Computers in Human Behavior 127 (2022) 107080

Contents lists available at ScienceDirect

Computers in Human Behavior

journal homepage: www.elsevier.com/locate/comphumbeh

Predicting reposting latency of news content in social media: A focus on issue attention, temporal usage pattern, and information redundancy☆

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ARTICLE INFO

Keywords:
Reposting latency
News content
Social media
Issue attention
Information redundancy

ABSTRACT

Social media platforms are increasingly being used as important sources for obtaining various types of information in the current digital age. While an increasing number of studies have investigated the factors that influence user's news content sharing behavior, few have paid attention to the reposting latency of online news contents. Reposting latency refers to the delay of interval time between original post publish time and repost time. Reposting activity on social media is an important type of user feedback behavior to the message received. The speed of the response could reflect user's processing efficiency and capacity. This study examined the possible factors that may influence users' reposting latency of news contents on social media. In doing so, we employed a multilevel negative binomial model to examine the impacts of issue attention, temporal usage pattern, and information redundancy. Our findings show that multiple issues could distract user's attention, thus leading to the low reposting speed. We also found a distributed temporal usage pattern could help shorten reposting time, while information redundancy and information overload could increase the reposting latency of news contents on social media. The findings of this study can contribute to advancing the understanding of news consumption behavior on social media. The conclusions have the potential to help in explaining and further predicting the success of news diffusion.

Social media platforms are increasingly being used as important sources for obtaining various types of information in the current digital age. Apart from the entertainment purposes, social media has also seen a great deal of usage for news about health, disaster, crises, job searching, education, and so on (Ma et al., 2014; Zhu et al., 2020). Compared to traditional news media, social media enables participation and interaction for users while they consume news content. Users can interact with each other in various ways, such as by reposting news stories, leaving comments, and clicking the "like" button. Among these interactive activities, news reposting, also called news sharing, is the most common one. According to Pew Internet and American Life Project, 72% of online news consumers say they have received news shared through a social media platform at least once, and half of them get news from social media "often" or "sometimes" (Shearer & Mitchell, 2021). In fact, news sharing is replacing news searching as the most important online news consumption procedure (Olmstead et al., 2011).

Previous news consumption studies have investigated the unique patterns of online news consumption on social media. Horan (2013) found that although the volume of soft news information on Twitter was more than double that of hard news, social media users preferred "producing" hard-news topic contents and "consuming" soft news. This indicates a big difference in news-sharing patterns among various news topics. Scholars have also found that an individual's usage pattern and network structure could determine their news reposting behavior (Kümpel et al., 2015; Zhu et al., 2020). For example, in Liang and Fu's (2019) study, while network redundancy was positively associated with news reposting probability, it was also positively correlated with information redundancy, which in turn, decreased the chance of news sharing.

While studies have been increasingly investigating the factors that influence users' news-content sharing behavior, few have paid attention to the reposting latency of online news content. Social networking sites

☆ This work was partially supported by City University of Hong Kong SRG 7005702, Laboratory for AI-Powered Financial Technologies, and Tencent S-Tech Academic Support Plan—Internet Communication Project.

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https://doi.org/10.1016/j.chb.2021.107080
Received 17 January 2021; Received in revised form 24 August 2021; Accepted 22 October 2021
Available online 26 October 2021

have been theorized as a new form of the public sphere in which individuals construct a public profile and freely discuss societal problems (Brantner et al., 2021; Habermas, 1962), and these sites are becoming the most common spaces for users to share, discuss, and further contribute to news dissemination. However, timeliness is an essential factor for news value and news spreading. Late reposting of news content may hinder its diffusion speed in the local network structure and ultimately determine whether the news story will arouse a society-wide burst of public attention (Fan et al., 2020; Zhu et al., 2020).

Reposting activity on social media is also an important type of user feedback behavior about the message received. The speed of response could reflect the user's processing efficiency and capacity (Fazio, 1990). Since social media provides users with diverse information, they can get access to every topic of news content only if they want it. However, the limited capacity model (Lang, 2000) suggests that people have limited capacities for processing such information in terms of their attention, perception, memory, etc. How to efficiently process the overwhelming amount of news content on social media has also become an essential problem for news consumption research.

The goals of this study were to quantify individuals' reposting latency of news content and examine the possible factors that determine the latency. To do this, we used Twitter as our case study platform and collected and analyzed its users' online activity traces. We employed multilevel regression analysis to examine the associations of several factors with reposting latency, including issue attention, user temporal usage pattern, information redundancy, and information overload.

