



The effect of affordance on deliberation when retweeting: From the perspective of expression effect

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ABSTRACT

Well-designed social media are supposed to improve user deliberation. Around the 2020 US presidential election, Twitter temporarily suspended the *Retweet* function and prompted users to use the *Quote Tweet* function. This study aims to use this natural experiment condition to examine whether this affordance change can increase users' deliberation levels by encouraging them to express themselves. From the expression effect perspective, this change might increase the cognitive costs of users' retweeting and commenting behaviors and thus lead to deliberativeness. Based on this natural experiment, the study found that at the population level, the suspension of the *Retweet* function made users spend more time before quoting. However, it did not encourage them to post quotation tweets of higher analytical and interactive quality or put more effort into writing longer comments and finding longer tweets to quote. These effects were moderated by users' retweeting habits, as the change increased deliberativeness for those who used the quotation function frequently before the suspension.

1. Introduction

Deliberation is an ideal discussion form in which people express different views about public issues with reasonable supporting evidence (Carpini et al., 2004); it is an inherently social process of both listening and responding (Barber, 2003). The aim of such discussion is usually to achieve consensus, make a democratically legitimate decision, or generate rational actions rather than select the superior argument or determine a winner (Mendelberg, 2002; Pingree, 2007). Deliberation on social media—which has become one of the most important public discussion spaces—is important for cultivating a healthy discussion environment. High-level deliberation could help curb the spread of misinformation related to public issues, spark more democratic conversations about relevant issues, and encourage civic participation in political debates (Albrecht, 2006; Bago et al., 2020; Carpini et al., 2004).

However, people's confirmation bias and the echo chamber that may be amplified by recommendation algorithms and communities of like-minded people on social media lead to repetitive exposure to similar opinions and attitude polarization, which are harmful to deliberation (Sunstein, 2000, 2001). Practically speaking, deliberation might be improved by leveraging social media affordances that enable users to receive diverse opinions or provide users with more opportunities to

express themselves (Pingree, 2007). Therefore, it is meaningful to examine whether certain affordances can improve social media users' deliberation. Methodologically, the sudden changes in social media interfaces have provided unique natural experiment settings for researchers to identify the causal effects of affordances on human behaviors (e.g., Gligorić et al., 2018; Jaidka et al., 2019).

As the 2020 US presidential election approached, Twitter temporarily suspended the *Retweet* function (which enabled users to simply forward others' tweets without any comments) and set a noticing message encouraging users to use the *Quote Tweet* function (forwarding tweets with comments) and carefully consider what they would be retweeting. If users do not add anything to the *Quote Tweet* composer, it will still appear as a retweet. The change was not intended to prohibit users from retweeting but to encourage them to deliberate before retweeting and retweeting with commentary (Gadde & Beykpour, 2020).

Deliberation not only derives from the reception of diverse opinions but also exists when people are preparing to express their opinions (Pingree, 2007). The expression of comments and opinions would inspire users' deliberative thinking, during which they recall their prior beliefs about the tweets, reevaluate their opinions, and reshape these ideas into understandable language (Pingree, 2007). This reasoning

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process is assumed to help reduce irrational retweeting behaviors and facilitate deliberative discussion through retweeting interactions (Gadde & Beykpour, 2020). The present study tests whether the temporary suspension of the *Retweet* function on Twitter influenced deliberative discussion around the 2020 US presidential election. Through this natural experiment setting, we demonstrate that although the suspension increased usage of the *Quote Tweet* function, it did not increase—and even decreased, on average—users' deliberation when retweeting. This negative effect was partly lasting from some perspectives but not from others for a short period after the *Retweet* function was reactivated. Moreover, the effect of this affordance change on users' deliberative behaviors varied by users' retweeting habits. For those who used the *Quote Tweet* function frequently before the temporary suspension, the change increased their deliberation levels, an effect that partly persisted after the *Retweet* function was reinstated.

This study contributes to the knowledge of deliberation by taking the expression effect and social media affordances into account. It enriches our understanding of the mechanisms of deliberation and provides references for designing platform affordances based on the expression effect mechanism. In addition, the relationship between platform affordances and users' deliberation levels is further explored. The change in Twitter's retweeting-related affordance around the 2020 US presidential election provides a niche opportunity to examine the causal effect of affordances on users' deliberation behaviors. From a broader perspective, this helps understand how platform affordances shape usage behaviors and how users deploy their agency to interact with platforms' constraints.

2. Theoretical background and hypothesis development

2.1. The effect of platform affordances on deliberation

Affordances refer to possibilities of or constraints on actions in a specific environment (Faraj & Azad, 2012). They take shape based on the materiality of objects that constitute the environment, such as surfaces, substances, objects, and places (Gibson, 2014). These possibilities and constraints determine to a greater or lesser extent what actions are possible and what can be realized in a specific environment. In the digital environment, affordances are offered by a wide range of technologies, electronic devices, and systems. Different combinations of technical specifications offer different possibilities. For example, online forums enable users to communicate with others anonymously, instant messaging allows people to engage in real-time conversations, and social networking sites provide people with opportunities to build (a)symmetrical connections.

These internet-driven affordances enable communication practices that are unavailable in the offline environment and open up both new possibilities for and challenges to deliberative discussion. For instance, because online discussion protocols afford asynchronous communication, it is easier for a given interaction to continue, and people have more time to share reactions and respond after reflection, which helps improve deliberation (Janssen & Kies, 2005). At the same time, some new affordances may hinder deliberation. Unlike traditional mass communication forms that do not permit people to choose what information to receive, the internet has increasingly enabled people to separately access and consume the kinds of information they want to read. Because of confirmation bias, the information that people like is usually what is consistent with their prior beliefs or values (Frey, 1986). Selective exposure to exclusively attitude-reinforcing information and opinions can lead to attitude polarization, which means that through internet use, people will end with more extreme ideas than they start with (Sunstein, 2009). This does harm to deliberation. The recommendation algorithms that speculate about what people like based on their reading, listening, or watching preferences on the internet further reinforce the echo chamber effect of similar viewpoints and increase polarization. People are fragmented into a few extremes and

communities of like-minded people, which can impede deliberative discussion among the broader public (Stroud, 2010; Sunstein, 2000, 2001).

