the moderating effect of content type varied across these models, potentially due to biases introduced by the characteristics inherent in truncated data processing in a Tobit model. The significance of the negative binomial regression model was further validated using a likelihood ratio test. Two models were compared: a baseline model with only constants and a full negative binomial regression model that included all parameters. The likelihood ratio test produced a chi-squared statistic of 7751.79 ($p < 0.001$), indicating that including all parameters significantly improved the model's explanatory power and confirming the robustness of the findings from the negative binomial regression analysis.

**Table 4-7** Robustness check results: Tobit regression

| Variables | Negative binomial (Model 3) | Tobit (Model 8) | Negative binomial (Model 7) | Tobit (Model 9) |
|---|---|---|---|---|
| *Pictorial IC* | -0.125*** | -14.68*** | -0.585*** | -53.26*** |
| *Textual IC* | 0.421*** | 17.49** | 0.068** | -6.856 |
| *Pictorial IC * Textual IC* | -0.054*** | -2.172 | -0.002 | 0.714 |
| *PicSize* | 4.05e-06 | 0.0187*** | 3.05e-05*** | 0.022*** |
| *PicNum* | 0.059*** | 21.28*** | 0.0325*** | 24.26*** |
| *TextLength* | 0.001*** | 0.158*** | 0.0005*** | 0.024 |
| *EmojiRatio* | -0.177 | 76.56 | 0.817** | 1.625 |
| *AttractionType* | | | -0.165*** | 23.04 |
| *Pictorial IC *AttractionType* | | | 0.084*** | -2.701 |
| *Textual IC *AttractionType* | | | -0.0540** | -21.88 |
| *VisitTime* | | | -0.0615 | -82.22*** |
| *Pictorial IC *VisitTime* | | | 0.469*** | 39.99*** |
| *Textual IC *VisitTime* | | | 0.120*** | 9.142 |
| *UserType* | | | 2.486*** | 152.3*** |
| *Pictorial IC *UserType* | | | 0.282*** | 29.15*** |
| *Textual IC *UserType* | | | 0.165*** | 82.69*** |

| | | | | |
|---|---|---|---|---|
| N | 14712 | 14712 | 14,712 | 14712 |
| AIC | 7.456 | 13.934 | 7.096 | 13.925 |
| Log likelihood | -54838.091 | -102491 | -52177.282 | -102411.3 |
| P value chi2 | <0.001 | <0.001 | <0.001 | <0.001 |

Secondly, we refine the method used to measure the dependent variable to conduct an additional robustness test. Initially, user engagement behavior was represented by an aggregate measure that combines likes, comments, and retweets. To enhance the granularity of our analysis, we disaggregate the dependent variable into three distinct dimensions—likes, comments, and retweets—to separately examine IC's impact. Given that the proportion of zero values for likes, comments, and retweets is 26.42%, 40.17%, and 89.40%, respectively, we employ a zero-inflated negative binomial regression model to achieve robust results. Table 4-8 presents these findings. The results for pictorial IC remain consistent with those of the main model, while the influence of textual IC on likes is not significant. The interaction term between the two independent variables significantly affects the number of likes, consistent with the results of the main model, whereas it has a significantly positive effect on the number of retweets. On one hand, retweeting behavior often reflects communication value. As the IC of combined text and images increases, content may become more comprehensive and professional, thereby encouraging users to share information. On the other hand, the high frequency of zero values in retweets might affect the zero-inflation component of the model, leading to a positive effect on the interaction coefficient.

**Table 4-8** Robustness results: alternative dependent variables

| Variables | Engagement (Model 7) | Likes | Comments | Retweets |
|---|---|---|---|---|
| *Pictorial IC* | -0.585*** | -0.636*** | -0.356*** | -0.831*** |
| *Textual IC* | 0.0682** | 0.0418 | 0.228*** | 0.725*** |
| *Pictorial IC * Textual IC* | -0.00231 | -0.0176** | -0.000611 | 0.125*** |
| *PicSize* | 3.05e-05*** | 4.07e-05*** | -3.19e-05*** | 3.75e-05 |
| *PicNum* | 0.0325*** | 0.0325*** | -0.0344*** | 0.0923*** |
| *TextLength* | 0.000459*** | 0.000552*** | 0.000848*** | -0.000154 |
| *EmojiRatio* | 0.817** | 1.892*** | -0.661* | 9.571*** |
| *AttractionType* | -0.165*** | 0.00466 | -0.342*** | -0.652*** |
| *Pictorial IC*AttractionType* | 0.0839*** | 0.0636*** | 0.0960*** | 0.116 |
| *Textual IC *AttractionType* | -0.0540** | -0.176*** | 0.0699** | 0.0414 |
| *VisitTime* | -0.0615 | -0.301*** | 0.608*** | 0.9611*** |
| *Pictorial IC *VisitTime* | 0.469*** | 0.552*** | 0.279*** | 0.394*** |
| *Textual IC *VisitTime* | 0.120*** | 0.287*** | -0.174*** | -0.534*** |
| *UserType* | 2.486*** | 2.608*** | 1.910*** | 3.881*** |
| *Pictorial IC *UserType* | 0.282*** | 0.270*** | 0.213*** | 0.415*** |
| *Textual IC *UserType* | 0.165*** | 0.122*** | 0.330*** | 0.108 |
| N | 14,712 | 14712 | 14,712 | 14712 |
| AIC | 7.096 | 7.069 | 4.659 | 1.304 |
| Log likelihood | -52177.282 | -45070.11 | -33935.36 | -9569.26 |
| P value chi2 | <0.001 | <0.001 | <0.001 | <0.001 |

## 4.6 Discussion and conclusion

Drawing on MRT and the ELM, this research employs data from the Weibo platform to investigate how textual and pictorial IC affects user engagement.

Utilizing negative binomial regression and Tobit models for the analysis, the study further explores the moderating effects of three factors: content type (natural versus cultural landscapes), complexity of travel destinations, and posters' verification status.

The effectiveness of a communication medium depends on its richness (Suh, 1999), and different media formats exhibit varying degrees of effectiveness in conveying information cues (Drossos *et al.*, 2024). Within the context of the ELM framework, textual content primarily provides core information, while pictorial content offers supplementary information. As a core cue, textual IC positively enhances user engagement. Conversely, as a peripheral cue, overly rich pictorial content can distract users' attention and negatively impact user engagement. Furthermore, when pictorial IC is high, users allocate less cognitive effort to processing textual content, which diminishes the positive effect of textual IC on user engagement.

When seeking information for different destinations, users exhibit varying preferences for textual or pictorial content. In this context, users exert a consistent level of cognitive effort but the allocation between textual and pictorial content differs. In the tourism context, users tend to rely more on textual content to understand cultural travel destinations but prefer to browse pictures to appreciate natural travel destinations. Consequently, compared to social media posts about cultural travel destinations, those about natural travel destinations demonstrate less pronounced positive effect of textual IC and a less significant negative effect of pictorial IC.

When seeking information for different requirements, users' motivation to process textual or pictorial information varies. In this context, cognitive efforts differ across situations. For instance, when users seek information about complex travel destinations or read social media posts from verified accounts with high credibility, they invest more effort in processing textual content and rely less on pictorial content. Consequently, textual IC's positive impact is more pronounced for complex travel scenarios or when posts originate from verified users, while pictorial IC's negative impact is notably diminished.

### 4.6.1 Theoretical implications

This study advances the existing literature on user engagement on social media in three key areas. First, it differentiates the distinct impacts of textual and pictorial IC on user engagement and explores their interactive effects. Prior studies predominantly focus on textual sentiment (Aldous *et al.*, 2023; Hussain *et al.*, 2024) or the complexity of post titles (Noguti, 2016; She *et al.*, 2022) when analyzing textual features, while largely overlooking textual IC. Similarly, research on pictorial features primarily concentrates on color dimensions (Kanuri *et al.*, 2024; Li and Xie, 2020; Yu and Egger, 2021) without adequately exploring pictorial IC. Moreover, the interplay between textual and pictorial IC and their combined impact on user engagement has not been thoroughly explored. By investigating the interaction of these two forms of IC, this study provides novel insights into how different types of information complexity can complement or detract from each other in influencing user behavior on social media platforms. This dual focus not only enriches our understanding of content dynamics but also offers practical guidance for optimizing social media strategies.

Second, this study leverages MRT to examine the moderating effect of content type on the relationship between textual or pictorial IC and user engagement. Prior research shows that users distribute their attention across different media when seeking information about cultural or natural travel destinations(Ji and Fu, 2013). However, the moderating role of content type on the relationship between social media posts and user engagement remains underexplored. This study extends MRT by showing that the effectiveness of media richness is context-dependent and varies with the type of content and user expectations.

Third, this study leverages the ELM to investigate the moderating effects of travel destination complexity and poster verification status on the impact of social media posts. Prior research shows that users exert varying levels of effort when seeking information for destinations with different levels of complexity and have differing credibility perceptions of posts from verified versus unverified users(Choi, 2024). However, existing studies have not examined how

these two factors moderate the influence of social media posts. Textual content, which requires more cognitive effort, aligns with the central route of processing, while pictorial content aligns with the peripheral route. This study highlights how user engagement is moderated by factors such as content type and poster verification status, which influence the information processing route.

By integrating MRT and the ELM, this study not only fills existing gaps in the literature but also offers a comprehensive framework for understanding the complex dynamics of user engagement with social media content. These theoretical contributions pave the way for future research to explore the nuanced interactions between different types of media and user characteristics in various digital contexts.

### 4.6.2 Practical implications

Our findings provide valuable insights for social media platform managers, content creators, and marketers who seek to enhance user engagement by strategically deploying textual and visual elements. Specifically, the implications for social media platforms are as follows. First, social media platforms should not only leverage images to enhance information vividness but also prioritize the promotion of high-quality textual content. Platforms must recognize both the negative impact of pictorial IC on user engagement and its negative moderating effect on the positive impact of textual IC. Second, social media platforms need to implement diverse management strategies for posts with varying content types and complexities, as these factors can influence users' preferences for textual or pictorial IC. Third, social media platforms should emphasize the management of verified users, as their verification status typically correlates with higher-quality content and greater perceived credibility.