The findings of this study could contribute to filling the research gap concerning reposting latency on social media. Late reposting of news content may hinder the chain of diffusion and, consequently, do harm to news timeliness. Whereas few studies have paid attention to the factors that cause reposting latency, the present study could extend our understanding of this information consumption phenomenon and its causal factors. In addition, this study could have practical implications for news sources (e.g., media outlets, key opinion leaders) to build their own social media strategies. Further, the findings of this study could provide insight into how news topic, issue diversity, temporal digital usage pattern, and information relevance influence the news diffusion process. The conclusions have the potential to explain and predict the success of news diffusion.

1. Literature review

1.1. Response latency of user feedback behavior on social media

Response latency and response time are frequently used as measures in social science, especially in cognitive psychology. Both terms are measured as the time interval between the stimulus's set-up and the subject's response (Fazio, 1990), though the former refers particularly to a delay in the interval between these two points in time. The explanation and interpretation of response latency depend on the essence of the context, mainly based on the principles of study design and deductive logic (Pachella, 1973). The most common interpretations include the measures of cognitive processing speed, associative strength in memory, and spontaneous cognitive formation of a construct (Fazio, 1990).

Response time was then introduced to interpersonal communication to study user responses via channels. Media platforms were categorized according to the average response time per conversation into synchronous communication channels (e.g., by phone or face-to-face) and asynchronous ones (e.g., email and online forums; Avrahami & Hudson, 2006). It was determined that the uncertainty of responsiveness causes users of asynchronous communication channels to take more risks of communication breakdown. Under the framework of expectancy violations theory, Kalman and Rafaeli (2011) explored response latency in email replies. Users expected email responses from other users, and those expectations were correlated with further evaluations. Their results confirmed that latency was associated with responders' negative evaluations.

In recent years, with the advanced capacity to collect and analyze massive amounts of data, social science scholars can now reveal the underlying temporal patterns of user behavior by modeling digital traces quantitatively. More research has begun focusing on the pattern of response time of user feedback behaviors on social media (Fan et al., 2020; Zhu et al., 2020). Zhang et al. (2017) employed the social amplification of risk model to examine the impact of emotional characteristics of media content on online public response time to health emergencies. Aruguete and Calvo (2018) modeled cognitive dissonance by measuring users' response times for protest-event content on social media. More recently, Zhu et al. (2020) examined whether messages widely spread also diffuse quickly.

However, most of these studies have focused on the online public reposting latency of a single event; few studies have examined differences in reposting latency among various online public topics and the competition for online public attention among these topics. Therefore, this study aimed to fill the research gap regarding the underlying mechanism of reposting latency. This study could extend our understanding of how different news topics compete in terms of reposting speed. The results of this study could also advance the emerging research on information consumption on social media by examining how characteristics of users' information repertoires predict their reposting efficiency.

1.2. Issue attention

Public issue attention refers to the scarce resources that the public willingly devotes to thinking about a publicly debated issue (Newig, 2004; Ripberger, 2011). It is commonly measured either as the intensity with which citizens dedicate their cognitive resources per time unit or as a ratio compared to other issue competitions. According to previous studies, the analytic scale of an "issue" may influence the dynamic cycle pattern of public attention (Newig, 2004). The common unit of an "issue" in current democracies is a relatively small-scale problem, such as flooding, smog, or ozone depletion, while extensive problem areas, such as air pollution or natural disasters, could comprise multiple small-scale issues. Research on issue cycles has found that the broader the issue is, the longer the time-scale cycle will last in its public attention dynamics (Downs, 1972; Newig, 2004). In this study, we aimed to examine users' attention capacities regarding the overloaded and various types of messages on social media. Therefore, we defined *issue* as a large-scale unit of a publicly debated agenda—similar to news topics—such as economics, politics, environment, or technology.

Although scholars generally believe that issue attention plays an important role in information dissemination (Xu et al., 2014), how issue attention affects users' information selection and processing is far from conclusive. Issue publics, a well-established concept in political communication, refer to those individuals who are exclusively and persistently concerned about a very small number of public issues (Krosnick, 1990; Krosnick & Telhami, 1995). Previous studies found that single-issue publics, also called information specialists, are regarded as "narrow-minded," not concerned with issues other than those directly relevant to their interests, while *multi-issue publics*, also called attentive publics or information generalists, are recognized as well-educated with relatively more cognitive resources to digest information (Bolsen & Leeper, 2013). Further, the generalists are generally expected to defeat the specialists in information-processing efficiency.