Affordance designs or changes that could weaken the echo chamber effect and polarization and foster deliberation have been explored in previous studies. For example, users are more likely to be exposed to different viewpoints if platform affordances are designed to make high-quality and intriguing opposing ideas more accessible to people who are curious about them and create an environment that can accentuate the benefits of receiving challenging opinions (Garrett & Resnick, 2011; Munson & Resnick, 2010). In addition, social media platforms that afford heterogeneous networks would foster cross-cutting connections and nudge people to reevaluate their previous ideas, thus facilitating depolarization (Lee et al., 2014). Moreover, relaxation of the message length constraint encourages users to use fewer contractions and abbreviations, adopt a more professional writing style, and take a more civil and polite tone (Glgorić et al., 2018; Jaidka et al., 2019). It also makes users more likely to provide facts and evidence in their posts (Jaidka et al., 2019). These changes in user behaviors increase the readability and credibility of the posts and are beneficial for information exchange between users. Thus, elaborate designs or changes in platform affordances can help improve online deliberation.

Based on the change in retweeting-related affordance on Twitter around the 2020 US presidential election, this study explores how users' retweeting behaviors changed along with the affordance adjustment. During the suspension of the *Retweet* function, their quoting behaviors were more frequent and retweeting behaviors were less frequent. The specific uses of the *Quote Tweet* function are examined to explore whether deliberation was improved by the need to employ the quotation function.

2.2. Deliberation and expression effect

Deliberation is depicted as a discussion process that emphasizes the role of logic and reasoning rather than coercion and power. It is regulated by the principles of equality, symmetry, and civility (Carpini et al., 2004; Halpern & Gibbs, 2013). Compared with other forms of discussion, people in deliberation not only consider the single strongest argument in their minds but also think about all available arguments or counterarguments about a given issue (Pingree, 2007). They do not assume their existing beliefs as correct or superior and do not start deliberating from prior ideas to find appropriate evidence to support those ideas; instead, deliberation starts from appropriate reasons. All people who are relevant to the issue being discussed should have the right to participate and be encouraged to take part in the deliberation; that is, deliberation ideally includes all interested parties, and different voices should be treated equally. Thus, opinions deriving from deliberation are regarded as having undergone a thoughtful reasoning process, are more rational, and of higher quality.

Social media afford the possibility of deliberative discussion from two approaches: on the one hand, the large user networks on social media platforms increase information flow and diversity of opinion, which enables people to encounter a greater number of differing opinions from a wide range of sources and learn alternative perspectives, thus encouraging them to be reflective of the truth and their real beliefs (Eveland & Hively, 2009). This is the effect of the reception of different opinions on deliberation. On the other hand, social media offer a space for users to express their personal views. As users organize language to describe their stories and relate their thoughts, they will undergo a reasoning process. Although what they deliver may be ideas that were already in their minds, they still need to recall the relevant information. As information in their heads is not stored in the form of complete and well-scripted sentences, people need to reorganize or at least transform the ideas into explicit and understandable language to ensure effective diffusion (Greene, 1984; Pingree, 2007). This is not a memory recall process but a decoding-encoding process that should lead people to

reevaluate their prior beliefs. Existing misbeliefs may be abandoned, and new, more reasonable thoughts are likely to form. This is the expression effect on deliberation. Thus, the effect of deliberation does not derive merely from “hearing from all sides”; what matters equally is the expression effect.

The expression effect is the counterpart of the reception effect. It implies that the impact of a spreading message is bidirectional. It not only influences recipients through the reception effect but also has an impact on senders through the expression effect. The impact on senders should not be merely explicated as the effect that is exerted through the sender-receiver-sender loop. It does not refer to the effect of feedback from receivers but exists as soon as senders start to prepare delivering a message (Pingree, 2007). This means that senders’ information-delivering behaviors will affect their own thoughts.

When Twitter users come up with comments and express their opinions about others’ tweets, they are likely to deliberate about the tweets and reevaluate their previous thoughts about them. They are forced to confront any contradictions or gaps that exist in their prior thoughts and to find a coherent and reasonable explanation. This encourages users to focus on the logic of tweets and process them based on their true merits rather than peripheral cues, such as sources, forms, or tone (Petty & Cacioppo, 1984). In this way, Twitter’s temporary suspension of the *Retweet* function and promotion of the *Quote Tweet* function could facilitate users’ deliberation and encourage them to consider more carefully why they are retweeting a given tweet and whether the message included in the tweet should be amplified through retweeting, resulting in more rational retweeting behaviors.

According to previous research, the quality of deliberative discussion can be captured through language features of users’ tweets, including justification, constructiveness, reciprocity, empathy and respect, and incivility (Jaidka, 2022b; Jaidka et al., 2019). From an analytical aspect, high-quality deliberative messages should be comprehensive with reliable supporting materials or rationales and help resolve conflicts and build consensus between different viewpoints (Jaidka et al., 2019; Oz et al., 2018; Stroud et al., 2015). From the interactive aspect, deliberative discussions are supposed to provide responses or feedback to others’ messages. People are empathetic about others’ opinions and do not use uncivil or obscene language (Friess & Eilders, 2015; Jaidka, 2022b; Jaidka et al., 2019). These language features of tweets can reflect the extent to which users are deliberative when composing these tweets. We anticipated that when employing the *Quote Tweet* function, users’ expression processes would trigger deep thinking and that the deliberative quality of their tweets would increase in both analytical and interactive aspects.

H1. The analytical and interactive quality of quotation tweets increased during the temporary suspension of the *Retweet* function, compared to that before the suspension.