Implications for content creators are as follows. First, content producers must strike a balance between visual appeal and textual depth, ensuring that graphics enhance rather than overshadow messages. When visual elements are necessary, they should be employed judiciously to support the text without becoming the primary focus. In cases where textual content is rich and detailed, content creators should refrain from using overly complex images to ensure their

written material's effectiveness. Second, content creators should adopt appropriate strategies for posting on social media based on the topic. For example, they can use visually appealing images in posts about natural travel destinations but should avoid complex visuals in posts about cultural travel destinations.

### 4.6.3 Limitation and future research

This study acknowledges certain limitations that present opportunities for future research. First, the research primarily analyzes travel-related social media posts from a single platform (Weibo), which may restrict the generalizability of the findings to other platforms or types of content. Future studies should , to enhance the external validity of the results. Second, this study employs quantitative methods, which do not establish direct causal relationships among constructs nor fully elucidate the underlying mechanisms. Incorporating an experimental design where participants are exposed to specific conditions and their responses are captured would facilitate more robust causal inferences. Last, the identified moderating effects, such as destination complexity and poster level, are context-specific and may not be universally applicable across all categories of travel destinations or social media environments. Future research could broaden the scope of moderators to include cultural backgrounds and technological familiarity and explore the impacts of other content formats (e.g., video). This would reveal further nuances in how different users respond to rich information, providing more comprehensive guidelines for marketers and content creators.

# Chapter 5 The Double-Edged Sword Effect of AI Fact-Checker on User Engagement Behaviors (Study 3)

This chapter investigates the double-edged sword effect of AI fact-checker on user engagement behaviors, focusing on the roles of innovation image and perceived source credibility. Furthermore, it explores the moderating effects of AI literacy and confirmation bias. A polit study and three experiments are employed for hypotheses testing. Our findings indicate a significant indirect effect of AI fact-checker on user engagement through the dual mediating roles of innovation image and perceived source credibility. AI literacy primarily plays a positive moderating role by altering the intermediary path of innovation image and confirmation bias plays a negative moderating role by altering the intermediary path of perceived source credibility. This chapter contributes to the existing literature on AI-generated content and users' news engagement behaviors. It offers a robust theoretical framework that elucidates two distinct mechanisms through which various types of fact-checkers enhance user engagement and extends the principles of impression management theory and source reliability theory within the context of AI. Additionally, it explores boundary conditions under these mechanisms. Our findings offer substantial implications for practitioners striving to improve the effectiveness of AI fact-checking.

## 5.1 Introduction of Study 3

The first two studies (Chapters 3 and 4) examined what factors influence user engagement behaviors on social media platforms infested with fake news, while the third study explore user engagement behavior from a new perspective, i.e., rumor-debunking content.

Due to the profound implication in various fields, including politics, social issues, healthcare, business, and media and journalism fields, government institution and mainstream media make efforts to explore the effective of fact-checking to refute fake news spread. Therefore, fact-checking comes into being. Fact-checking has caught the eyes of scholars and practitioners. For example, Thorson (2016) noted that debunking false claims has increasingly become a popular component of political coverage, conducted by both organizations dedicated to fact-checking and traditional media outlets (Thorson 2016, P.461). Fact-checking aims to "search the truth" (Fridkin *et al.*, 2015) and is proposed as a promising approach to address the dissemination of false information (Hameleers and van der Meer, 2020). Fact checkers put efforts to prove whether the piece of news is truth, then want to nudge to change individual perceptions and curb the spread of fake news. However, few studies directly seek effective debunking strategy from the perspective of fact-checker, exploring the boundary conditions and underlying mechanisms.

In addition, with the rapid advancement of artificial intelligence (AI) technology, AI systems are increasingly utilized for fact-checking as they demonstrate enhanced capabilities in text processing, graphics processing, and audio processing. For example, *Meta* has launched novel AI technologies designed to automatically identify emerging variants of content that have already been discredited by independent fact-checkers and deploys AI tools to detect deepfakes (AI, 2020). I wonder whether there has different influence between different fact-checkers. Although significant technological progress in AI-assisted fact-checking has undeniably emerged, our comprehension of its public acceptance remains unclear. Therefore, I propose the first research question: *Will the persuasive effects of fact-checking remain consistent when AI intervenes in the fact-checking process, whether to a greater or lesser extent?*

Based on source credibility theory (Hovland and Weiss, 1951), various kinds of fact-checking sources are viewed with differing levels of credibility. Some scholars suggest that users might doubt the ability of machines to settle factual disputes, making them view AI-driven fact-checkers as less reliable than those

operated by humans (Longoni *et al.*, 2019). Furthermore, based on impression management theory, social interactions can be likened to a form of performance, wherein individuals portray themselves in specific manners to create desired impressions (Berger, 2014). The adoption of novel high-tech products can serve as a remarkably effective indicator of an individual's technological proficiency and personal innovativeness in social contexts (Wood and Hoeffler, 2013). Within a social network, members actively engage and interact, deciding whether to share or recommend specific news items to other group members. The adoption of AI fact-checking tools is not only a technical issue but also a sociopsychological one. Therefore, AI fact-checking may have two different effects on user participation behavior through perceiving the source credibility and the innovative image. Understanding the underlying mechanisms that influence the effectiveness of AI fact-checking is particularly urgent today, given the continuous emergence of new forms of fact-checking. Thus, I propose the second research question: *Whether and how do the different fact-checkers affect individual innovation image and perceived source credibility, thereby affecting the intention to engage with the message (e.g., share and recommend the debunking message)?*

In addition, different user groups will also have an impact on participation behavior. The application of AI technology has increasingly penetrated people's daily lives and work, and the acceptance degree of users is also constantly improving. The significant differences in acceptance degrees significantly affect users' perception of the innovative image shaped by sharing AI-generated content (Wood and Hoeffler, 2013). Furthermore, even when confronted with two equally plausible interpretations of the same information, individuals tend to perceive the one that aligns with their preexisting beliefs (Balcetis and Dunning, 2006). Confirmation bias may influence user's information processing. Thus, I propose the third research question: *How do AI literacy and confirmation bias moderate the effect of AI fact-checker on user engagement toward rumor-debunking information via the mediation of innovative image or perceived source credibility?*

To address above three research questions, this study conducts a polit study and three experiments through Credamo platform. It contributes to the existing literature on AI-generated content and users' news engagement behaviors by making three theoretical advancements. First, it presents a theoretical framework that identifies how innovation image and perceived source credibility mediate the enhancement of user engagement by various fact-checkers, providing deeper insights into user perceptions and responses to AI-generated content. Second, it reveals that the type of fact-checker (AI vs. human) as a peripheral cue can enhance consumers' image of innovation and increase sharing behaviors, extending impression management and source reliability theories in the context of AI. Third, it establishes that AI literacy and confirmation bias are boundary conditions affecting the impact of AI-generated content on user engagement, enhancing theoretical coherence and external validity within the dual mediating mechanism framework.

The remaining sections of this paper are structured as follows. Section 5.2 provides a comprehensive review of the relevant literature on debunking rumor, AI-content, and user engagement. In Section 5.3, we propose a research model and formulate research hypotheses. Section 5.4, 5.5, 5.6, and 5.7 outlines the research methodology employed in this study and present the data analysis and corresponding results. Finally, in Section 5.8, we engage in an extensive discussion and draw conclusions and limitations based on our findings.

## 5.2 Literature review

### 5.2.1 Research on debunking rumors

The proliferation of rumors on social media has significantly disrupted online order and social development. To reduce the possible negative impacts resulting from rumors, it is crucial to disseminate debunking information effectively to eliminate rumors and understand the influence of debunking information features on users' communication behavior. The content features of debunking information substantially affect the debunking effect and users'

participation behavior. Firstly, the tone of the title, whether negative or in the form of a question, does not influence readers' belief in false statements or their memory of the article (Fazio *et al.*, 2023). Secondly, the evidence used in debunking, such as the quality of evidence, the authenticity of evidence, the certainty of expression, the richness of expression, the completeness of expression (Zhang *et al.*, 2024a; Zhang *et al.*, 2024b), the type of evidence (Tsang *et al.*, 2023), the intensity of correction (Martel *et al.*, 2021) and the depth of explanation (Kim and Lim, 2023), are key cognitive factors that influence the persuasiveness and dissemination of debunking information on social media. Additionally, the emotional appeal in debunking information significantly impacts its persuasiveness (Lu *et al.*, 2019), with a U-shaped relationship between emotional pleasure and persuasiveness. Enhanced emotional arousal and dominance may overload users' cognitive capacity, weaken their ability to process and understand debunked information, and have an inverted U-shaped relationship with the persuasiveness of debunking information (Pal *et al.*, 2020; Shin *et al.*, 2017; Zhang *et al.*, 2024a; Zhang *et al.*, 2024b). Different rumor refutation contexts exhibit varying dominant emotional polarities (Chao *et al.*, 2021). Lastly, social media allows for the presentation of rumor-debunking information in various forms. Text-only rumor-refuting posts evoke more positive emotions than those with images or videos, despite the latter being easier to read and understand. Non-text-only posts often refute multiple rumors in one go, with a large information capacity, including numerous images, long images, or videos, which can lead to information overload and memory blurring, hindering the spread of rumor-debunking information (Gao *et al.*, 2022).