However, some scholars believe that self-motivation is the main driving force behind the variance of public issue attention (Bolsen & Leeper, 2013; Kim, 2007). It is self-interest that facilitates people's information selection and processing. Compared to multi-issue publics, single-issue publics are regarded as being more motivated to process information. In addition, from the perspective of agenda-setting research, issue attention is a zero-sum game in which rising attention toward one issue occurs at the expense of other issues (Zhu, 1992).

Owing to limitations of time, access, and mental capacity, the public agenda generally includes no more than five to seven issues at any time (McCombs & Zhu, 1995). The consequence of continually distracted issue attention is a sacrifice in information processing performance, which leads to low efficiency in general information processing.

Despite the theoretical controversy, empirical studies, in general, support the idea that public issue attention shows a preference for domain specificity. For example, Kim (2007) found that issue specialists with clear preservation goals showed strong information search skills. Smith et al. (2007) found that information processing motivations and time pressure moderated selective exposure. Thus, social media users with single-issue attention are more likely to have stronger motivations for information processing and repost news content more quickly than multi-issue users. Thus, we propose the hypothesis below:

H1. Issue attention has a positive influence on users' information reposting time. Specifically, single-issue users are likely to repost news more quickly, on average, than multi-issue users.

1.3. Digital temporal usage pattern

It is commonly believed that the significant spread of information and communication technologies (ICTs) has altered the traditional human activity pattern in terms of time and space (Hubers et al., 2008). People are dedicating more and more time to using ICTs due to their convenient access and strong effectiveness for communication (Shen et al., 2020). However, time is limited for everyone. Thus, the time devoted to online interconnections is in competition with offline activities, necessitating a new time management strategy to cope with this dilemma.

Previous studies have identified that social media users are developing personalized and unique temporal digital usage patterns (Johnson, 2020). Some users have a more distributed schedule for social media, using it to fill empty intervals throughout the day; hence, their daily digital usage pattern will be more flatter distributed (Wheatley & Ferrer-Conill, 2020). Others have a settled digital temporal schedule, using devices intensively only at certain times. Meanwhile, users' temporal digital usage patterns could shape their information consumption habits (Hubers et al., 2008; Liang & Shen, 2018). Users with flatter temporal distributions could catch the latest information during each short visit to a social media platform. Therefore, we propose the hypothesis below:

H2. Users who have more distributed daily digital usage patterns will, on average, repost news more quickly.

1.4. Characteristics of information repertoires

Social media users can choose to follow other users' information as their future news stream, and this following behavior acts as a subscription to information repertoires (Liang & Fu, 2017). Previous literature has found that how users build their own "Daily Me" (Thurman, 2011) may influence their information consumption efficiency and change their reposting activities (Choi, 2016; Merten, 2020). Information overload and information redundancy are two major indexes describing how users build their own information repertoires on social media (Liang & Fu, 2017; Liu et al., 2020; Tunney et al., 2021).

First, information overload may influence users' information processing speed and further interfere with their information-related performance. Previous research suggests that the relationship between performance and the amount of information received generally follows an inverted U-curve (Eppler & Mengis, 2004). The performance usually increases with the amount of information up to a certain point. Then, if the provision of information continues beyond that point, the performance will experience a rapid decline as the amount of information overwhelms the information processing and integrating capacity (Reutskaja et al., 2020; Roetzel, 2019). We assumed that a similar pattern would exist between information overload and reposting latency, as reposting latency may be regarded as one of the performance indicators for information-processing tasks. Thus, as social media users continue to receive information from their own "Daily Me," they may experience some positive information processing until the information loads severely exceed their processing capacities. Users who receive heavy loads of information in their information repertoires will consume more time on processing before participating in reposting activities.

Second, the degree of overlap of information sources will negatively influence information retrieval efficiency. Previous literature has found that high information redundancy of a user's newsfeed often occurs when the community structure is tightly connected (Liang & Fu, 2019). The redundancy hinders users from obtaining unique and new information effectively (Liang & Fu, 2017), so users are likely to feel confused and experience low efficiency in information-processing tasks. Therefore, we propose the following hypotheses:

H3. Users who receive an overloaded amount of information on Twitter will need more time to repost news.

H4. Users who have more redundant information on their newsfeed timelines will have, on average, longer reposting times.

1.5. Characteristics of contents

Characteristics of the posting contents (e.g., information relevance, topics) may also influence social media user's reposting activities (Soldatova et al., 2020; Tang et al., 2019). First, research suggests that relevant information is more likely to be selected for encoding into working memory during information processing (Sokolov et al., 2002). When users read the relevant information, the contents can be easily recalled from user's past sensory stores. This process will lead to an automatic selection mechanism, the orienting response, and further increase the resource allocation to relevant information (Lang, 2000). Thus, users will be more sensitive to the relevant messages and take relatively less time to process and then repost them.

