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A multidisciplinary, theoretical model of information propagation

Why do people share information and narratives on social media?

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The revelations of Russian disinformation campaigns on social media against the U.S. population during the 2016 election have identified a stark vulnerability in the security of the United States (e.g., Sydel, 2017; *United States of America v. Internet Research Agency LLC*, 2018; Waltzman, 2017; Woolley & Howard, 2017). Fake news, as it is currently popularized,¹ is not new, nor is propaganda (e.g., Allcott & Gentzkow, 2017; Jowett & O'Donnell, 2015; Lazer et al., 2018; McKernon, 1928; Pratkanis & Aronson, 2001). There has been an increase in this kind of 'information war' by Russia against the United States and European countries at least since 2014 (e.g., Paul & Matthews, 2016; Prier, 2017; Woolley & Howard, 2017). Information warfare does not simply occur between nations: In addition, extremist groups recruit and spread propaganda online, both jihadi Islamic groups and right-wing extremists (e.g., Benigni, Joseph, & Carley, 2017; Bowman-Grieve, 2013; Caiani & Wagemann, 2009; Derrick, Sporer, Church, & Ligon, 2016; Prier, 2017; Vidino & Hughes, 2015). These activities open up new fronts in the United States' information environment, both domestically and abroad.

Before tackling the roots or spread of misinformation (incomplete, vague, ambiguous information) or disinformation (intentionally untrue information; Cooke, 2017), it is important to understand why people share any information on social media at all. This report presents a broad, multidisciplinary review of the factors that have been shown to, or might, influence sharing information on social media, regardless of its veracity. This report begins with an introduction to the problem, then covers the background and an overview of a high-level model of information sharing. The model flows through the different ways information is acquired or viewed from a source, to reactions by the target sharer and motivations to share, to the ability (and perceptions of the ability) to share before leading to sharing behavior. Finally, this model distinguishes between genuine and non-genuine (inauthentic) actors: Non-genuine actors are individuals who are pretending to be someone they are not, and can include bots, which are automated and driven by algorithms designed to interact or share information.

¹ Fake news historically has included yellow journalism and other information in news media that is deliberately inaccurate or misleading. For most of this paper, we use the term 'fake news' to refer to "news articles that are intentionally and verifiably false, and could mislead readers" (Allcott & Gentzkow, 2017, p. 213). Note that intent is hard to prove, and propaganda can include a mix of falsehood and truth. Although we will refer to 'fake news,' particularly in reference to the corpus we analyze, we will often also refer to the more technical terms of misinformation and disinformation (Cooke, 2017). Fake news may include one or both types. While disinformation is intentionally untrue, misinformation may have elements of truth in it (Cooke, 2017).

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INTRODUCTION

Social media are a relatively new channel by which people not only acquire, but also share information. Social media-based information conflict has sparked the interest of government, academia, and industry alike. Key research topics underlying the flood of online communication are *why* and *how* people share narratives and information online. Narratives, in this context, refer to coherent stories that are shared with multiple people rather than isolated pieces of information (Green & Brock, 2005, Hinck, Kluver, & Cooley, 2017). Defined in this manner, a narrative might describe an activity or conflict consisting of a storyline with a beginning, middle, and end, rather than a single fact, and it may imply or state a context, how, and why (van Krieken & Sanders, 2016). Readers of news stories can be more involved in narrative reporting, for instance, compared to more neutral, ‘hard news’ reporting (van Krieken & Sanders, 2016). This review examines studies of information propagation, but often focuses on narratives. Given its conceptual breadth, we also use the term “message” to include narratives. Although narrative propagation is not new, social media has made spreading stories, including false ones or ones with false elements, easier.

In the U.S., social media use has become synonymous with digital and mobile life. A 2016 Pew Research Center study found that in November of that year, at least 69% of U.S. adults used at least one social media site (Pew Research Center, Internet & Technology, 2017). This finding is a significant jump from November of 2010, when only 45% of American adults said the same. Among popular social media sites in the U.S.—including Facebook, Twitter, Instagram, LinkedIn and Pinterest—Facebook remains the most popular. In the latest numbers from Pew from April 2016, 68% of U.S. adults say they use Facebook, and more than 75% of Facebook users say they visit the site daily.

Social media platforms are proving popular destinations for news consumption, specifically. In August 2017, 67% of Americans reported getting at least some of their news on social media, with, again, Facebook leading the way (Shearer & Gottfried, 2017). Forty-five percent of Facebook users say they get news on the site, followed by YouTube (18%) and Twitter (11%; Shearer & Gottfried, 2017), though about a quarter of Americans report getting news from two or more social media sites.