The choice of channels for refuting rumors significantly affects the effective dissemination of rumor-refuting information. Studies indicate that individual and community communication positively impact the spread of rumor-refuting information, with community communication being more effective in debunking political and economic rumors than individual communication (Zhang *et al.*, 2024a). This highlights the importance of social relationships in user information processing, as community communication

fosters connections between information communicators and users with common interests. Users tend to rely on rumor-busting information provided by community peers, thus facilitating timely information dissemination (Lee *et al.*, 2021b; Oh *et al.*, 2018). Consequently, people are more likely to trust information from their social groups rather than news media, and public participation in debunking rumors can reduce the overall impact of rumors. Other scholars suggest that platforms like WeChat or Facebook are more effective in spreading rumor-debunking information due to their stable closed-loop communication channels, increasing the likelihood of rumors being debunked by acquaintances (Wang *et al.*, 2019). Moreover, the response time of rumor-busting information significantly negatively impacts its effectiveness, with shorter response times leading to better rumor-busting outcomes (Baccarella *et al.*, 2018).

Attention has also been given to the characteristics of rumor-debunkers, with studies indicating that these characteristics significantly affect users' trust in rumor-debunking information, which in turn influences their participation behaviors (McCracken, 1989), including reading, liking, commenting, and sharing (Kim and Dennis, 2019). Specifically, the credibility, popularity, influence, and types of debunkers (Song *et al.*, 2021; Zhang *et al.*, 2024b) as well as identity (celebrities, media, government, and ordinary accounts) (Chao *et al.*, 2021; Chao *et al.*, 2024), all influence users' engagement behaviors with debunking information. Furthermore, increasing followers significantly boosts participation behavior and positively impacts the spread of rumor-debunking content, whereas directly highlighting the debunker's identity decreases retweets. Thus, expanding follower count to enlarge the potential audience is more effective for enhancing retweet rates (Chao *et al.*, 2021). Although rumor-busters with a larger number of followers are more effective in spreading rumor-debunking information, they also require more resources to promote and expedite their work, increasing the cost of refuting rumors. This has led to growing interest in developing AI tools that automatically generate content (Montoro-Montarroso *et al.*, 2023). However, existing studies have not further explored the underlying mechanisms between AI fact-checker and user participation behavior.

### 5.2.2 Research on AI-content and user engagement

In recent years, artificial intelligence (AI) has emerged as a prominent research focus across multiple disciplines. Scholars have extensively investigated user adoption and engagement with AI-generated content, as well as the acquisition and utilization of AI services. Their research can be categorized into two contrasting perspectives.

The first perspective maintains a positive stance toward the application of AI technology and its generated content. In the healthcare sector, AI-based tools have shown considerable accuracy in generating bibliographic information on topics such as heart failure, suicide prevention hotlines, and healthcare pilot projects (Boo and Oh, 2023; Kozaily *et al.*, 2024), providing a superior experience for stakeholders like clinicians, consumers, and researchers (Scott *et al.*, 2021). In the marketing sector, when consumers learn that the content is generated by AI, they exhibit higher expectations for technological innovation (Wood and Hoeffler, 2013) and emotional arousal (Berger and Milkman, 2012), leading to a stronger willingness to share and more sharing behavior. Similarly, in the virtual live streaming sector, perceived usefulness and trust positively impact users' emotional arousal and enhance the content experience, which in turn aids in information adoption (Liu *et al.*, 2024a). In the hospitality and tourism sector, tourists are generally receptive to AI-generated advertising and AI service providers, focusing more on the role of AI in creating content and augmenting AI to enable consumers to enjoy personalized value and co-creation experiences provided by AI services compared to using only human employees (Kong *et al.*, 2023; Song *et al.*, 2024; Vorobeva *et al.*, 2024). In the field of clothing and fashion, AI-based VR fashion catwalk design offers a stronger sensory experience and smoother screen design for users compared to traditional online fashion catwalks (Hong and Ge, 2022). In the business administration sector, chatbots provide personalized services to employees, such as problem-solving, coaching, psychological and emotional support, health tips, employee performance data, and HR-related issues, with employees likely developing positive attitudes towards chatbots (Pillai *et al.*, 2024). In the politics field, the use of AI language technology is acceptable, and AI-

generated legislative communications under human supervision are likely to be well received and increase voter trust compared to generic automated responses employed by busy legislators (Kreps and Jakesch, 2023).

The alternative perspective maintains a negative stance toward the application of AI technology and its generated content. The acceptance and trust in AI-generated content are not universal among users (Chi *et al.*, 2020; Gursoy *et al.*, 2019). Several factors contribute to this skepticism. Firstly, critics argue that artificial intelligence is unreliable and lacks the capability to adapt to variability, which renders it prone to inaccuracies and potentially irrelevant (Dietvorst *et al.*, 2015; Longoni *et al.*, 2019; Longoni *et al.*, 2020). For example, in the healthcare context, consumers exhibit a reluctance to engage with AI providers, fearing that the unique nuances of individual characteristics, circumstances, and symptoms may be overlooked (Longoni *et al.*, 2019). Furthermore, clinical content generated by AI has been found to contain factual inaccuracies, which significantly undermines patient confidence in its reliability as a source of clinical information (Labrague, 2024). Additionally, given that consumers perceive themselves as unique individuals confronting distinct decision-making challenges, the homogeneity of AI solutions is seen as incapable of addressing their personalized needs, leading to a general aversion to AI reliance (Longoni *et al.*, 2020).

Secondly, from an emotional standpoint, AI is perceived as deficient in empathy and experience (Castelo *et al.*, 2019; Longoni and Cian, 2022). This lack of empathy can influence customer attitudes and behaviors, impacting the potential benefits to businesses (Huang and Rust, 2021). In the domain of artificial intelligence customer service (AISC), the absence of empathy in communication has been shown to significantly bolster customer mistrust, leading to resistance and, in some cases, anger and service failure (Yam *et al.*, 2021; Yang *et al.*, 2023).

Thirdly, the insufficient consistency of artificial intelligence in expressing empathy may intensify users' doubts. For instance, an AI device's empathy response that is ill-suited to the interaction context may intensify distrust in the information it provides (Chin and Yi, 2022) .

Given the divergent scholarly perspectives on the impacts of AI-generated content—ranging from positive to negative—this paper aims to explore the dual-edged sword effect of AI fact-checking from both viewpoints. It explores how AI fact-checking influences users' engagement with content, both positively and negatively. It considers factors such as the perceived source credibility and the innovative image it presents. By examining both the advantages and potential downsides, the research aims to offer a balanced perspective on the role of AI in verifying information and its wider impact on user interaction and trust within digital platforms.

## 5.3 Research model and hypotheses

Building upon the theories of impression management and source credibility, this study investigates the influence of fact-checkers on user engagement toward rumor-debunking information through dual mediation process involving innovation image and perceived source credibility, while also exploring the moderating effects of AI literacy and confirmation bias. The research model is presented in Figure 5-1.

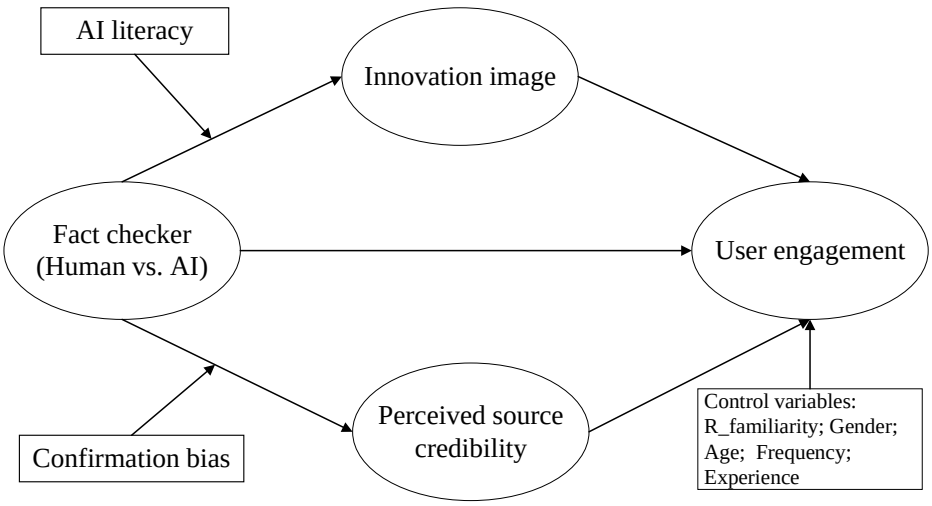



**Figure 5-1** Research model of study 3

### 5.3.1 Fact-checker and innovation image

Fridkin (2015) found that fact-checkers impact individuals' evaluations of the precision, utility, and manner of negative political ads. They expected a fact-check message is persuasive as the quality and the source of fact-checkers. A Fact-check message are more likely to involve a lot of evidence and to be viewed as originating from a credible source and expert source (Fridkin *et al.*, 2015). Yet the effectiveness of fact-checks in reducing misperceptions is not consistent, and research has demonstrated that the impact of different sources of fact-checking on opinion change varies (Liu *et al.*, 2023). For example, expert sources generally prove more effective than non-expert sources in diminishing beliefs in and curbing the dissemination of health misinformation (Walter *et al.*, 2021). Nowadays, the application of AI in fact-checking information is widely applied. As fact-checking message is expected to be persuasive, I still have limit knowledge towards the effect of different types of fact-checkers. Is the perceived credibility of debunking information published by human or AI the same?