The measurement of information relevance differs across disciplines. In cognitive psychology literature, it has usually been measured as people's self-reported perceptions of how relevant issues are to their lives (Chen & Kim, 2011). Meanwhile, literature on information retrieval has measured it quantitatively as a matter of degree by calculating the semantic similarity or concurrence correlation (Borlund, 2003; Greisdorf, 2000). The present study, using observable data on social media, followed the information retrieval approach, measuring information relevance for one user by calculating the semantic similarity between the message and the user's previous information taste. In doing so, we followed the basic assumption in information retrieval studies that people's previous information consumption decisions could indicate their behavior relevance implicitly and this relevance degree could be inferred by calculating relevance clues (Saracevic, 2007).

The topic of information may also determine a user's reposting behavior (Tang et al., 2019). Previous research has found that social media users have different usage biases in their consumption of hard- and soft-topic information (Horan, 2013). Users prefer "producing" the hard-topic information and "consuming" the soft-topic information. Furthermore, scholars have found that the diffusion patterns of diverse topics differentiate in their spreading structures and speed (Kim et al., 2013). While controversial topics, such as political protests, spread concurrently, entertainment topics spread within internal social networks and last longer. Therefore, we propose the hypotheses below:

H5. Users are more likely to quickly repost news that is more relevant to their issue interests.

H6. Users are more likely to quickly repost soft-topic news (e.g., health, art) than hard-topic news (e.g., economic, politics).

2. Methods

2.1. Data collection

We collected our data using Twitter REST APIs. Using the method reported by Liang and Fu (2017) and Zhu et al. (2011), we sampled Twitter accounts from the whole population of Twitter users. First, a Twitter user ID range was determined to cover all likely user ID values. Subsequently, a random sample of 100,000 numbers was generated within the Twitter account ID range and the existence of each number was automatically tested by a program. Through this method, this study obtained a random ID pool of valid Twitter users.

Then we tried to collect the users' data, including their profiles, followers' and followees' ID lists, and up to 3200 (limited by Twitter API) tweet records for each user and their followees. However, due to the privacy settings on Twitter, we could not access private accounts; thus, only public account users were included in the tweet collection. Inactive users who did not engage in any activities shown on their timelines were further excluded, leading to 3565 users in this step.

Twitter REST APIs allow us to obtain the information about the original tweet ID and original author ID for each retweet. Using the original tweet ID information, we further collected the timestamp and text contents of the original tweets. To process the textual characteristics of the original tweets, we only included original tweets written in English. We utilized Python and its open source libraries to conduct the data collection and analysis.

2.2. Data selection

To take a closer look at the content of each tweet and filter the news tweets, we utilized a Reuters news corpus and employed a natural language processing approach. The news dataset, Reuters27000, included 27,000 random news articles under eight common news categories: health, art, politics, sports, science, technology, economy, and business. To identity the news tweets and label their topics, we first applied a key feature selection algorithm (Zheng et al., 2004) on the news corpus. Through tokenization and stemming, each word in the news corpus was parsed and processed into its word stem. Next, using the bag-of-word approach, each news article was represented by a vector of word frequency. By considering the chi-square score when predicting the topic category, 300 key features (the processed word stems) were then selected for each category. Meanwhile, the content of each tweet was pre-processed using the similar text mining approach. Each word of the tweets was tokenized and stemmed, and each tweet was represented by a stemmed word frequency vector. Finally, using the selected key features from the news corpus, we calculated the weighted probability of each tweet's category.

Table 1 shows the percentage of tweet topics. More than two million tweets from the representative user sample were categorized into eight topics. Among these tweets, 7.13% were recognized as health topics, followed by politics (5.85%), art (4.68%), sports (4.67%), business (4.47%), science (3.48%), economy (2.18%), and technology (1.76%).

Table 1
Proportion of topics on twitter.

Category	Count	Share
Health	146,265	7.13%
Politics	120,020	5.85%
Art	95,961	4.68%
Sports	95,926	4.67%
Business	91,653	4.47%
Science	71,485	3.48%
Economy	44,747	2.18%
Technology	36,224	1.76%
Uncategorized	1,350,238.0	65.78%
Total	2,052,519.0	100.00%

The uncategorized tweets, accounting for 66%, were basically personal issues and emotional statements. To focus on public tweets relating to new topics, we further excluded the uncategorized tweets expressing personal statements. Thus, 105,639 retweet records from 2868 users were included in this step.