In addition to the language features of tweets, the effort that users put into composing tweets can also reflect their levels of deliberation. From the perspective of the expression effect, deliberation is a cognitive process (Pingree, 2007). The effort used in cognition determines the extent to which the cognitive result is the output of deliberative thinking (J. S. Evans & Stanovich, 2013). There are two modes of the cognitive process: intuitive cognition is depicted as a fast, nearly automatic process. People process information or make judgments according to their intuition or the first idea that comes to mind. They do not consider all information related to the issues in question (Betsch, 2005; J. S. Evans & Stanovich, 2013). This process tends to be effortless and unconscious, which is rapid and less likely to trigger deliberative thinking. By contrast, reflective cognition is more time-consuming and requires people to think about the issues in a sequential, rule-governed, and explicit way (Kahneman, 2011). People should consider and weigh all available information before arriving at their own thoughts. This process requires more cognitive effort and costs in composing a final idea (Betsch, 2005; J. S. Evans & Stanovich, 2013). Deliberation can be

achieved through expression when it triggers a reflective thinking process. In other words, deliberation needs a more logical, analytical, and complex cognitive process, which is inevitably slower than intuitive thinking.

Due to the expression effect, the suspension of the *Retweet* function and the encouragement to offer commentary were supposed to trigger users’ deliberative thinking when quoting others’ tweets. Users were expected to spend more time in processing relevant information and ideas embedded in the tweets that they are quoting, deliberating about the information or ideas, and finalizing their comments on others’ tweets. Therefore, response time, which refers to the duration between the posting times of an original tweet and a retweet, should be longer in a deliberative context.

H2. The response time of quotation tweets became longer during the temporary suspension of the *Retweet* function than the response time before the suspension.

However, longer response times may not only be related to the slower, reflective cognitive process discussed above but also be associated with the greater complexity involved in quoting than direct retweeting. Even if users do not deliberate when composing comments and simply write a few words that occur to them, quoting takes more time than direct retweeting; thus, a longer response time is a necessary but insufficient condition for deliberation. The increased response time can be caused by deliberation when users are quoting others’ tweets and generating comments on others’ tweets, by the complexity of the quoting task, or both. Thus, additional indicators of deliberation should be examined.

Message length can reflect the level of deliberation (Halpern & Gibbs, 2013) and has been associated with discussion quality (Gligorić et al., 2018). Longer messages are more likely to have cogent arguments, constructive ideas, and solid evidence, suggesting the existence of a higher level of deliberation (Gligorić et al., 2018; Jaidka et al., 2019; Wilhelm, 1998). Previous research (Jaidka et al., 2019) that examined the change in tweets after Twitter doubled the per-tweet character limit found that more deliberative discussions were triggered. Discussions on Twitter became less uncivil and more constructive. In addition, research comparing the deliberation level on Facebook and Twitter found that messages on Twitter were less deliberative than those on Facebook, which may be due to the different character limits of these two platforms (Twitter has a character limit, while Facebook does not; see Oz et al., 2018). Having more characters at their disposal enables users to clarify facts and express their thoughts in a more professional writing style, which makes the messages more readable and effective in fostering deliberative discussion (Gligorić et al., 2018; Jaidka et al., 2019). When users quote others’ tweets, the length of their commentary may also reflect the cognitive effort they have put into composing those comments and further indicate their deliberation levels. Given the expression effect, we anticipated that while the *Retweet* function was suspended, users who were truly affected and encouraged by the *Quote Tweet* function would make significantly longer comments on others’ tweets than they had before the suspension.

H3. The length of users’ comments when quoting others’ tweets was longer during the temporary suspension of the *Retweet* function than it was before the suspension.

Furthermore, reflective thinking refers to understanding an issue comprehensively and forming reasonable ideas based on an understanding of the whole issue. Thus, people are effortful in seeking and processing related information. If users engage in a reflective thinking process, they will pay close attention to what they are quoting, because the quoted content is the basis for composing their comments. It is plausible that when users make comments, they will rethink the information contained in these tweets. They may sometimes give up quoting and turn to quote other relevant tweets that contain a higher quality of information or argument. Longer tweets tend to have a higher quality (Gligorić et al., 2018); they are more informative and can foster people’s

extensive thinking about the issues, which increases users' deliberation levels (Betsch & Glöckner, 2010; Petty et al., 1995). Thus, the length of tweets that are quoted should be an indicator of the deliberation level. We propose that the use of the *Quote Tweet* function encouraged users to find high-quality tweets to quote and spread.

H4. The length of quoted tweets was longer during the temporary suspension of the *Retweet* function than it was before the suspension.

2.3. The moderating role of users' retweeting habits

Objects that constitute the action environment form the basis of environment affordances, and the features of these objects delimit what actions are (and are not) possible in the environment (Faraj & Azad, 2012). These objects' properties exist relative to human actors' subjective perceptions, expectations, and needs, but the effect of affordances is not merely determined by the materiality of objects. People who act in the environment still have agency when behaving under the constraints of affordances (Hutchby, 2001; Leonardi, 2011), and they thus may perceive and react to affordances differently. The interactions between the environment's constraints and people's agency determine the degree of influence of affordances. The same affordance can involve different possibilities and constraints for different individuals. The effect of affordances on people is about how actors take advantage of or resist affordances (S. K. Evans et al., 2017).

Taking users' agency into account, Twitter's temporary suspension of the *Retweet* function may have influenced users in a nuanced way. There may not have been uniform behavior changes. Some users may have become more deliberative after the suspension, while others may not have been affected or have become even less deliberative. People's behaviors on social media are associated with their previous use habits (e.g., Bayer et al., 2016; LaRose, 2010). Those who were accustomed to using the *Quote Tweet* function and making comments on others' tweets may have been more likely to comply with the platform developers' encouragement and be triggered by Twitter's suggestion to make comments and engage in more deliberation. However, those who preferred retweeting directly may have passively reacted to this change in affordance by writing nothing or just a few words without deliberation in the *Quote Tweet* composer.

H5. The deliberation level of quotation tweets for users who used the *Quote Tweet* function more frequently before the temporary suspension of the *Retweet* function increased more than those who used the *Quote Tweet* function less frequently during the suspension.

In summary, this study examines the effect of the temporary suspension of the *Retweet* function and the promotion of the *Quote Tweet* function on users' deliberation levels by operationalizing the deliberation level as the deliberative quality of quotation tweets and the effort put into composing quotation tweets. The moderating effect of users' retweeting habits before the suspension is also explored. The relevant hypotheses are summarized in Fig. 1.