Based on impression management theory, social interactions can be likened to a form of performance, wherein individuals portray themselves in specific manners to create desired impressions (Berger, 2014). Consumers frequently select products and behaviors that convey their preferred identities while steering clear of those that might express undesirable ones (Berger, 2014). People are inclined to engage in discussions regarding topics that remain unfamiliar to others, which involve recent occurrences and unexpected elements, as it enables them to project a more fashionable and cutting-edge image. Similarly, the adoption of novel high-tech products can serve as a remarkably effective indicator of an individual's technological proficiency and personal innovativeness in social contexts (Wood and Hoeffler, 2013). Therefore, I argue that compared to debunking message of human fact-checker, sharing AI content can enhance the image of innovation in the eyes of others. It means that when individuals become aware that a specific piece of content is produced through the utilization of AI, they perceive it as novel, cutting-edge, and innovative. Sharing content labeled as

"AI-generated" allows them to project an image of being forward-thinking, technologically adept, fashionable, and receptive to novelty. This contributes to enhancing their reputation for technological innovation in the eyes of others and subsequently increases their inclination to share. Conversely, upon discovering that certain content is authored by humans, individuals may feel that sharing such commonplace material does not yield positive social value of innovation. Consequently, their willingness to disseminate said content tends to be relatively diminished. Therefore, I argue that different types of fact-checkers will influence users' innovation image, thereby affecting individual engagement behaviors under exposure to fact-checking. Therefore, I propose the following hypothesis:

*H1a: Compared to human fact-checker, users believe that sharing content generated by AI fact-checker will enhance their innovation image.*

*H1b: Innovation image is the mediating variable between AI fact-checker and user sharing behavior. Users believe that sharing content generated by AI fact-checker will enhance their innovation image, thereby generating more sharing behavior.*

### 5.3.2 Fact-checker and perceived source credibility

Based on source credibility theory (Hovland and Weiss, 1951), various kinds of fact-checking sources are viewed with differing levels of credibility. While algorithms demonstrate the ability to swiftly identify and categorize false claims on a large scale, concerns arise regarding their accuracy due to the concise and inherently ambiguous nature of language within news reporting. Users might doubt the ability of machines to settle factual disputes, making them view AI-driven fact-checkers as less reliable than those operated by humans. Research also has indicated that individuals would have a reluctance towards the replacement of humans by AI, primarily due to AI's limitations in adjusting to changeable, unforeseeable, or distinctive situations (Longoni *et al.*, 2019). Additionally, concerns arise from its deficiency in empathy and experiential

capabilities (Castelo *et al.*, 2019). Moreover, the task of news production may be perceived as carrying moral implications, leading individuals to deem it unsuitable for AI to engage in ethical decision-making (Bigman and Gray, 2018).

Furthermore, some scholars assume that credibility assessment might rely on the transparency of the system, as users' perceptions and confidence in AI agents' judgments can be influenced by comprehending the reasoning process and factors behind their conclusions (Banas *et al.*, 2022; Rader *et al.*, 2018). Algorithmic decision-making is often perceived as an opaque "black box" (Burrell, 2016), and individuals' limited familiarity with automated fact-checking tools may impede their ability to discern the mechanisms by which AI systems authenticate claims. Consequently, individuals might perceive AI-based fact-checking sources as comparatively less credible than human source. Therefore, I propose the following hypothesis:

*H2a: Compared to human fact-checker, users perceive a decrease in the credibility of AI fact-checker.*

Users always interact with others through engagement, such as comment on the news, like the news, or recommend the news. I posit that the degree to which a user perceives credibility in a news article will in turn influence the news engagement. Therefore, I propose the following hypothesis:

*H2b: Source credibility mediates the relationship between AI fact-checker and user engagement behavior, as users' perception of decreased credibility in AI fact-checker subsequently reduces sharing behavior.*

### 5.3.3 The moderating effect of AI literacy

The term literacy was originally defined as "the ability to express ourselves and communicate using written language" (Kit *et al.*, 2021). In the current digital age, the concept of functional literacy has expanded to encompass a variety of emerging or diverse literacies (Buckingham, 1993; Hattwig *et al.*, 2013), including visual literacy, media literacy, and artificial intelligence literacy (Hattwig *et al.*,

2013; Kong, 2014; Siu-Cheung *et al.*, 2021). AI is swiftly becoming prevalent across numerous domains. To fully leverage AI-driven technologies and address associated ethical concerns, individuals need to possess a diverse set of knowledge, skills, and values related to AI (Smith *et al.*, 2012). These competencies, expertise, and principles have given rise to the concept of AI literacy (Long *et al.*, 2021). Scholars define it as a capability that empowers individuals to critically assess AI technologies, interact and collaborate efficiently with AI systems, and utilize AI as a practical tool in everyday life (Long and Magerko, 2020).

Building on the mediating role of the innovative image of science and technology as posited by H1b, this study further posits that users' AI literacy moderates the relationship between AI-generated debunking information and their sharing behavior. Empirical evidence suggests that AI-related news consumers can improve their AI literacy by actively participating in AI policy and regulatory processes (Liu *et al.*, 2024c). Within the realm of generative AI, users' AI literacy influences their interaction with AI tools, with those possessing higher AI literacy more inclined to utilize AIGC platforms for literature searches due to the superior content they provide (Zhou and Mi, 2024). AI literacy encompasses not only the utilization of AI capabilities but also the deepening of understanding to enable individuals to shape their comfort in life and assert subjectivity in the AI era (Yi, 2021). Studies have revealed that consumers perceive sharing their knowledge and use of high-tech products, such as AI, as a means to bolster their personal image regarding technological acumen and innovation, thus driving a strong motivation to share (Wood and Hoeffler, 2013). Consequently, this paper posits that AI literacy primarily modifies the mediating effect of innovation image on users' sharing behavior. Specifically, users with higher AI literacy are more likely to view sharing AI-generated debunking information as a means to project a positive innovative image, thereby increasing their sharing intentions. In contrast, users with lower AI literacy may not perceive a difference in personal image enhancement between sharing human-generated and AI-generated debunking information,

leading to no significant difference in sharing behavior between the two content types. Thus, I propose the following hypothesis:

*H3: AI literacy is a moderating variable in the influence of AI fact-checker on users' sharing behavior. Users with high AI literacy are more significantly influenced by AI-generated content in their sharing behavior compared to users with low AI literacy.*

### 5.3.4 The moderating effect of confirmation bias

Confirmation bias refers to the tendency of individuals to favor information that aligns with their pre-existing beliefs and preferences when processing data. This involves selectively searching for, interpreting, and remembering information in a way that supports their prior motivations (Adaval, 2001). Even when confronted with two equally plausible interpretations of the same information, individuals tend to perceive the one that aligns with their preexisting beliefs (Balcetis and Dunning, 2006). Beyond general psychological research (Dibbets and Meesters, 2022; Sleegers *et al.*, 2019), studies have demonstrated that confirmation bias influences various everyday behaviors, including personal information gathering and dissemination (Ling, 2020; Zhao *et al.*, 2020a); political engagement in electoral processes (Lerman and Acland, 2020; Millner *et al.*, 2020); investment and financial decision-making (Cafferata and Tramontana, 2019); and the accuracy of judgments in criminal investigations (Liden *et al.*, 2019; Ling, 2020). In the realm of online search (Knobloch-Westerwick *et al.*, 2015; Yin *et al.*, 2016; Zhao *et al.*, 2020b), confirmation bias is particularly significant as search result pages often present messages with divergent viewpoints. Consumers subconsciously filter information through their own beliefs or biases when confronted with these messages (Knobloch-Westerwick, 2015). Confirmation bias may also result in an increased perception of the usefulness of positive reviews when the overall product rating is high. Conversely, it can lead to a greater perception of the usefulness of negative reviews when the overall rating is low (Lei *et al.*, 2023). Reckoning with confirmation bias is imperative in comprehending the impact of

customers' own stances on their perception of messages (Cheung *et al.*, 2009; Qiu *et al.*, 2012).

Building on the hypothesis of the mediating role of source credibility as proposed in H2b, this paper further suggests that users' confirmation bias will moderate the relationship between AI generated debunking information and their sharing behavior. Individuals are not consistently motivated to critically assess the reliability and accuracy of online information (Metzger, 2007). Rather, they rely on specific content features and their search and comprehension of information to gauge the credibility of a website's information (Knobloch-Westerwick, 2015; Yin *et al.*, 2016). Research indicates that people generally perceive information confirming their beliefs as more credible, useful, and persuasive. For instance, parents often prefer information on childhood vaccinations that aligns with their existing beliefs. When faced with a list of information, individuals tend to selectively expose themselves to messages that confirm their prior beliefs over those that challenge them. This confirmation bias is evident not only in message selection but also in message evaluation (Meppelink *et al.*, 2019).

Based on this, this paper believes that confirmation bias primarily plays a moderating role by altering the intermediary path of perceived source credibility. Specifically, when users have a pre-existing positive attitude towards rumors, they have low demand for debunking information and are unwilling to accept contradictory information. In this case, the intermediary role of source reliability plays a major role, as users make engagement decisions by evaluating the credibility of debunking sources. Based on the assumption of H2a, compared to human-generated debunking content, they are even less willing to believe AI-generated debunking content. Therefore, I propose the following hypothesis:

*H4: Confirmation bias is a moderating variable in the influence of AI fact-checker on users' sharing behavior. Users with high positive level of confirmation bias are less inclined to believe and share AI-generated content compared to human-generated debunking content.*

## 5.4 Polit study

In order to identify potential issues and select suitable experiment material for three studies, we conducted a pilot study to assess participants' perception of the truthfulness, familiarity, and interest in each selected rumor. We recruited a total of 97 participants from the Credamo platform, a professional research and modeling integrated data platform with a sample size exceeding three million. We selected 9 news statements on social issues such as health, beauty and politics that were collected from famous fact check platforms and news platforms (See Table 5-1).

**Table 5-1** Nine statements for polit study

| Name | Statement | Source |
|---|---|---|
| R_1 | Heatstroke can be relieved by taking Huoxiang Zhengqi water. | Toutiao piyao (www.toutiao.com) |
| R_2 | The most suitable temperature for the air conditioner is 26℃. | Science Facts (https://piyao.kepuchina.cn/) |
| R_3 | Masks and cotton swabs contain graphene, which can be harmful to health. | Science Facts (https://piyao.kepuchina.cn/) |
| R_4 | It is dangerous to have an electrical substation near your home and you need to move your house. | China network Piyao platform (https://www.piyao.org.cn/) |
| R_5 | The risk of cancer increased by 43% for each additional CT scan. | Science Facts (https://piyao.kepuchina.cn/) |
| R_6 | You can spot a mole with dog tail grass. | China network Piyao platform (https://www.piyao.org.cn/) |
| R_7 | The US FDA has issued the latest notice to prohibit the import of irradiated food from Japan. | China Fact Check (https://chinafactcheck.com/) |
| R_8 | The U.S. government pays $2,000 a month to illegal immigrants. | Tencent (https://www.qq.com/) |
| R_9 | The three departments jointly issued a document to issue special agriculture-related subsidies for family farms. | China network Piyao platform (https://www.piyao.org.cn/) |

Participants are provided with instructions to assess the veracity and familiarity of 9 statements, while also indicating their inclination towards sharing these statements. Their assessments were recorded a 7-point Likert scale

ranging from 1 (very disagree) to 7 (very agree). The descriptive statistical results of three assessments are shown below (See Table 5-2).