To avoid interference from Twitter bot accounts (Hallvard & Larsson, 2015), we utilized a well-developed R app, tweetbotornot,[1] to detect Twitter bots. Using machine-learning algorithms, the R package classifies Twitter accounts as bots or not with an accuracy of 93%. Thus, users with more than 90% probability of being Twitter bots were excluded. The final dataset for analysis contained 93,628 retweet records from 2386 users.

2.3. Measures

As a dependent variable of this study (see Table 2), *reposting time* was measured by quantifying the time interval between the original tweet publish time and the user's retweeting time, following Zhang et al.

Table 2
A subset of constructed metrics.

Dimension	Variable	Operational Definition
Dependent Variable	Response Latency	Interval between the original tweet's publish time and user retweet time.
User Level	Issue Publics	Member of issue publics was classified into single-issue publics, multi-issue publics (2–5 issues), and information generalists. A user was regarded as a member of k issue if $0.75/k$ or more of their timeline tweets focused on each of the k issues.
	Daily Digital Usage Pattern	Levels of fragmentation and uncertainty of user's usage rhythm. An individual's daily digital rhythm was measured by percentages of aggregated activities over 24 h on their timeline. Temporal fragmentation was measured by Shannon entropy of user's daily digital rhythm.
	Information Overload	Total number of tweets the user received on their newsfeed timeline. The level of information overload was divided into three levels (high, middle, and low) by the average score plus or minus one standard deviation.
	Information Redundancy	Degree of duplicated information appearing on a user's newsfeed timeline, normalized by the total number of newsfeed timeline tweets.
Retweet Message Level	Information Relevance	Semantic similarity between the tweet and the user's timeline tweet records.
	Tweet Topic	The topic of a tweet was automatically categorized by the natural language processing approach. Using a news dataset, Reuters27000, keyword features were extracted and applied to the tweet corpus. Tweets were categorized into eight common news categories (health, art, politics, sports, science, technology, economy, and business) and uncategorized personal statements.
Covariates	Years Since Registration	Number of years since the user registered on Twitter
	Tweeting Frequency	Number of activities (including tweets, retweets, and replies) shown on the user's timeline
	No. of Followees	Number of followees the user received
	No. of Followers	Number of followers the user received

[1] For more information, see http://blog.revolutionanalytics.com/2018/03/twitter-bot-or-not.html.

(2017). We calculated the reposting time at the minute level. The average reposting time in our sample was 636.7 min ($SD = 1996$; $Mdn = 32.5$).

The type of *issue publics* for each user was categorized according to the classification scheme reported by Sun et al. (2014). Previous studies have stated that the analytic scale of an issue could vary greatly according to the concerned question (Newig, 2004). The common unit of an issue is a relatively small-scale problem, such as flooding, smog, or ozone depletion. However, extensive problem areas, such as air pollution or natural disasters, could comprise multiple small-scale issues. For this study, issue generally refers to a large-scale unit of a publicly debated agenda—similar to news topics—such as economics, politics, environment, or technology. We measured the type of issue public by quantifying the issue distribution on the user's personal timeline. Following Sun et al.'s (2014) approach, a user was regarded as a member of k issue if $0.75/k$ or more of their timeline tweets focused on each of the k issues. For example, users who devoted more than 75% of their tweets to a single issue were categorized as single-issue users. Users who focused more than 37.5% of their tweets on two issues were categorized as two-issue users. Users who had relatively distracted issue attention, with tweets about almost every issue, were categorized as information generalists. According to these criteria, 4.1% of the users were considered single-issue users on Twitter, 39.8% as multi-issue users. The information generalist egos, concerned with nearly all topics, comprised 56.1%.

The *level of information overload* was measured by the number of tweets that a user received on their newsfeed timeline. Each Twitter user has two kinds of timelines: a personal timeline and a newsfeed timeline. A personal tweet timeline is a collection of the user's own activities. A newsfeed timeline, also called a home timeline, displays tweets from the accounts the ego follows or subscribes to. For this study, users' newsfeed timelines were constructed by combining their followees' tweet timelines together. On average, users received a total of 1,208,513 tweets on their newsfeed timelines ($SD = 2{,}126{,}520$; $Mdn = 632{,}075$). The level of information overload was divided into three levels (high level, middle level, and low level) by the average score plus or minus one standard deviation.