Many users openly struggle with misinformation and disinformation. A Pew study using 2016 survey data found that 23% of respondents said they had shared a made-up news story—some knowingly, some unknowingly ($N = 1,002$; Barthel, Mitchell, & Holcomb, 2016). A larger percentage of respondents in this study, 64%, stated that fabricated news stories “cause a great deal of confusion about the basic facts of current issues and events.” A different study of 1,200 respondents found that only 14% of American adults viewed social media as the most important source of election news, but that all the respondents were exposed to at least one, or perhaps several, fake news articles (Allcott & Gentzkow, 2017). Fake news websites relied more heavily on social media traffic than true news, which relied on social media traffic relatively less (42% versus 10%).

The propagation of information has many antecedents, causes, and moderating factors, including amplifiers and suppressors. Information propagation has been studied for decades across a range of disciplines: psychology, marketing, sociology and social network analysis, political science and political communication, human-computer interaction (HCI), journalism, and information sciences. Some articles from these disciplines cite other disciplines (e.g., HCI may cite psychology), but others do not (e.g., psychology rarely cites other disciplines). In this report, our goal is to review the literature from these varied sources to build a multidisciplinary, theory-driven model of online narrative propagation. This report leverages existing knowledge about the spread of information in general, why people are convinced by information they see, the effects of different kinds of messages on human affect and cognition, and what might make someone go from interest to sharing, as well as some possible cross-cultural differences. Most individual papers focus on a small number of factors that might be useful, with few works attempting a comprehensive view (see Hermida, 2014, for one such attempt). By assembling the many factors from across a wide and interdisciplinary literature, future research can develop measures to quantify those factors, with the goal of discovering which ones have predictive power for encouraging sharing behavior in conjunction with each other in real-world social media and within different cultural and language contexts.

This report first provides a brief background about social media and the information environment. It then offers a high-level model of why people share information, and describes factors within each component in detail. In addition to surveying the literature, we conducted a bottom-up, qualitative analysis of 20 fake news stories shared via social media in English and Russian, in terms of both language and social media users and platforms (Methodology in Appendix A). We use insights from these stories to contextualize and illustrate the findings from the literature, as well as to add to our theoretical model.

BACKGROUND AND OVERVIEW

Those polling public opinion have discovered a rich, inexpensive resource in social media, where some individuals express their opinions freely and frequently. Opinions are expressed attitudes (Glynn, Herbst, O’Keefe, Shapiro, & Linderman, 2004), whereas attitudes are a mix of behavior, affect (feelings), and cognition (beliefs; Breckler, 1984; Glynn et al., 2004). Attitudes may be overtly or implicitly contained within narratives, including in how narratives are presented and framed.

Social media has made the cost of spreading information low, making it easy to influence public opinion (Allcott & Gentzkow, 2017; Shao, Ciampaglia, Varol, Flammini, & Menczer, 2017). Social media are, of course, not only used for sharing individual political opinions. Social media are used by large companies to advertise; by smaller-scale creators and businesses to promote themselves and cultivate an audience and fan base; by politicians to share directly their thoughts with constituents and others; and by individuals to share news, memes, and their lives with each other. On the one hand, social media serve as a new ‘public sphere’ that enables minority and oppressed voices to gain an audience by circumventing gatekeepers, thus enhancing free speech (Debatin, 2008). On the other hand, social media platforms are designed to encourage sharing, regardless of the authenticity or benevolence of the content, and thus support the best and worst of human psychology: the needs for attention, affiliation, and status; the desire to control and dominate narratives; and the attraction of novelty (e.g., Hermida, 2014; Tufekci, 2018). Malicious actors, be they state-sponsored or unaffiliated with a state, also use social media platforms to organize, spread their narratives, recruit, disrupt, undermine, and outright harm (see Goolsby, 2013; Goolsby, Galeano, & Agarwal, 2014; O’Sullivan, 2018; Paul & Matthews, 2016; Prier, 2017; Sindelar, 2014; Tufekci, 2018; Vidino & Hughes, 2015; Waltzman, 2017; Woolley & Howard, 2017).