3. Method

3.1. Data collection

We randomly sampled 100,000 Twitter users in a two-stage procedure. In the first stage, we developed a sampling frame of the Twitter population. As a proxy for the target population, a sampling frame may not include all members of the population but should be an unbiased representation of it and contain contact information for all its members (Zhu et al., 2011). Through a paid subscription to Crimson Hexagon (an authorized data distributor of Twitter), we obtained access to Twitter's "firehose" (i.e., population) data, from which we randomly retrieved four million users who registered as residing in the United States and posted or retweeted at least once between October 1, 2019, and September 30, 2020, to create our sampling frame.

In the second stage, we randomly selected 100,000 users from the sampling frame as the initial sample for the present study. We included only 2.5% of the sampling frame instead all four million users because the chosen sample is sufficiently large to test our hypotheses. We then crawled all posts (up to the limit of 3200) that were publicly accessible in the timelines of the sampled users between August 1, 2020, and January 31, 2021. After filtering user accounts that did not post anything during the six months under study, there were a total of 82,617 users comprising the study's final sample. The data mainly include users' tweets posted over those six months and fall into four categories: original tweets, retweeting tweets, quotation tweets, and reply tweets.

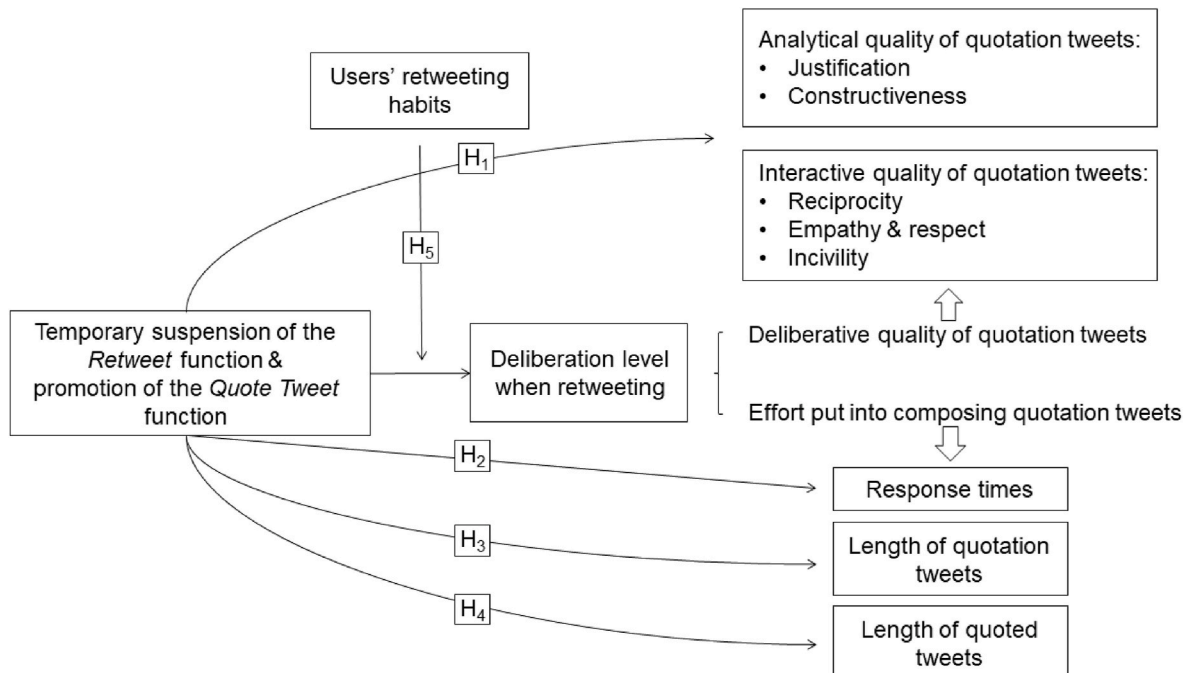


Fig. 1. Theoretical model of the study.

3.2. Research design

Every user's data were divided into three periods: tweets posted between August 1, 2020, and October 22, 2020 (i.e., before the suspension of the *Retweet* function), tweets posted between October 23, 2020, and December 28, 2020 (i.e., during the suspension of the *Retweet* function), and tweets posted between December 29, 2020, and January 31, 2021 (i.e., after the *Retweet* function was reinstated). The differences between users' posting behaviors in these three time periods may reflect whether and how they were influenced by the temporary suspension of the *Retweet* function and the promotion of the *Quote Tweet* function. Compared with previous studies that use two platforms with different affordances to examine the effect of affordances on human behaviors (e.g., Oz et al., 2018), this natural experiment design can help control for the effect of unobserved or unmeasurable individuals' demographic traits and other characteristics that heavily influence the level of deliberation. The results should thus be more valid in terms of reflecting the real effect of affordances on deliberation.

To test the proposed hypotheses and compare the differences in usage behaviors, fixed-effect models were conducted to control for user-level confounding variables. In the panel data, variations of the dependent variable are from two aspects: variations within each observed unit across time and variations across observed units. The fixed-effect model is effective in controlling for the effect of variables that reflect the characteristics of different individuals, can influence the dependent variable, and do not change over time. The model can help examine the causal effect of the time-variant independent variables on the dependent variable.

The present study uses three time periods. The analytical and interactive quality of quotation tweets, the response time of quotation tweets, the length of commentary, and the length of quoted tweets not only vary among individual users but also change over time. We wanted to examine the effect of the affordance change on these variables, but their values largely depend on differences in individuals. Thus, fixed-effect regression models were used to control for the influence of these differences and to explore the effect of the changes in the affordance on users' behaviors across time. Specifically, fixed-effect generalized linear models (fixed-effect logistic regression models) were used to examine the change in the analytical and interactive quality of tweets. The fixed-effect survival model was used to examine the change in the response time, given that duration variables usually follow the Weibull distribution. Fixed-effect negative binomial models were used to examine changes in the length of quotation tweets and the length of quoted tweets, given that the distribution of these variables is over dispersed. The moderating effects of users' retweeting habits were examined by adding interaction terms (period*percentage of quotation tweets in total tweets before the suspension) into the fixed-effect models referred to above.