The *daily digital usage pattern* was measured using the methods reported by Liang and Shen (2018). First, an individual's daily digital rhythm was measured by the percentage of aggregated activities over a 24-h period on their timeline. Then the daily digital usage pattern was measured by calculating the Shannon entropy of the user's daily digital rhythm, normalized to the range of 0–1. A high entropy score represented a high probability for the user to equally distribute his or her time over a 24-h period. A low score indicated that the user's usage time would be tightly concentrated at certain times. The average daily digital usage pattern score was 0.386 ($SD = 0.064$; $Mdn = 0.368$).

The *information redundancy* of a user's newsfeed timeline was measured by calculating the number of overlapping retweets with comments shown on the user's newsfeed timeline, normalized by the total number of newsfeed timeline tweets. The same message can appear more than once on one user's newsfeed timeline if two of their followees retweet the same tweet with their own comments. A higher score indicated that the user had more duplicated messages on their newsfeed timeline. The mean of information redundancy was 0.0242 ($SD = 0.0290$; $Mdn = 0.0150$).

Information relevance was measured at the dyadic level by the semantic similarity between the tweet and the user's timeline tweet records. First, the words in tweets were transformed into a feature vector of term frequency-inverse document frequency (TF-IDF). Then the similarity between tweets was quantified by a cosine similarity measure. Theoretically, the score ranged from 0 (completely irrelevant) to 1 (totally similar). The mean of information relevance was 0.0313 ($SD = 0.0575$; $Mdn = 0.0135$).

This study also included user-specific variables as control variables. A user's *activity frequency* was measured by calculating the number of activities (including tweets, retweets, and replies) shown on the user's timeline. On average, users posted 6933 tweets ($SD = 1156$; $Mdn = 2254$). Year since registration ($Mean = 3.45$; $Mdn = 3$; $SD = 1.59$), number of followers ($Mean = 406$; $Mdn = 94$; $SD = 3247$), and number of followees ($Mean = 311$; $Mdn = 163$, $SD = 685$) were obtained from Twitter API.

3. Findings

We employed a multilevel negative binomial model to examine the hypotheses. We adopted negative binomial regression to handle the dependent variable with discrete probability distributions, such as count data and time data (Hilbe, 2011). In our study, the units of analysis were the users' retweeting behaviors. Retweeting records nested under the same user to different messages could be influenced by the unique characteristics of that particular user. All the retweeting-specific measures were Level-1 variables. All the user-level predictors were Level-2 variables.

We first calculated the intra-class correlation coefficient (ICC) based on a null model with only the intercept. The ICC score was 80.5%, indicating that 80.5% of the variance could be explained at Level 2, the user level. In other words, it showed that the information reposting time was mainly determined by the characteristics of the message. This also suggested the necessity of using the multilevel model. We then calculated the conditional R2 for multilevel models. The conditional R2 describes the proportion of variance explained by both the fixed and random factors. Our model explained 18.5% of the variance.

This study revealed the variance of reposting latency among different members of issue publics. Holding other variables as constant, multi-issue users generally took more time to respond than single-issue users ($B_{\text{multi-issue vs. single-issue}} = 460$; $SE = 172$; $p < 0.05$), consistent with H1. Compared with single-issue users, information generalists, who have unfocused attention on almost every news issues, on average, took more time to repost tweets ($B_{\text{information generalists vs. single-issue}} = 348$; $SE = 163$; $p < 0.05$). When comparing multi-issue publics and information generalists, the results show that though the difference was not significant ($B_{\text{information generalists vs. multi-issues}} = -112$; $SE = 79$; $p = 0.15$), information generalists seemed to require less time to respond than multi-issue publics. Overall, the results show that multiple issue attention costs more time for users to respond to tweets.

Daily digital usage pattern was significantly correlated with reposting time, indicating that users with more flexible usage time responded to information more quickly ($B = -794$; $SE = 343$; $p < 0.05$). Hence, users who consistently used social media at a particular time (the score is 0) spent 794 min longer than users who had completely equal distributions of activities over 24 h (the score is 1). Therefore, H2 is confirmed.

H3 posited that users who receive overloaded amounts of information on Twitter need more time to respond to messages. Our results show no significant difference between the average reposting speeds of users with low- and middle-level information overload. However, users with high-level information overload took more time to respond to information on social media compared to users with middle-level information overload ($B = 265$; $SE = 107$; $p < 0.05$).