Social media therefore can suffer from a series of problems, including deliberately false information, too much information, and malicious or hostile actions (Goolsby, 2013; Tufekci, 2018). This hostility can affect individuals outside of the digital environment, such as when individuals’ personal information is deliberately posted online (called doxing) and malicious actors falsely report to law enforcement an emergency, resulting in the deployment of a SWAT (Special Weapons and Tactics) team to an unsuspecting person’s home (swatting; Tufekci, 2018). Even beyond deliberate malicious actions, compared to traditional media, new media encourage audiences to follow content they already agree with (Paletz, Owen, & Cook, 2018). Citizen journalists (and those trying to be journalists) lack the resources to truly uncover the truth and are primarily reactive (Paletz et al., 2018). In addition, most new media platforms are controlled by a few large corporations (e.g., Facebook), with smaller social media organizations increasingly acquired by larger ones (Arsenault & Castells, 2008; Paletz et al., 2018). Further, social media raise a range of privacy concerns (Ellison, Vitak, Steinfield, Gray & Lampe, 2011; Paletz et al., 2018; Trepte & Reinecke, 2011). Not only are people on social media publically sharing what used to be private word-of-mouth and rumor (Hermida, 2014), but social media are used to express and promote hatred, extremism, and fanaticism, and “are rife with muddle and nonsense, distortion and error” (Paletz et al., 2018, p. 27).

With such downsides, one wonders why anyone remains engaged in social media, let alone shares information. This report delves into that question. Understanding why people share information online is key to sorting through the “muddle and nonsense, distortion and error” (Paletz et al., 2018, p. 27).

The virality, or widespread sharing, of messages themselves has been studied extensively. One conceptual model of virality in social media, based on successful viral marketing campaigns, suggests four success factors with the acronym ‘SPIN’: “spreadability of content based on personal factors, the propagativity of content based on media type, the integration of multiple media platforms, and the successive reinforcement of messaging” (Mills, 2012, p. 166). Within this SPIN framework, the *spreadability* refers to likeability of the content of the

message and whether the sharer feels others in the social network will have a similar reaction; *propagativity* refers to the ease with which consumers can continue to distribute or redistribute the content based on both qualities of the content itself and the initial sharer's social network; *integration* refers to the strategic use of multiple social networks simultaneously; and although most content does not achieve this final stage, *nexus* refers to the "successive reinforcement of the campaign by virtue of sequentially releasing units of viral content" (Mills, 2012, p. 168). Our model incorporates the factors behind both spreadability and propagativity and goes beyond this framework to include insights from a range of disciplines.

In creating a multidisciplinary model, we can utilize the best insights from a range of separated disciplines. The higher-level constructs in this model draw from a range of disciplinary theories. For example, from political communication, we take the different ways in which media collects narratives (Paletz, 2002). From psychology, we draw on the interplay and distinctions among cognition, affect, and behavior; the impact of culture on the three of those; the distinctions among different types of cognitive processing; persuasion; and the importance of both individual differences and the social situation (see below, e.g., Ajzen, 1991; Breckler, 1984; Brock & Green, 2005; Cialdini & Goldstein, 2004). This framework does not presume sharing, but instead identifies factors that may encourage or discourage sharing and the potential interactions among those factors.