**Table 5-2** The descriptive statistical results of three assessments

| Name | Perceived truthfulness | | | Perceived familiarity | | | Sharing behavior | | |
|---|---|---|---|---|---|---|---|---|---|
| | M | SD | Var | M | SD | Var | M | SD | Var |
| R_1 | 6.13 | 0.909 | 0.826 | 6.06 | 0.827 | 0.684 | 5.81 | 1.236 | 1.528 |
| R_2 | 5.73 | 1.279 | 1.636 | 5.84 | 1.106 | 1.223 | 5.55 | 1.472 | 2.167 |
| R_3 | 2.59 | 1.289 | 1.662 | 3 | 1.307 | 1.708 | 2.67 | 1.397 | 1.952 |
| R_4 | 3.54 | 1.809 | 3.272 | 3.88 | 1.763 | 3.11 | 3.43 | 1.892 | 3.58 |
| R_5 | 2.67 | 1.427 | 2.306 | 3.1 | 1.544 | 2.385 | 2.81 | 1.609 | 2.589 |
| R_6 | 2.37 | 1.577 | 2.486 | 2.62 | 1.686 | 2.843 | 2.61 | 1.687 | 2.846 |
| R_7 | 4.7 | 1.494 | 2.233 | 4.77 | 1.461 | 2.136 | 4.46 | 1.582 | 2.503 |
| R_8 | 2.45 | 1.465 | 2.146 | 2.6 | 1.511 | 2.285 | 2.66 | 1.45 | 2.103 |
| R_9 | 4.71 | 1.876 | 3.52 | 4.59 | 1.824 | 3.328 | 4.59 | 1.886 | 3.557 |

Study (i) aimed to investigate the dual underlying mechanisms explaining the association between fact-checker (human vs. AI) and user engagement. To fulfill the experimental objectives, we selected the news exhibiting the highest variability in user participation behavior among nine news statements as the experimental stimulus, namely R_4 (“It is dangerous to have an electrical substation near your home and you need to move your house.”).

Study (ii) aimed to investigate the moderating mediated role of AI literacy between the association between fact-checker (human vs. AI) and user engagement. To mitigate the influence of news authenticity on the AI literacy report, we have opted for news statements that possess a moderate level of truthfulness, namely R_5 (“The risk of cancer increased by 43% for each additional CT scan.”).

Study (iii) aimed to investigate the moderating mediated role of confirmation bias between the association between fact-checker (human vs. AI)

and user engagement. To accurately assess users' pre-existing attitudes towards news, we selected the statement that are most familiar to them, namely R_1 ("Heatstroke can be relieved by taking Huoxiang Zhengqi water.").

## 5.5 Study (i): Dual mediating effects testing

Study (i) aimed to investigate the dual underlying mechanisms explaining the association between fact-checker (human vs. AI) and user engagement. A two-cell, between-subject design was employed to examine H1 and H2.

### 5.5.1 Method

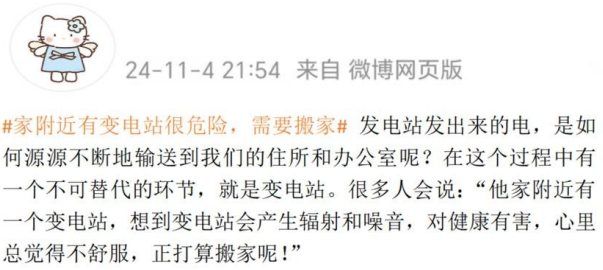
***Participants.*** We recruited a total of 97 participants from the Credamo platform, a professional research and modeling integrated data platform with a sample size exceeding three million. The majority of participants were young individuals aged between 21 and 30 (47.8%) or between 31 and 40 (42.2%). More than half of the participants use social media for more than three hours a day, and 92.2% of them have read content generated by AI.

***Experiment manipulations.*** We mimic the posts on social media platform, such as Weibo, to manipulate the fake news and debunking message to test the hypotheses (see Figure 5-2). The fake news and debunking content are from China network Piyao platform[1], which collect most kinds of popular fake news. In the human fact-check group, we release debunking information through the "Headline News" account; while in the AI fact-checker group, we release debunking information through the "Headline News AI Account". Apart from the different release accounts, all other information of these two groups is the same. Then we use the options, such as the share, commend and like button, to increase the face validity of experiment design.

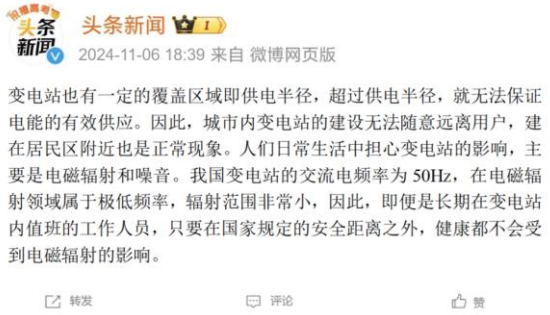
Subjects were randomly assigned to one of two debunking message scenarios (AI vs. Human fact-checker). The stimuli were visible for at least 10 seconds. After participants completed reading, they were asked to do the

[1] https://www.piyao.org.cn/2020-09/15/c_1210800664.htm

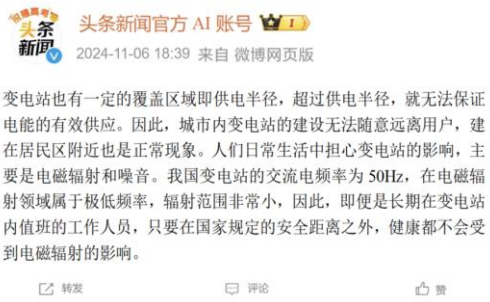
questionnaire about the manipulation check and dependent variables measurements.




(a) fake news




(b) Debunking by human




(c) Debunking by AI

**Figure 5-2** The experiment design in Study (i)

***Measures.*** The dependent variable is user's engagement toward debunking message. We assessed participants' engagement using four items rated on a seven-point scale ("I would share this debunking message to my friends." "I would share this debunking message on social media." "I would commend this debunking message." "I would like this debunking message."), with response options ranging from 1 (very disagree) to 7 (very agree)(Kim and Dennis, 2019). These items were subsequently averaged to establish the construct of user's engagement ($\alpha = 0.781$).

Additionally, we assessed two mediators: innovation image and perceived source credibility. Innovation image was measured using three items rated on a seven-point scale ("If I share the aforementioned debunking message within my social network, others will perceive me as (a) technologically proficient, (b)

highly innovation and receptive to novel concepts, (c) forward-thinking and trendsetting."), with response options ranging from 1 (very disagree) to 7 (very agree) (White and Peloza, 2009). These items were subsequently averaged to establish the construct of innovation image ($\alpha = 0.724$). Perceived source credibility was measured using three items rated on a seven-point scale ("The source of the debunking message is credible." "The source of the debunking message is trustworthy." "The source of the debunking message is reputable." 1= very disagree, 7= very agree) (Xu, 2013). These items were subsequently averaged to establish the construct of perceived source credibility ($\alpha = 0.751$).

Five variables were included in the model as statistical controls: age, gender, frequency of using social media, experience of reading AI-generated content and rumor familiarity. Specifically, frequency of using social media was measured by asking participants what is the average frequency of your daily use of social media, which was categorized as follows: 1=<1 hour; 2= 1-2 hours; 3=2-3 hours; 4= 3-4 hours; 5= >4 hours. Experience of reading AI-generated content was measured by asking participants have you ever read information posted by AI accounts on platforms such as Weibo. Rumor familiarity was measured using the following item ("I have encountered the same information". 1= very disagree, 7= very agree).

### 5.5.2 Results and analysis

***Manipulation check.*** In order to examine the manipulation of fact-checker, we presented the query, "Which source do you read the debunking message from?". Except for one participant, all the other participants passed the test with an accuracy rate of 98.99%. The manipulation test yielded satisfactory results and we proceed with further analysis to test our hypotheses.

***Research analysis.*** A one-way analysis of variance (ANOVA) was conducted to examine the relationship between fact checker and innovation image, revealing a significant model ($F(1, 83) = 4.12, p = 0.045, \eta^2 = 0.047$), supporting H1a. This means that compared with human-fact checker, users believe that sharing the debunking message released by AI-fact checker can

enhance their image of technological innovation ($M_{AI}$ = 5.57, $M_{Hunam}$ = 5.26). Additionally, another ANOVA examining the impact of fact checker on perceived credibility yielded a significant model ( $F(1, 83) = 6.29, p = 0.014, \eta^2 = 0.07$), supporting H2a. This means that compared with human-fact checker, users perceive the debunking message posted by AI-fact checker to be less credibility ($M_{AI}$ = 5.42, $M_{Hunam}$ = 5.82).

Then in order to investigate the underlying mechanism between fact checker and user's engagement, we conducted a dual mediation analysis. We employed PROCESS Model 4 (Hayes, 2017) to perform a dual mediation analysis with fact checker as the independent variable, user's engagement as the dependent variable, innovation image and perceived source credibility as mediators, and age, gender, confirmation bias and frequency of hospital visits as covariates. Figure 5-3 illustrates the path analysis conducted in this study.