Information redundancy was positively correlated with reposting time. Holding the other variables constant, users with completely duplicated newsfeed timelines took 1130 more minutes to respond to messages than users who had no redundant information on their newsfeed timelines ($B = 1130$; $SE = 510$; $p < 0.05$). In addition, information relevance was negatively associated with the time taken to respond ($B = -885$; $SE = 107$; $p < 0.001$). Users responded 885 min sooner to messages that were completely similar to their issue interests (information relevance = 1) than to totally irrelevant messages (information relevance = 0). Therefore, H4 and H5 are supported.

Concerning H6, using the economic topic as the reference group, our results suggest that health tweets, on average, had the shortest reposting

times, followed by technology, sports, and business topics, respectively. Art, politics, and science tweets had relatively longer response times. Economic news had the longest response times among all the categories (see Table 3).

4. Discussion

This study empirically examined the impact of issue attention, daily digital usage pattern, and information redundancy on the speed of reposting time on Twitter. First, our results suggest that information reposting times on Twitter have a highly skewed distribution. Half the tweets were forwarded within 30 min, but the maximum response time was 72,522 h. Compared to other platform users, Twitter users are generally quicker at reposting information. For example, previous studies found that the median diffusion speed of health emergency messages on Chinese microblogging sites was more than 200 min (Zhang et al., 2017), which is much longer than our findings on Twitter.

Second, this study observed a significant relationship between the audience's issue attention and information reposting speed. The results show that single-issue users outpace multi-issue users in reposting speed. This finding is consistent with our hypothesis that information specialists are more motivated to consume information, which facilitates their information-processing efficiency. Meanwhile, continual distracted issue attention is a sacrifice in processing performance, which leads to low efficiency in general in information processing for multi-issue publics. Following this logic, we should expect that information generalists, who have unfocused attention on almost every news issue, will take the longest time, on average, to respond to tweets. However, our results indicate that among the three types of issue publics, multi-issue publics, who pay attention to two to five issues, generally had the highest reposting times. Information generalists took slightly less time, on average, to respond to messages than multi-issue users. Although the difference between information generalists and multi-issue publics was not statistically significant, this pattern nevertheless met our expectation.

A possible explanation for this is that a user's information processing capacity may also be affected by other factors, such as time availability or account type (professional Twitter account or individual Twitter account). Our hypotheses were proposed under the limited capacity condition, where multiple issues distract a user's attention and cause a decline in the user's information processing speed. However, we could not neglect the huge gap between Twitter users' processing capacities. It is possible that information generalists have high demands for information consumption. For example, they could be influencers who professionally lead opinions and disseminate the latest messages, and thus, would undoubtedly have higher capacities and motivations to forward tweets efficiently. This explanation is also consistent with the generalist model of issue publics (Chen, 2012), according to which information generalists are better equipped with more cognitive resources and goals, and thus, there is no clear boundary of their abilities, no matter how many issues they are involved in.

Third, this study revealed that reposting time is significantly constrained by the network structure of the information source and the temporal usage pattern. We found that a tight daily digital rhythm could cause longer response times, while information redundancy and information overload can exacerbate reposting latency. Although previous literature found an inverted U-shaped impact of information amount on the performance of decision-making, our study observed no significant difference in the reposting speeds of users with low- and middle-level amounts of information. This indicates that users should be careful when they decide to subscribe to more followees to increase the amount of received information. Their information processing performance may experience a rapid decline if the information amount exceeds their processing capacity.

Furthermore, although this study focused on the effects of individual usage patterns, this does not negate the importance of effects of message characteristics. The positive evidence of information relevance on reposting speed can further explain users' selective exposure. In addition, our results on the message topics indicate a considerable difference in users' behavior patterns toward various types of content. Users prefer to quickly respond to health-related messages while avoiding responding to heavy topics, such as economics, science, and politics.

Table 3
Multilevel regression model predicting information reposting time.

	Estimate	SE	Beta
User Level			
Multi-issue publics vs. single-issue publics	460.1**	172.1	0.0290
Information generalists vs. single-issue publics	348.0*	163.4	0.0242
Daily digital usage pattern	−794.2*	342.6	−0.0253
Information overload (low level vs. middle level)	120.2	78.3	0.0209
Information overload (high level vs. middle level)	264.9*	107.2	0.0484
Information redundancy	1130.1*	509.8	0.0307
Year since registration	−45.8**	15.7	−0.0358
No. of followers [a]	1.28	25.9	0.0009
No. of followees [a]	−6.77	43.1	−0.0034
Tweeting frequency [a]	−82.7***	23.3	−0.0606
Retweet Message Level			
Information relevance[b]	−884.5***	107.0	0.0376
Topic: Business vs. economy	−107.5***	30.6	−0.0179
Topic: Art vs. economy	−83.9**	29.8	−0.0166
Topic: Health vs. economy	−140.0***	28.9	−0.0277
Topic: Politics vs. economy	−88.4**	29.5	−0.0163
Topic: Science vs. economy	−70.6*	32.3	−0.0102
Topic: Sports vs. economy	−112.3***	30.4	−0.0190
Topic: Technology vs. economy	−118.8**	38.4	−0.0123
Intercept	1243.3**	352.0	
Log-Likelihood	−838,130		
AIC	1,676,301		
Conditional R2	18.54%		
No. of retweets	93,628		
No. of users	2386		