3.3. Measurement

This study measures the deliberation level from two perspectives (see Table 1): first, based on the language features of users' tweets, justification, constructiveness, reciprocity, empathy and respect, and incivility were used to measure the deliberative quality from the analytical and interactive perspectives (Jaidka, 2022b; Jaidka et al., 2019).

3.3.1. The analytical quality of tweets

The analytical quality of quotation tweets can be indicated by their justification and constructiveness, which respectively measure whether users' tweets provide reliable evidence to support their arguments and whether their tweets are posted to move the discussion forward (Jaidka et al., 2019). Users' tweets were labeled according to the level of justification and constructiveness in a binary fashion (e.g., tweets showing justification were labeled with 1, otherwise 0) by supervised machine learning classifiers trained by Jaidka and colleagues (Jaidka, 2022a,

Table 1
Measurement of deliberation.

	Measurement	Definition	
Deliberative quality of quotation tweets (Jaidka, 2022b; Jaidka et al., 2019)	Analytical quality	Justification	Whether users' tweets provide reliable evidence to support their arguments.
		Constructiveness	Whether users' tweets move the discussion forward.
	Interactive quality	Reciprocity	Whether users attempt to pose a genuine question or give a response.
		Empathy and respect	Whether users are respectful to different arguments.
Effort put into composing quotation tweets	Response time	Incivility	The antithesis of empathy and respect. The time between an original tweet and quoting it by panel users.
		Length of quotation tweets	The length of commentary when users quote others' tweets as measured by the number of characters and words.
		Length of quoted tweets	The length of tweets quoted by panel users as measured by the number of characters and words.

2022b; Jaidka et al., 2019). Overall, 22.5% of tweets were labeled as showing justification, and 0.02% of tweets were labeled as showing constructiveness.

3.3.2. The interactive quality of tweets

The interactive quality of quotation tweets was operationalized as the level of reciprocity, empathy and respect, and incivility. Reciprocity reflects whether users attempt to pose a genuine question or give a response. Empathy and respect reflect whether users are respectful of different arguments. Incivility is the antithesis of empathy and respect (Jaidka, 2022b; Jaidka et al., 2019). These three indicators are also measured in a binary way using supervised machine learning classifiers trained by Jaidka and colleagues (Jaidka, 2022a, 2022b; Jaidka et al., 2019). Overall, 14.06% of tweets were labeled as showing reciprocity, 37.97% of tweets were labeled as showing empathy and respect, and 0.01% of tweets were labeled as showing incivility.

Second, as shown in Table 1, the deliberation level was also measured by the effort users put into composing quotation tweets, using these three indicators.

3.3.3. The response time of quotation tweets

Response time refers to the time between the posting of the original tweet and when it was quoted by panel users. Longer response times indicate more effort in information processing and thus higher levels of deliberation. It was measured in seconds ($M = 690,405.20$, $SD = 9,214,905.00$, $Skewness = 21.85$). The response time of every post for every user is calculated. In addition, the response time may be associated with users' habits of using Twitter. For example, some users prefer to check new posts several times every day while others may check only once a day. This influences their response times (Guan et al., 2022). The fixed-effect models used in this study compare the response time within individual users across periods and thus make response times more accurate in reflecting deliberation levels.

3.3.4. The length of quotation tweets

The length of quotation tweets is the length of the commentary users add when quoting others' tweets. Longer comments are associated with a greater level of deliberation as they have higher cognitive costs. It was measured by the number of characters ($M = 69.06$, $SD = 37.89$, $Skewness = 1.00$) and the number of words ($M = 12.54$, $SD = 7.32$, $Skewness = 1.59$) in each quotation post. Every user could have any number of quotation posts during any period.

3.3.5. The length of quoted tweets

The length of quoted tweets refers to the length of tweets quoted by the sampled users. It indicates the level of deliberation by reflecting users' effort put into seeking high-quality tweets that could better support their reasoning. This indicator was measured by the number of characters ($M = 96.24$, $SD = 42.95$, $Skewness = 0.00$) and the number of words ($M = 17.29$, $SD = 8.15$, $Skewness = 1.15$) of each tweet quoted. Every user could have any number of quoted tweets during any period.

4. Results

The analyses were conducted based on data from 82,617 users. Descriptive statistics are shown in Table 2. Except for the indicators introduced in Section 3.3, counts for the four types of tweets (i.e., original tweets, retweeting tweets, quotation tweets, and reply tweets) are also listed. As the three time periods (i.e., before the suspension, during the suspension, and after the suspension ended) were of different lengths, counts of the four kinds of tweets are calculated as the average counts of tweets *per day per user*. The percentages are calculated as the proportions of each type of tweet to total tweets.

4.1. Main effects of the suspension of the retweet function

Fixed-effect generalized linear models of deliberative quality on time periods (main effects without interaction terms) show that the levels of justification ($B = -0.042$, $p < .001$), reciprocity ($B = -0.030$, $p < .001$), and empathy and respect ($B = -0.068$, $p < .001$) of quotation tweets decreased during the suspension of the *Retweet* function, compared with levels before the suspension. The levels of constructiveness and incivility did not significantly change during the suspension; thus, H_1 is not supported. The deliberative quality of quotation tweets did not increase from either the analytical or interactive perspectives.

The fixed-effect survival analysis of response time on time periods (main effects without interaction terms) shows that the response time increased slightly during the suspension of the *Retweet* function ($B = 0.055$, $p < .001$) and after the resumption of the *Retweet* function ($B = 0.038$, $p < .001$). Thus, H_2 is supported.

Based on results from fixed-effect negative binomial models of the

Table 2
Descriptive statistics before, during, and after the temporary suspension.