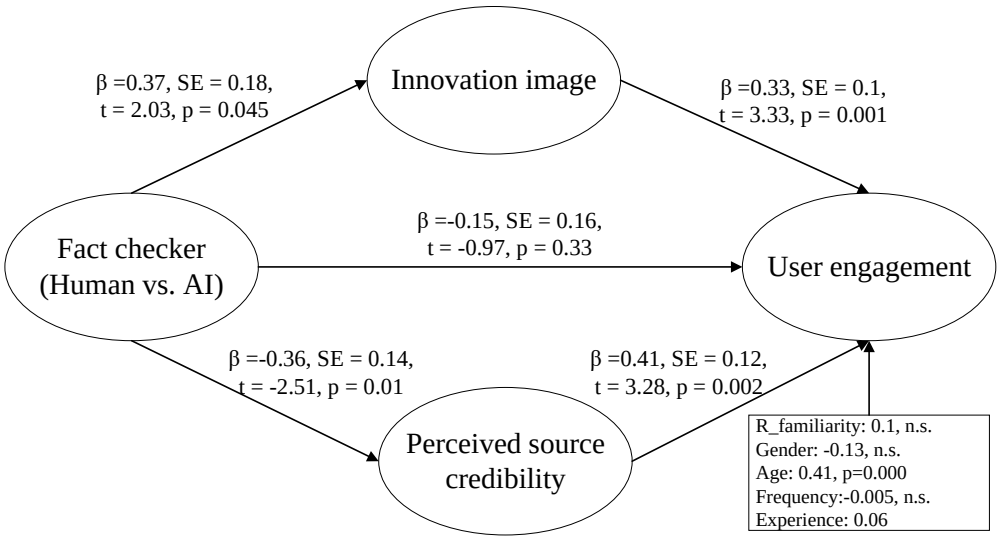



**Figure 5-3** Results from dual mediational analysis of study (i)

By utilizing bootstrapping with 5,000 samples, it shows significant indirect effect of fact checker on user's engagement through the mediating roles of innovation image (index = 0.12, SE = 0.07, 95%CI [0.004, 0.273]) and perceived source credibility (index = -0.15, SE = 0.08, 95%CI [-0.32, -0.03]),

thereby providing support for H1b and H2b. The findings demonstrate that the relationship between fact-checkers and user's engagement follows divergent paths. Specifically, sharing AI-generated debunking content enhances the perception of innovation image, thereby promoting sharing behavior. Conversely, reducing user's perception of source credibility diminishes their inclination to share.

## 5.6 Study (ii): the moderating mediated role of AI literacy

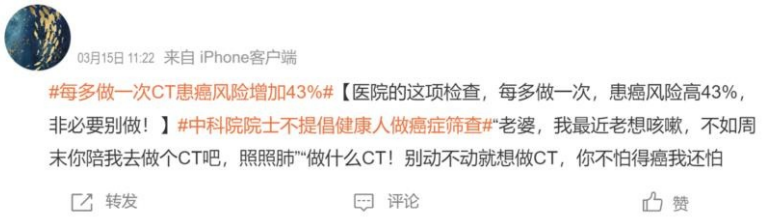
Study (ii) aimed to investigate the moderating mediated role of AI literacy between the association between fact-checker (human vs. AI) and user engagement. A two-cell, between-subject design was employed to examine H3.

### 5.6.1 Method

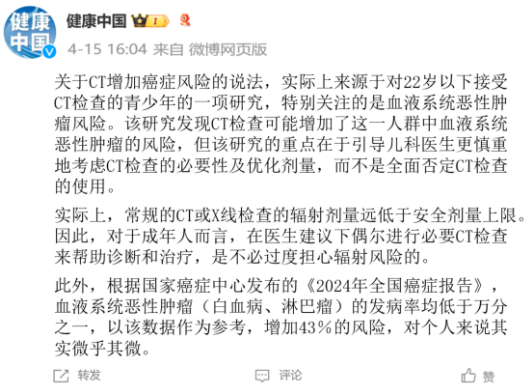
***Participants.*** We recruited a total of 194 participants from the Credamo platform, a professional research and modeling integrated data platform with a sample size exceeding three million. The majority of participants were young individuals aged between 21 and 30 (51%) or between 31 and 40 (33.5%), which are active on social media.

***Experiment manipulations.*** Similar with Study (i), we still mimic the posts on social media platform to manipulate the fake news and debunking message to test the hypotheses (see Figure 5-4). The fake news and debunking message are from China network Piyao platform[2]. Then we use the options, such as the share, commend and like button, to increase the face validity of experiment design. The experiment process is the same with Study (i). Subjects were randomly assigned to one of two debunking message scenarios (AI vs. Human fact-checker). The stimuli were visible for at least 10 seconds. After participants completed reading, they were asked to do the questionnaire about the manipulation check and dependent variables measurements.

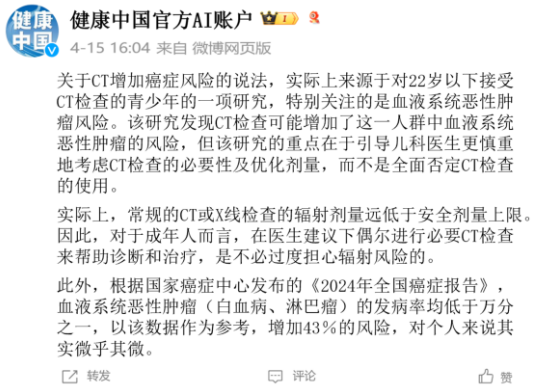
[2] https://www.piyao.org.cn/2020-09/15/c_1210800664.htm




(a) fake news




(b) Debunking by human




(c) Debunking by AI

**Figure 5-4** The experiment design of study (ii)

***Measures.*** The measurements of user's engagement (α = 0.827), innovation image (α = 0.811) and perceived source credibility (α = 0.824) are the same of study (i).

The moderating variable of AI literacy was measured using five items rated on a seven-point scale (a typical item is that "I know AI can be used to generate text or images." 1= very disagree, 7= very agree) (Liu *et al.*, 2024b). These items were subsequently averaged to establish the construct of AI literacy (α = 0.705).

Four variables were included in the model as statistical controls: age, gender, frequency of hospital visits, and rumor familiarity. Specifically, the frequency of hospital visits was measured by asking participants, "How many times have you been to the hospital in the past six months?", which was categorized as follows: 1=<0; 2= 1-2 times; 3=3-4 times; 4= 5-7 times; 5= 8-10

times; 6= >10 time. Rumor familiarity was measured using the following item ("I have encountered the same information". 1= very disagree, 7= very agree).

### 5.6.2 Results and analysis

***Manipulation check.*** In order to examine the manipulation of fact-checker, we presented the query, "Which source do you read the debunking message from?". In the AI-fact checker group, only one participant answered incorrectly, with a correct rate of 98.97%. In the human-fact checker group, the correct rate is 91.75%. The manipulation test yielded satisfactory results and we proceed with further analysis to test our hypotheses.

***Research analysis.*** Firstly, we employed PROCESS Model 4 to verify the results of study (i). By utilizing bootstrapping with 5,000 samples, it shows significant indirect effect of fact checker on user's engagement through the mediating roles of innovation image (index = 0.14, SE = 0.07, 95%CI [0.005, 0.29]) and perceived source credibility (index = -0.16, SE = 0.07, 95%CI [-0.30, -0.02]), thereby providing support for H1 and H2.

Further, we employed PROCESS Model 1 (Hayes, 2017) to conduct a moderating analysis, investigating the interactive effect between fact-checker and AI literacy. The results revealed a significant moderating effect of AI literacy on the relationship between fact checker and innovation image ($\beta$ = 0.55, $t$ = 2.04, $p$ = 0.04). The moderating effect was illustrated in Figure 5-5. Specifically, when users have low AI literacy, the indirect effect of fact-checker on user's engagement through the mediating factor of innovation image is not significant (95%CI [-0.255, 0.444]); however, when users have high AI literacy, the indirect effect through innovation image becomes significant (index = 0.53, SE = 0.18, 95%CI [0.167, 0.895]).

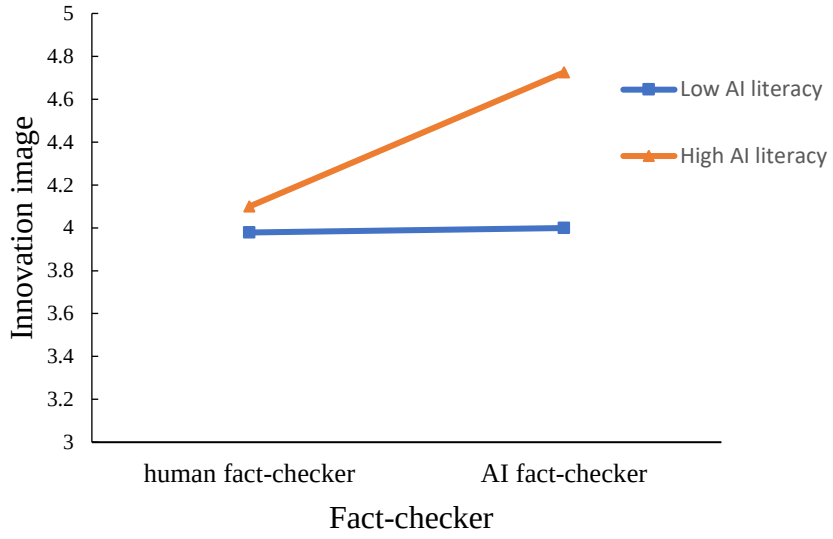



**Figure 5-5** Moderate effect of AI literacy

Lastly, we investigate the moderating effect of AI literacy on user's engagement by conducting a moderated mediation analysis using PROCESS Model 7 to test H3 (Hayes, 2017). The path analysis is illustrated in Figure 5-6. Consistent with our hypothesis, bootstrapping with 5,000 samples revealed a significant moderated mediation effect of AI literacy on the relationship between fact checker and user's engagement (index = 0.29, SE = 0.14, 95%CI [0.025, 0.581]), supporting H4. Specifically, when users have low AI literacy, the indirect effect of fact-checker on user's engagement through the mediating factor of innovation image is not significant (95%CI [-0.134, 0.224]); however, when users have high AI literacy, the indirect effect through innovation image becomes significant (index = 0.28, SE = 0.10, 95%CI [0.092, 0.490]). Moreover, we also test the moderating effect of AI literacy between fact-checker and user's engagement through the mediating factor of perceived source credibility. The result is not significant (95%CI [-0.240, 0.474]). Therefore, our findings indicate that AI literacy primarily plays a moderating role by altering the intermediary path of innovation image, whereby users with higher AI literacy are more inclined to believe that sharing debunking information generated by

artificial intelligence can bring about a positive innovation image and thus generate a greater willingness to share content.