Note: AIC = Akaike Information Criterion.
$p < 0.05$; **$p < 0.01$; ***$p < 0.001$.
[a] Number of followers, number of followees, amount of information received, and tweeting frequency were log-transformed for multilevel analyses.
[b] Information relevance was converted into its square root.

4.1. Theoretical implications

This study carries theoretical implications. First, the study extends our understanding of the consequences of information redundancy. Social media users may suffer from a high degree of information redundancy due to the highly connected and overlapping structure of online communities. Prior research has found that overwhelming numbers of repetitive messages can lead to emotional exhaustion (So, Kim, & Cohen, 2017). Moreover, people are likely to unfollow the information source to reduce redundant information (Liang & Fu, 2017). Our findings highlight another negative view of information redundancy from the information processing perspective. Redundancy hinders users from obtaining unique and new information effectively; thus, individuals will need more time to deal with their information repertoires and, in turn, will take a longer time to respond to the information.

Second, this study contributes to research on news consumption in terms of news overload and issue diversity. With the proliferation of ICTs, the amount of news and the availability of issue diversity have increased tremendously (Liu et al., 2020; Tunney et al., 2021). Therefore, news overload has become a crucial research topic in the news consumption realm (Reutskaja et al., 2020; Roetzel, 2019). This study provides empirical evidence that issue diversity and information overload may overwhelm a user's processing capacity. Thus, our findings could shed new light to enable information consumption research to address how users' information repertoires influence diffusion patterns.

4.2. Practical implications

This study could also provide practical implications for news sources (e.g., media outlets, KOLs) in industry seeking to build their own social media strategies. Our results show that information relevance and time availability on digital devices could largely reduce reposting latency. To guarantee relatively fast and widespread diffusion, news sources on social media should consider whether their main audience is reachable on digital devices when they decide to post content. Meanwhile, media outlets should consider more strategies to address the issue relevance of their target audience. For example, they can classify the audience by their topics of interest and personalize the news subscription process. The conclusions have the potential to help advance the news spreading algorithm and predict the success of news diffusion.

5. Conclusions and limitations

The current study investigated the reposting latency of news content to advance our understanding of information consumption activities on social media. The main contribution of this study lies in its focus on social media users' information repertoire characteristics. We examined six hypotheses to illustrate how users' construction of their "Daily Me" could influence their reposting speed. Distracted issue attention slows down a user's reposting speed, while a distributed temporal usage pattern could help shorten reposting times. Furthermore, information redundancy and information overload could increase the reposting latency of news content on social media.

Several limitations must be addressed for future studies. First, when we measured information overload by the amount of information shown on users' news streams, we assumed that every tweet that appears on a user's newsfeed timeline can have an effect on their browsing behavior. This assumption might not be accurate. Users can simply ignore the message or quit the social media platform when the received information amount exceeds their processing capacity. Future studies can examine the actual consumption pattern with browsing record data.

Second, in previous literature, membership of issue publics was generally measured using the self-report approach by asking people about their perceived most important problem. In this study, using an unobtrusive approach, we measured the membership of issue publics by examining the issue distribution of users' personal Twitter timelines. However, Twitter is not the only channel through which users obtain information. The issue distribution measured from users' social media accounts may not reflect their overall issue interests, especially their issue attention in offline information consumption. Further, although the unobtrusive data collection method allowed us to measure users' online behavior records more accurately, it is difficult to link the users' behavior records with their demographic variables. Previous studies have found that information processing capacity is largely constrained by users' socioeconomic statuses and educations. Future studies are needed to examine the effects between self-reported and unobtrusive measures.

Finally, to measure the news topics of tweets, this study used the traditional text mining technique of extracting the key text features from the Reuters news corpus and then calculated the weighted probability of each tweet's category. The study did not utilize the state-of-art deep learning methods (e.g., word2vec) because the semantic expressions and grammar in a news corpus and tweets could differ greatly. Future studies could further update the latest text mining techniques to improve the accuracy of topic classification.

Credit author statement

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