	Before	During	After
<i>Average counts per day per user (percentage of all tweets)</i>			
Original tweets	1.60 (15.02%)	1.91 (15.71%)	1.75 (14.63%)
Retweeting tweets	5.72 (53.71%)	5.99 (49.26%)	6.42 (53.68%)
Quotation tweets	0.70 (6.57%)	1.10 (9.05%)	0.84 (7.02%)
Reply tweets	2.63 (24.69%)	3.16 (25.99%)	2.95 (24.67%)
<i>Percentage of all tweets</i>			
Justification	22.77%	21.51%	23.10%
Constructiveness	0.02%	0.02%	0.02%
Reciprocity	14.23%	13.74%	14.54%
Empathy & Respect	39.19%	36.73%	38.67%
Incivility	0.00%	0.01%	0.01%
<i>Average time span per tweet (seconds)</i>			
Response time	689,500.90	704,671.40	655,308.90
<i>Average number of characters per tweet (Average number of words per tweet)</i>			
Length of quotation tweets	71.36 (12.95)	67.02 (12.17)	69.64 (12.64)
Length of quoted tweets	95.99 (17.27)	96.40 (17.32)	96.33 (17.23)

message length on time periods (main effects without interaction terms), the length of quotation tweets decreased when the *Retweet* function was not available, based on the change in character counts ($B = -0.043$, $p < .001$) and word counts ($B = -0.041$, $p < .001$). Thus, H_3 is not supported by the fixed-effect analysis, which indicates that users did not tend to provide longer comments even though they were prompted to consider and deliberate more by Twitter. When they were not using the *Quote Tweet* function by their own choice, the affordance's positive impacts on deliberation through the expression effect are insignificant. Twitter stated that 45% of quotation tweets had only one word and that 70% of them had fewer than 25 characters during the affordance change period (Peters, 2020).

The length of quoted tweets also did not increase during the suspension, based on change in character counts ($B = -0.004$, $p < .001$) and word counts ($B = -0.003$, $p < .001$). Thus, H_4 is not supported. This result shows that users were less likely to be effortful in processing the relevant information and that deliberation was less likely to be triggered, based on the short and low-quality tweets.

4.2. Moderation effects

Based on the results shown in Tables 3–5, H_5 is partly supported. For the language features, the level of quotation tweets' justification ($B = 0.088$, $p < .001$) and empathy and respect ($B = 0.106$, $p < .001$) for users who posted quotation tweets more frequently before the suspension increased more than others during the suspension of the *Retweet* function, while this moderating effect of people's previous frequency of using the *Quote Tweet* function on the influence of the affordance change on tweets' constructiveness, reciprocity, and incivility was not statistically significant. For the effort put into writing quotation tweets, the response time ($B = 0.014$, $p < .001$) and the length of quotation tweets ($B = 0.064$, $p < .001$) for users who used the *Quote Tweet* function more frequently increased more during the affordance change period. However, the length of quoted tweets decreased more for these users ($B = -0.013$, $p < .01$) during the suspension.

4.3. Change in counts of the four types of tweets

Changes in the counts of the four types of tweets (original, retweeting, quotation, and reply tweets) were also examined through fixed effect negative binomial models. As shown in Table 6, the results illustrate that users posted more original tweets ($B = 0.129$, $p < .001$), quotation tweets ($B = 0.445$, $p < .001$), and reply tweets ($B = 0.108$, $p < .001$) during the suspension of the *Retweet* function while posting fewer retweeting tweets ($B = -0.246$, $p < .001$). This suggests that Twitter's change in retweeting-related affordances did influence the frequency of using different retweeting functions. Although Twitter suspended direct access to the *Retweet* function, users could still choose to type nothing into the *Quote Tweet* composer as an alternative to the simple *Retweet* function. The regression results show that there was a significant increase in the frequency of quotation tweets, which indicates the effect of the platform's deliberate change in affordance design on user behaviors. However, from another perspective, the total number of retweeting and quotation tweets declined by 20% during the temporary suspension of the *Retweet* function (Peters, 2020). The overall use of retweeting with or without comments decreased.

After Twitter reverted to the traditional *Retweet* process, the frequency of original tweets ($B = 0.048$, $p < .001$), quotation tweets ($B = 0.177$, $p < .001$), and reply tweets ($B = 0.041$, $p < .001$) were still slightly higher than their frequency before the suspension; the frequency of retweeting tweets was lower ($B = -0.136$, $p < .001$). Thus, the increase in use of the *Quote Tweet* function was not transient, and Twitter may have encouraged some users to develop a habit of or preference for quoting rather than retweeting, at least over the short term.

Table 3

Fixed-effect generalized linear regression models in predicting the analytical and interactive quality of quotation tweets.

	Analytical quality		Interactive quality		
	Justification	Constructiveness	Reciprocity	Empathy & respect	Incivility
<i>Fixed effects (coefficient with SE)</i>					
During vs. before	-0.057*** (.004)	-0.097 (.088)	-0.037*** (.004)	-0.086*** (.003)	0.143 (.150)
After vs. before	-0.002 (.004)	0.003 (.107)	0.007 (.005)	-0.024*** (.004)	0.237 (.188)
During*percentage	0.088*** (.023)	0.777 (.477)	0.041 (.023)	0.106*** (.022)	-0.175 (.804)
After*percentage	0.114*** (.024)	0.542 (.583)	0.071** (.027)	0.051* (.024)	0.676 (.905)
<i>Model fit index</i>					
BIC	14,265,940.6	53,546.2	11,251,554.6	17,653,388.4	18,763.1
Adjusted pseudo R ²	0.031	-0.033	0.016	0.033	-0.036

Note. The period before the suspension was set as the reference group. Justification, constructiveness, reciprocity, empathy and respect, and incivility of quotation tweets during the suspension of the *Retweet* function and after the resumption were compared with levels before the suspension. The interaction terms are comprised of time periods and the percentage of quotation tweets (before the suspension) in total tweets (before the suspension). Estimates reflect changes in tweet quality; * $p < .05$, ** $p < .01$, *** $p < .001$.

Table 4

Fixed-effect survival analysis in predicting the response time of quotation tweets.