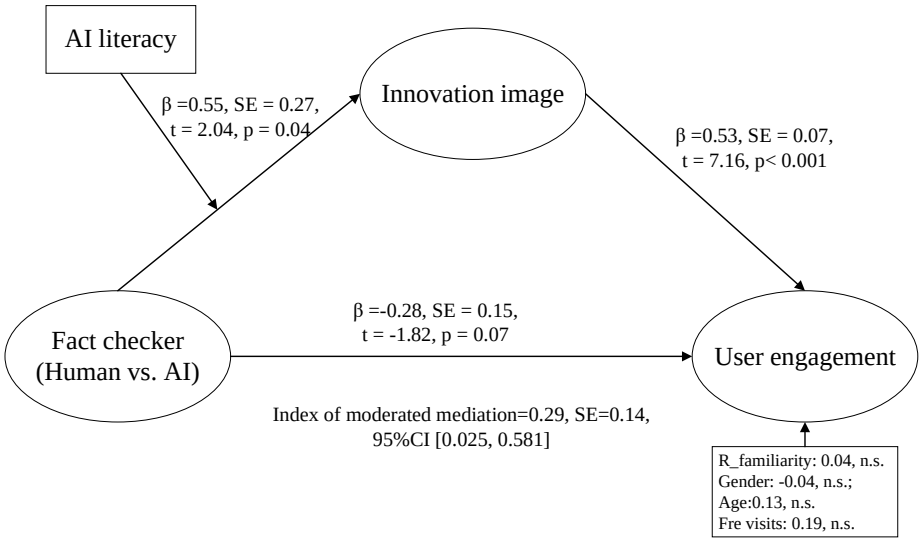



**Figure 5-6** Results from the moderated mediating analysis of study (i)

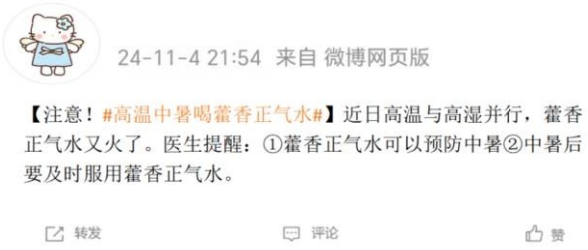
## 5.7 Study (iii): the moderating mediated role of confirmation bias

Study (iii) aimed to investigate the moderating mediated role of confirmation bias between the association between fact-checker (human vs. AI) and user engagement. A two-cell, between-subject design was employed to examine H4.

### 5.7.1 Method

***Participants.*** We recruited a total of 97 participants from the Credamo platform, a professional research and modeling integrated data platform with a sample size exceeding three million. The majority of participants were young individuals aged between 21 and 30 (49%) or between 31 and 40 (36%). More than half of the participants use social media for more than three hours a day, and 87% of them have read content generated by AI.

***Experiment manipulations.*** Similar with Study (i), we still mimic the posts on social media platform to manipulate the fake news and debunking message to test the hypotheses (see figure 5-7). The fake news is from China network Piyao platform[3]. Then we use the options, such as the share, commend and like button, to increase the face validity of experiment design. The experiment process is the same with Study (i). Subjects were randomly assigned to one of two debunking message scenarios (AI vs. Human fact-checker). The stimuli were visible for at least 10 seconds. After participants completed reading, they were asked to do the questionnaire about the manipulation check and dependent variables measurements.




(a) fake news


(b) Debunking by human (c) Debunking by AI

**Figure 5-7** The experiment design of study (ii)

[3] https://www.piyao.org.cn/2020-09/15/c_1210800664.htm

***Measures.*** The measurements of user's engagement (α = 0.906), innovation image (α = 0.818) and perceived source credibility (α = 0.842) are the same of study (i).

The moderating variable of confirmation bias was measured by multiplying the news's importance to the participant (You think the issue described in the news is important. 1= very disagree, 7= very agree) by the participant's position on the news (-3 = extremely negative to +3 = extremely positive) (Kim and Dennis, 2019). Thus, it ranged from -21 to 21.

Five variables were included in the model as statistical controls: age, gender, frequency of using social media, experience of reading AI-generated content and rumor familiarity. Specifically, frequency of using social media was measured by asking participants what is the average frequency of your daily use of social media, which was categorized as follows: 1=<1 hour; 2= 1-2 hours; 3=2-3 hours; 4= 3-4 hours; 5= >4 hours. Experience of reading AI-generated content was measured by asking participants have you ever read information posted by AI accounts on platforms such as Weibo. Rumor familiarity was measured using the following item ("I have encountered the same information". 1= very disagree, 7= very agree).

### 5.7.2 Results and analysis

***Manipulation check.*** In order to examine the manipulation of fact-checker, we presented the query, "Which source do you read the debunking message from?". Both the AI AI-fact checker group and the human human-fact checker group have passed the detection of this question with an accuracy rate of 100%. The manipulation test yielded satisfactory results and we proceed with further analysis to test our hypotheses.

***Research analysis.*** We employed PROCESS Model 1 (Hayes, 2017) to conduct a moderating analysis, investigating the interactive effect between fact-checker and confirmation bias. The results revealed a significant moderating effect of confirmation bias on the relationship between fact checker and perceived source credibility ($\beta$ = -0.43, $t$ = -0.37, $p$ = 0.02). The moderating

effect of confirmation bias was illustrated in Figure 5-8. Specifically, when users have a high negative confirmation bias, that is, they strongly disagree with the rumor information, the indirect effect of fact-checker on users perceive source credibility is not significant (95%CI [-0.213, 0.807]); however, when users have a highly positive preconceived attitude towards rumors, that is, they strongly agree with the false information, the indirect effect becomes significant (index = -0.554, SE = 0.26 95%CI [-1.061, -0.047]). It means that when users have a pre-existing positive attitude towards rumors, they have low demand for debunking information and are unwilling to accept contradictory information. Compared to human-generated debunking content, they are even less willing to believe AI-generated debunking content.

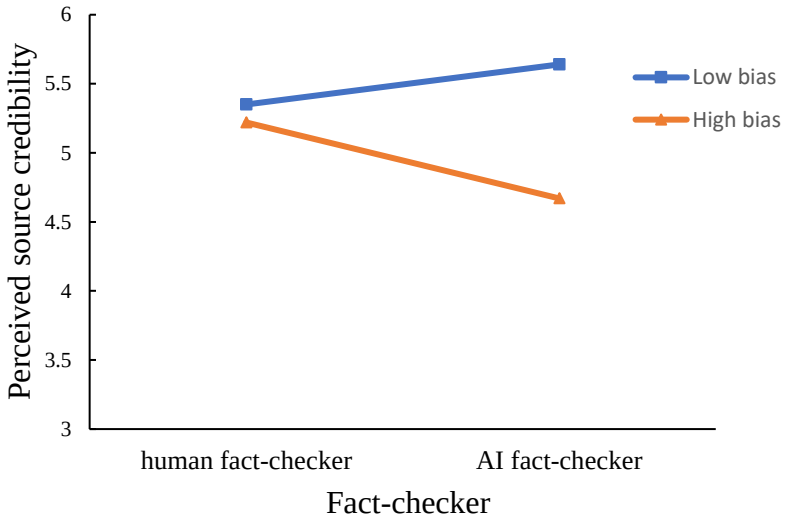



**Figure 5-8** Moderate effect of confirmation bias

Furthermore, in order to investigate the role of confirmation bias on user's engagement, we conducted a moderated mediation analysis using PROCESS Model 7 to test H4. We set users engagement as dependent variable, fact-checker as independent variable, innovation image and perceived source credibility as mediators, and confirmation bias as moderator. Consistent with our hypothesis, bootstrapping with 5,000 samples revealed a significant moderated mediation effect of confirmation bias on the relationship between fact

checker and user's engagement via the mediating role of perceived source credibility (index = -0.272, SE = 0.11, 95%CI [-0.503, -0.086]), supporting H4. The path analysis is illustrated in Figure 5-9. Specifically, when users have a high negative confirmation bias, the indirect effect of fact-checker on user's engagement through the mediating factor of perceived source credibility is not significant (95%CI [-0.067, 0.446]); however, have a highly positive preconceived attitude towards rumors, the indirect effect through perceived source credibility becomes significant (index = -0.35, SE = 0.17, 95%CI [-0.723, -0.046]). Therefore, our findings indicate that confirmation bias primarily plays a moderating role by altering the intermediary path of perceived source credibility, whereby when users have a pre-existing positive attitude towards rumors, compared to human-generated debunking content, they are even less willing to believe and share AI-generated debunking content.