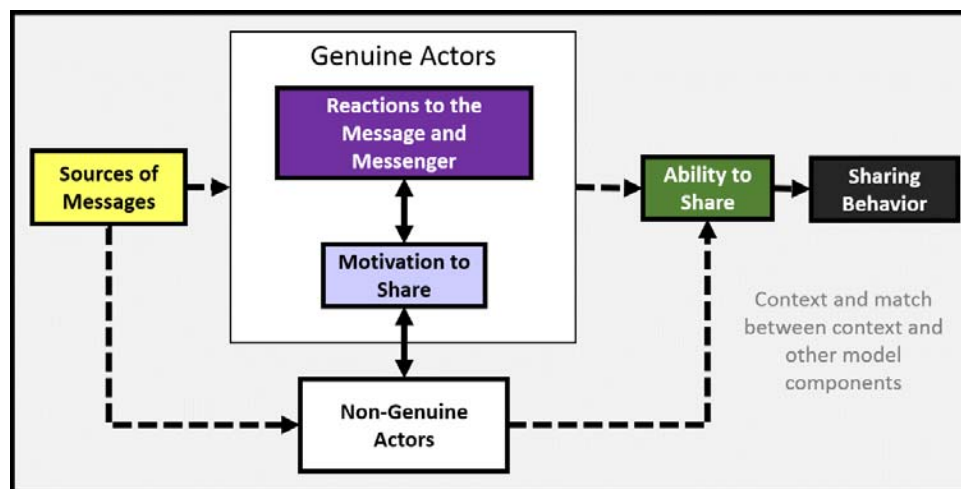


Figure 1. Highest-level model of narrative propagation

Most of the components of this model relate to the process of evaluation that a person goes through, explicitly or implicitly, before making a decision to share information. At the most abstract level, this evaluation involves information that originates from somewhere, a psychological reaction on the part of a real person engaged with that information (or a pre-programmed reaction by an entity that is not genuine), a motivation to share, and then an assessment as to what kind of sharing is possible and/or desirable. Thus, in our framework, the act of sharing information online is made up of several categories of factors: **sources of messages, reactions to the original message and messenger, the motivation to share, the ability to share** (and perception of the ability to share), and then, of course, actual **sharing behavior** (Figure 1). Dotted lines indicate the general temporal flow of a process which may, but need not, indicate direct causal relationships. Solid lines indicate potential directional influence. For example, the sources of messages do not cause the same reaction in all people, but the messages elicit *some* kind of psychological reaction by genuine actors. That reaction is influenced by their dynamic motivations. This high-level model has much in common with fundamental psychological theory that suggests that attitudes and norms feed into behavioral intentions that then feed into behavior, dependent on the perceived ability to perform the behavior (e.g., Madden, Ellen, & Ajzen, 1992). In addition, we recognize that an increasing amount of online activity is conducted by non-genuine actors (e.g., Arnsdorf, 2017; O'Sullivan, 2018; Woolley & Howard, 2017). These include bots, or algorithms designed to share (Lokot & Diakopoulous, 2015; Shao et al., 2017; Varol, Ferrara, Davis, Menczer, & Flammini, 2017) and/or sockpuppets, or multiple fake identities through which individuals create the illusion of support (or disdain) by pretending to be different people (Bu, Xia, & Wang, 2013). Sockpuppets can be bots or can be humans who are hiding behind a false identity. As defined here, non-genuine actors on social media do not react

to original messages with authentic or real psychological responses (i.e., with affective and/or cognitive processes). Instead, they are programmed to propagate messages based on preexisting and adaptive plans. That noted, genuine human actors are behind the creation or goals of bots and sockpuppets, and they have specific motivations of their own (e.g., economic, political), such that genuine actors' motivations impact non-genuine actors. Finally, the broader **context and match between that context and the component pieces of this model**, including culture and the sharer's placement within their social networks, influence and touch all the other components. The highest level model, represented in Figure 1, includes all of these components.

SOURCES OF MESSAGES

In information studies, scholars have identified spaces where information is shared. Information grounds—traditionally seen as physical spaces like coffee houses and beauty parlors—are described as neutral, accessible places where conversation is the main activity (Fisher & Naumer, 2006; Oldenburg, 1999). Though physical places were studied as information grounds in the early 2000s, in today's digital ecosystem, online spaces like social networking platforms and messaging sites could be considered information grounds where these same conversations happen regularly. The types of information shared in these information grounds include current events, gossip, everyday advice regarding family, healthcare, and employment.

Researchers in human information interaction (HII) examine the interaction between people and information in its multiple forms and purposes (Fidel, 2012). According to Fidel, within the HII field, there are two established research areas: (1) information-seeking behavior, which focuses on how people look for information, and (2) information retrieval, which focuses on creating models for computer systems that retrieve information based on users' requests. Information-seeking behavior is the most relevant for this review. HII is also concerned with how users evaluate, judge, use, and share information. Fidel states that sharing information is a common mode of human information interaction.

As with traditional journalists, a social media user can acquire information from a combination of three sources (Paletz, 2002): Social media users can originate, receive, and/or gather information. In originating, individuals can take their own photos, write their own narratives, and record their own videos. More commonly, social media users see information and narratives that those they follow share, and then may decide to (or not to) share in turn. Finally, social media users may actively seek out others' sources, such as online news sources or blogs (web-based public journal logs), and then gather them to share on Facebook, Twitter, or some other platform.