	Response time (seconds)
<i>Fixed effects (coefficient with SE)</i>	
During vs. before	0.053*** (.001)
After vs. before	0.043*** (.001)
During*percentage	0.014*** (.005)
After*percentage	-0.034*** (.006)
<i>Model fit index</i>	
Concordance	0.638
Nagelkerke R ²	0.132

Note. The period before the suspension was set as the reference group. Response times of quotation tweets during the suspension of the *Retweet* function and after it was reinstated were compared with response times before its suspension. The interaction terms are comprised of time periods and the percentage of quotation tweets (before the suspension) in total tweets (before the suspension). The estimates reflect changes in response times; * $p < .05$, ** $p < .01$, *** $p < .001$.

5. Discussion and conclusions

5.1. Summary of findings

Using Twitter usage data before, during, and after the temporary suspension of the *Retweet* function around the 2020 US presidential election, this paper examines the extent to which the change in platform affordances may have influenced user behaviors and the extent to which deliberation was achieved under the change in affordance from the expression effect perspective. The results show that response times of quotation tweets increased (as posited in H₂) during the temporary

Table 5

Fixed-effect negative binomial regression models in predicting the length of quotation tweets and quoted tweets.

	Number of Characters		Number of Words	
	Quotation tweets	Quoted Tweets	Quotation tweets	Quoted Tweets
<i>Fixed effects (coefficient with SE)</i>				
During vs. before	-0.054*** (.001)	-0.002** (.001)	-0.052*** (.001)	-0.002* (.001)
After vs. before	-0.035*** (.002)	-0.015*** (.001)	-0.032*** (.002)	-0.017*** (.001)
During*percentage	0.064*** (.008)	-0.013** (.004)	0.066*** (.008)	-0.012** (.004)
After*percentage	0.066*** (.011)	0.055*** (.007)	0.062*** (.011)	0.045*** (.007)
<i>Overdispersion parameter</i>				
Theta	5.30	5.14	6.54	7.07
<i>Model fit index</i>				
BIC	125,669,797.5	134,909,309.5	82,841,434.2	90,407,375.1
Adjusted pseudo R ²	0.029	0.017	0.038	0.019

Note. The period before the suspension was set as the reference group. The length of quotation tweets and quoted tweets during the suspension of the *Retweet* function and after its resumption was compared with that before the suspension. The interaction terms are comprised of time periods and the percentage of quotation tweets (before the suspension) in total tweets (before the suspension). The estimates reflect changes in the length; * $p < .05$, ** $p < .01$, *** $p < .001$.

suspension of the *Retweet* function compared with response times before the suspension. However, the analytical and interactive quality of quotation tweets (H₁), the length of users' comments when quoting others' tweets (H₃), and the length of tweets that are quoted (H₄) did not increase during the temporary suspension of the *Retweet* function. These effects are different for users with different retweeting habits. For those who used the *Quote Tweet* function more frequently before the *Retweet* function's temporary suspension, the levels of quotation tweets' justification (reflecting their analytical quality) and empathy and respect (reflecting their interactive quality), response times, and length of quotation tweets all increased more during the suspension, while the

Table 6

Fixed-effect negative binomial regression models in predicting the frequency of original tweets, retweeting tweets, quotation tweets, and reply tweets.

	Original tweets	Retweeting tweets	Quotation tweets	Reply tweets
<i>Fixed effects (coefficient with SE)</i>				
During vs. before	0.129*** (.005)	-0.246*** (.004)	0.445*** (.006)	0.108*** (.004)
After vs. before	0.048*** (.005)	-0.136*** (.004)	0.177*** (.007)	0.041*** (.005)
<i>Over-dispersion parameter</i>				
Theta	65.86	10.58	595.84	28.18
<i>Model fit index</i>				
BIC	1,420,998.6	1,752,910.8	1,179,674.2	1,499,365.9
Adjusted pseudo R ²	0.283	0.271	0.242	0.293

Note. The frequency of different types of tweets during the suspension of the *Retweet* function and after the resumption were compared with the frequency before the suspension in four models. The estimate reflects the change of levels of frequency; * $p < .05$, ** $p < .01$, *** $p < .001$.

levels of other tweet quality indicators did not change significantly, and the length of quoted tweets actually decreased, thus partly supporting H₅. The implications of these findings are discussed in detail in the following section.

5.2. Theoretical and practical implications

This affordance change on Twitter influenced users' behaviors in two respects. On the one hand, the suspension of the *Retweet* function and the promotion of the *Quote Tweet* function were effective at urging users to add commentary more frequently when retweeting. Those moves also made users spend more time considering the tweets they were quoting and what they wanted to express before retweeting. This is congruent with what affordance analysis suggests; that is, the deliberate design of affordances can influence user actions. Along with an increase in using the *Quote Tweet* function, the frequency of posting original tweets and reply tweets also increased during the temporary suspension. The proportions of quotation tweets, original tweets, and reply tweets to all tweets increased as well. Compared with the *Retweet* function, these three functions allow users to express their thoughts more fully. In this sense, the change in affordance urged users to express themselves more frequently, making their activities on Twitter more likely to be deliberative. These changes in user behaviors were meaningful during the presidential election. Misleading information that is irrational and uncivil political debates that can endanger the democratic election process and do harm to societal cohesion are reduced because of the increase in deliberation. In addition, when users reason reflectively and logically, their existing views and thoughts will be reexamined, facilitating the formation of more rational ideas.

On the other hand, the influence of this affordance change on users was not always consistent with the platform's expectations. As with any change in affordances, users still retained agency. For this study, both the analytical and interactive quality of users' quotation tweets decreased because of the affordance change. The length of both their quotation tweets and the quoted tweets decreased during the suspension of the *Retweet* function. The reason may be that many users passively accepted having to use the *Quote Tweet* function and quickly generated short and largely meaningless comments on others' tweets, thus retweeting them without deliberating on their contents. This inference is supported by the examination of moderation effects of users' retweeting habits on the influence of affordance changes on deliberation. Users who were accustomed to using the *Quote Tweet* function were affected more in the affordance designers' expected direction. The deliberative levels of their quotation tweets during the period of the affordance change increased more than other users in terms of deliberative quality (including analytical and interactive aspects) and tweet length. This suggests that nuances exist in the effect of the affordance change on users' deliberative behaviors. Some users were more compliant with the platform's intentions and deliberated more before retweeting, but the effect of the change in affordance for others was limited to a change in the form—but not deliberative levels—of their retweeting behaviors. The affordance change did not spark these users' awareness of the value of being or the need to be deliberative and reflective.