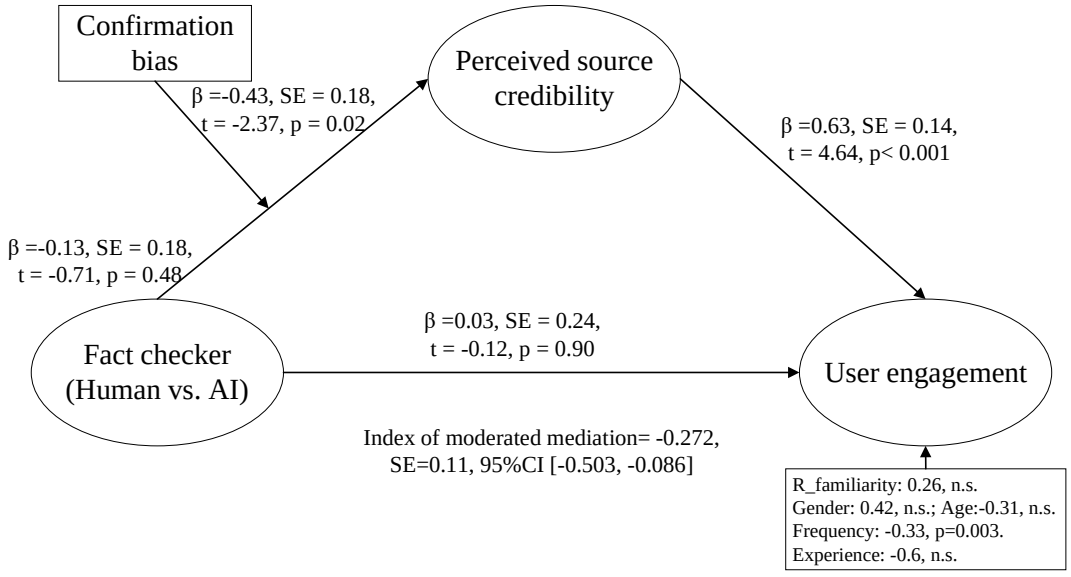



**Figure 5-9** Results from the moderated mediating analysis of study (ii)

## 5.8 Discussion and conclusion

In recent years, AI has become a prominent research focus in multiple domains. Researchers have been actively investigating user engagement and involvement in AI-produced content, as well as the acquisition and utilization of AI services. Building upon the impression richness theory and source credibility theory, this study employs a polit study and three online experiments to conduct moderating and mediating analyses in order to investigate the dual mediation process involving innovation image and perceived source credibility in shaping the impact of AI fact-checker on users' engagement behavior, while also exploring the moderating effects of AI literacy and confirmation bias. Our findings strongly support the theoretical model proposed in this study. The results of hypothesis testing are summarized comprehensively in Table 5-3.

**Table 5-3** Summary of hypothesis testing

| Hypotheses | Results |
|---|---|
| H1a: Compared to human fact-checker, users believe that sharing content generated by AI fact-checker will enhance their innovation image. | Supported |
| H1b: Innovation image is the mediating variable between AI fact-checker and user sharing behavior. | Supported |
| H2a: Compared to human fact-checker, users perceive a decrease in the credibility of AI fact-checker. | Supported |
| H2b: Source reliability mediates the relationship between AI fact-checker and user engagement behavior. | Supported |
| H3: AI literacy is a moderating variable in the influence of AI fact-checker on users' sharing behavior. | Supported |
| H4: Confirmation bias is a moderating variable in the influence of AI fact-checker on users' sharing behavior. | Supported |

To reveal the underlying mechanism behind users' participation and behavioral decisions when faced with debunking information released by AI or humans, this paper presents three novel findings. Firstly, I analyzed two

different mediating mechanisms of the relationship between fact-checkers and users' engagement behavior through a model, revealing the double-edged sword effect of AI-generated content. Specifically, on the one hand, users believe that sharing AI-generated debunking message can enhance their image of technological innovation in the eyes of others, thus increasing their inclination and actions towards sharing. On the other hand, users may also question the credibility of AI-generated debunking message, thereby reducing the willingness and activities to share. Secondly, the moderating role of AI literacy was validated, indicating that individuals with higher AI literacy are more inclined to believe that sharing debunking information generated by AI can bring about a positive innovation image and thus generate a greater willingness to share. Thirdly, the moderating role of confirmation bias was substantiated, indicating that when users have a pre-existing positive attitude towards rumors, compared to human-generated debunking content, they are even less willing to believe and share AI-generated debunking content.

### 5.8.1 Theoretical implications

This study contributes to the existing literature on AI-generated content and users' news engagement behaviors by making three theoretical advancements. Firstly, grounded in impression management theory and source reliability theory, this study offers a robust theoretical framework that elucidates two distinct mechanisms—namely, the mediating path of innovation image and perceived source credibility—through which various types of fact-checkers enhance user engagement. This research is different from the existing literature, which usually only explores the positive or negative impact of AI-generated content on user participation behavior (Castelo *et al.*, 2019; Wood and Hoeffler, 2013). This represents an extension and enhancement of current artificial intelligence studies in content creation, contributing to a deeper comprehension of how users psychologically perceive and behaviorally react to AI-generated products or services.

Secondly, different from analyzing the user's personal image perception from the central cue of the content itself (Berger, 2014), this study finds that the types of fact-checker (AI vs. human) as a peripheral cue can also enhance

consumers' image of innovation and thereby promote consumers to engage in more sharing behaviors. It is a further extension and application of the impression management theory and source reliability theory in the context of AI, which can provide reference for other scholars to understand consumers' differential perception of AI-generated content and traditional content.

Thirdly, this research examines and establishes that AI literacy and confirmation bias serve as boundary conditions influencing how AI-generated content impacts users engagement behavior. By proposing these two moderating variables within the framework of the dual mediating mechanism, the study maintains a consistent research context and theoretical coherence while also enhancing its external validity across diverse user groups and content domains. This contributes to a more comprehensive and systematic understanding of the factors influencing user sharing behavior in the realm of artificial intelligence.

### 5.8.2 Practical implications

Given the far-reaching consequences of fake news across multiple domains and the widespread use of AI-generated services, government institutions and mainstream media are making concerted efforts to explore the efficacy of fact-checking in combating the dissemination of fake news. The results of this research carry substantial implications for practitioners striving to improve the effectiveness of fact-checking.

Firstly, the results from this study provide evidence for the double-edged sword effect of AI fact-checker on user engagement behaviors by establishing a dual mediation model involving innovation image and perceived source credibility. Practitioners need to take a comprehensive view of the impact brought by the types of fact checkers. On one hand, users believe that sharing AI-generated debunking message can enhance their image of technological innovation in the eyes of others. Therefore, the debunking information on the topics that are of interest to that part of the young user group that pursues innovation and avant-garde can be generated by AI. On the other hand, practitioners also need to pay attention to the groups that hold a negative attitude towards the disclosed content generated by AI, and gradually establish

their trust in AI-generated content, such as by making the algorithm transparent and establishing a user feedback mechanism.

Secondly, our study establishes that AI literacy and confirmation bias serve as boundary conditions influencing how AI-generated content impacts users engagement behavior. It means that users with a higher level of AI literacy are more willing to share the debunking information generated by AI. Therefore, practitioners can focus on pushing information to this type of users. Moreover, confirmation bias is also influencing user's engagement. Therefore, practitioners can carry out training courses or workshops to enhance users' understanding of AI technology and information verification, and at the same time hold lectures on the hazards of sharing fake news to reduce confirmation bias.

### 5.8.3 Limitation and future research

This study also presents certain limitations, which provide opportunities for future research. Firstly, this study primarily investigates the influence mechanism of the static fact-checker type. However, the efficacy and strategy selection of fact-checking evolve with the dynamic development of rumors. Future research could consider the impact of the rumor life cycle on the strategy selection for AI fact-checking.

Secondly, regarding the expansion of the dependent variable, this study primarily examines users' engagement in debunking information, which indirectly indicates the effectiveness of fact-checking. Consequently, future research could delve into how users assess the fakeness of the news they encounter following exposure to the debunking information. Since fact-checking information is designed to communicate the authenticity of news articles to participants, it would be beneficial to have them report their judgments on the degree of fakeness of the news articles as a measure of the disclosed information's effective.

Thirdly, further research can be conducted on the engagement decision-making scenarios of users when they frequently encounter the same rumor and frequently come into contact with AI-generated content. Repeated exposure to the statement would increase its perceive truth and thereby reduce the effective

of debunking information. When users are frequently exposed to AI-generated content, they may become accustomed to it, potentially changing the dual mediating roles. Therefore, future studies could explore these diverse scenarios to expand the scope of research.

# Chapter 6 Conclusion

This thesis investigates user engagement behaviors on social media platforms affected by fake news dissemination through three studies. The first two studies explored user interactions with online news in environments rife with fake news, while the third study examined engagement with rumor-debunking content.

In particular, **Study 1** examined the effect of news quality on users' risk perceptions regarding online news, as well as its subsequent impact on perceived credibility and user engagement in news sharing. This was achieved by applying the Social Amplification of Risk Framework and utilizing Structural Equation Modeling. Furthermore, I examined the moderating roles of fake news awareness and social tie diversity. The results showed that the impact of news quality on users' news-sharing behavior is sequentially mediated by risk perception and perceived credibility. People who have a higher awareness of fake news or a more varied social network tend to be more likely to recognize the risks involved in sharing news and to doubt the authenticity of the news.

In **Study 2**, guided by Media Richness Theory, the negative binomial regression model and the Tobit model were utilized to examine how textual and pictorial IC affects user engagement. I also explored the moderating roles of content type (natural or cultural landscape), complexity of discussed travel destination, and posters' verification status, using data collected from the Weibo platform. The findings indicated that textual IC has a significant positive impact on user engagement, whereas pictorial IC has a significant negative impact. Additionally, the complexity of the travel destination and posters' verification status positively influence the effects of both textual and pictorial IC on user engagement.

In **study 3**, drawing on the theories of impression management and source credibility, a pilot study and three experiments were carried out to examine how fact-checkers impact user engagement with rumor-debunking information. This investigation utilized a dual mediation process that involves innovation image and perceived source credibility and explored the boundary conditions under these mechanisms. The findings revealed a substantial indirect impact of fact-checkers on user engagement, mediated by innovation image and perceived source credibility. AI literacy mainly functions as a moderator, influencing the intermediary pathway of innovation image, while confirmation bias also acts as a moderator, affecting the intermediary pathway of perceived source credibility.

Theoretically, these findings enrich the existing literature on users' news engagement behaviors and AI-generated debunking information. They offer a more comprehensive and systematic understanding of the factors that influence user sharing behavior in the context of artificial intelligence and fake news. Additionally, these insights have significant implications for practitioners seeking to curb the spread of fake news and enhance the efficacy of fact-checking efforts.

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