Combining the results from these two aspects, at the population level, the frequency of using the *Quote Tweet* function and the response times increased, while the deliberative quality, the length of quotation tweets, and the length of the quoted tweets decreased. This implies that the temporary suspension of the *Retweet* function and the design of the interface of the *Quote Tweet* function increased the complexity of retweeting but did not improve deliberation. Although the aim of designing this change was to foster deliberation, some users did not employ it as expected.

After the election, the *Retweet* function was reinstated. Twitter no longer provided any reminders or visual cues promoting the *Quote Tweet* function. Users could once again freely choose to retweet with or without comments, but use of the quotation function was higher than it

had been before the temporary affordance change. This means that the influence of the affordance change was persistent, at least in the short period covered by the data in the present study. Repetition in social media use could help people form habits, and the strength of a habit increases with the number of repetitions (Venkatesh et al., 2012). Thus, we assume that a long-run change in affordance might make its influence last longer. Compared with the effective change in usage frequency, deliberation levels did not increase to a meaningful extent. Although response times increased, the quality and length of quotation tweets actually decreased, and this decrease continued after the *Retweet* function was reinstated. Thus, a habit of deliberation did not form at the population level. The reason may be that habit formation not only relies on repetition but is also related to each individual's preferences and motivations. Users care about the rewards they could acquire in the formation of habits if this habit needs more costs (Smith & Graybiel, 2016). Deliberation needs high cognitive costs, and the benefits of deliberation cannot be felt in a short time. Thus, being deliberative when expressing oneself, at least on Twitter, is more difficult to accustom oneself to than simply using the *Quote Tweet* function. Furthermore, people who were more accustomed to using the *Quote Tweet* function before the temporary suspension, as discussed above, were more likely to be deliberative during the suspension. This effect also existed after the *Retweet* function was reinstated, which indicates that it is easier to reinforce users' existing habits than to change them.

Therefore, the influence of affordance change on deliberation was limited and nuanced. Some users' acceptance of the affordance change was passive, and passive expression is not effective in fostering deliberation. From the perspective of the expression effect, the precondition of achieving deliberation means putting sufficient effort into processing information according to logic, thinking reflectively about arguments from all sides, and organizing one's language to express one's considered reaction. However, this affordance change in Twitter simply increased users' access to the quotation function, which affords expression, but does not compulsorily require users to generate long comments or think more before retweeting. Users had many ways to avoid the influence of this change, such as writing just a few words or making a meaningless comment. The expression effect on deliberation can hardly take effect in this circumstance, although for people who were already prone to use the quotation function, the affordance change triggered more deliberation in their expression. This implies the necessity of designing more compulsory affordances that users cannot avoid—or can only avoid with great difficulty—if social media platforms want to increase users' deliberation level through the expression effect. In addition, different users' preferences and habits should be taken into consideration when designing affordances.

5.3. Limitations and future directions

Despite the findings shown above, the present study does have certain limitations. First, it uses a natural experiment design. Although time-invariant confounding variables can be controlled, there were still some time-variant variables (except for the affordance change) that could influence users' behaviors. The influence of these variables cannot be totally controlled in a natural experiment the way they might be in a randomized controlled trial. For example, during the presidential election, the increase in the number of election-related tweets may lead to information redundancy in users' newsfeed timelines, which is positively related to longer response times for quotation tweets (Guan et al., 2022). As the start time of the suspension was very close to the presidential election on November 3, this effect of the election may partly explain the increase in response times during the suspension of the *Retweet* function. This suggests that the increase in deliberation indicated by the response time may actually be smaller than the present study indicates. However, election-related information and discussion also existed in the pre-election period, which overlapped with the first period in the present study. To some extent, this could rule out the

influence of the election on user behaviors. Second, the present study measured deliberation levels from the expression effect perspective by examining the analytical and interactive quality of tweets and the effort put into composing quotation tweets. Many other indicators can be used, such as the change in the percentage of cross-cutting retweeting. Future research could explore new indicators of deliberation and the expression effect. Third, this study examined the effect of an affordance change on users' deliberation levels based on Twitter data, which are text-based data. Future research could examine this effect on other platforms, especially highly visual social media, like TikTok, Instagram, and Snapchat, which could enrich our knowledge of how the effect of platform affordance changes on users' deliberation levels might vary and help policymakers and platform owners design online environments that facilitate deliberative discussion.

5.4. Conclusions

This study aimed to explore the impact of a change in platform affordances on users' deliberative retweeting behaviors from the expression effect perspective through a natural experiment. This approach encouraged us to consider deliberation as a reasoning process that appears when people want to express something. We examined the change in deliberation levels among users from two perspectives: the analytical and interactive quality of quotation tweets and the effort they put into composing quotation tweets. We observed an increase in the frequency of using the *Quote Tweet* function and response times and a decrease in deliberative quality, the length of quotation tweets, and the length of quoted tweets, implying that this affordance change increased the complexity of retweeting but did not truly foster deliberation. Users' retweeting habits moderated this effect: those who were more accustomed to using the *Quote Tweet* function before the suspension were more deliberative because of the change. The findings in the present study enrich our knowledge about the way to improve deliberation and offer reference points for social media platforms to create a more democratic and civil discussion space in their design of platform affordances.

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CRedit authorship contribution statement

Qiyue Zhang: Conceptualization, Methodology, Formal analysis, Writing – original draft. **Hai Liang:** Conceptualization, Methodology, Investigation, Data curation, Writing – review & editing. **Tai-Quan Peng:** Conceptualization, Investigation, Data curation, Writing – review & editing. **Jonathan J.H. Zhu:** Conceptualization, Investigation, Data curation, Writing – review & editing, Funding acquisition.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

The data is not available, because the data were obtained based on the proprietary information provided by Crimson Hexagon.

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