Originating content

The broad access to digital technologies, especially in developed countries, has allowed anyone to become a content creator. Individuals can digitally share artistic content they create (e.g., music, fiction), as well as photographs, videos, and narratives detailing their personal lives. With this access, actors are also able to contribute to the news process. Users can report from events as they occur and share photos and videos live from the scene. They can also share their opinions on a wide range of topics. This phenomenon has been called citizen or participatory journalism (Allan, 2013; Rosen, 2006). Increasingly, the role of the audience is shifting from being passive receivers to active contributors, with the standard gatekeepers and expense of broadcasting giving way to easy access to an audience via social media (Paletz et al., 2018; Rosen, 2006). Allan (2013) defines citizen journalism as “a type of first-person reportage where ordinary individuals temporarily adopt the role of a journalist in order to participate in newsmaking, often spontaneously during a time of crisis, accident, tragedy or disaster when they happen to be present on the scene” (p. 9). Acts of citizen journalism can take many formats including eyewitness accounts, audio recordings, video footage, and mobile and digital camera photography (Allan, 2013). Anyone who has access to a smartphone, it seems, can share information online. This shift from consumers to contributors means that audiences and social media users play a much different role in the digital sharing and spreading of news and information. In addition to citizen journalists, malevolent actors can create their own content, as well (e.g., Arnsdorf, 2017; Scott, 2017).

Receiving content

Social media users can also receive content, viewing it on their social media passively, actively, and/or via the social media platform's algorithms. As noted previously, two-thirds of Americans reported getting their news via social media (Shearer & Gottfried, 2017). Social media users' digital networks have a significant impact on what content they are exposed to and what they consume. As they follow specific accounts of friends, family members, celebrities, businesses, and media organizations on social media, what those groups and individuals share dictates the content appearing in their feeds. Homophily is a basic principle such that individuals who are similar tend to connect with each other (McPherson, Smith-Lovin, & Cook, 2001). Individuals who are similar to each other socioculturally, demographically, professionally, ideologically, and so on will tend to join together into networks.

For some, this clustering may create an echo chamber of information. In *echo chambers*, individuals are largely exposed to conforming opinions (Flaxman, Goel, & Rao, 2016). A study of 10.1 million Facebook users found strong liberal versus conservative homophily, particularly for liberals (Bakshy, Messing, & Adamic, 2015). In fact, individuals chose to view less cross-cutting content than what was available to them. However, the same study also found cross-ideological friendships, such that on average over 20% of an individual's Facebook friends were from an opposing ideological affiliation (if they reported their ideology). This large study suggests that most peoples' echo chambers are porous. That noted, in a self-report study of 103 participants, individuals engaged less on Facebook if they perceived more diversity in their networks compared to those who perceived more similarities (Grevet, Terveen, & Gilbert, 2014). In other words, sharing was more likely to occur in the context of homophily, when friends exposed the user to like-minded content and the user was more assured to have a positive audience.

Researchers examining homophily need to take into account the dynamic (changeable) nature of friendship online (Noel & Nyhan, 2011). Two processes can make social networks more homogeneous: Users can become more like those in the existing network, and users can unfriend (drop from their social media network) individuals who are dissimilar (Noel & Nyhan, 2011). These dynamic processes increase homophily over time, making cross-sectional studies of the effects of homophily on social influence potentially biased (Noel & Nyhan, 2011). Even with that caveat, homophily is an established phenomenon that impacts the information that social media users observe (Bakshy et al., 2015; Flaxman et al., 2016).

In addition, Mills's (2012) SPIN theory of sharing identified size of network as a major factor of propagativity. This theory proposed that the bigger the network, the more viral content may show up on a user's social networking sites because of an increased chance of exposure. Thus, individual exposure to a greater array of, and more viral, content, is in part a function of the user's network size.

Gathering content

Individuals, of course, are not simply passive receivers of information: They also seek it out (Fisher & Julien, 2009; Kuhlthau, Heinström, & Todd, 2008). Social media users may actively seek out news sources, science articles, or other content directly and share those links on social media (parallel to Paletz, 2002). Information search can be a multi-stage process in its own right, including affective and cognitive responses (e.g., Kuhlthau et al., 2008). Conducting information search for a class project, for example, is a knowledge construction task that entails an initial increase and then subsequent decrease in uncertainty and anxiety (Kuhlthau et al., 2008). Less structured information search processes could also occur in the context of sharing information on social media.²

The phenomenon of homophily can also affect what individuals seek out, as individuals gather and check news from sources they trust and follow like-minded friends and family on social media (termed selective exposure; Paletz, Koon, Whitehead, & Hagens, 1972; see also the section on confirmation bias).

² There is a significant difference between our model and the Information Search Process model (Kuhlthau et al., 2008): Our cognitive and affective factors are reactions to information rather than reactions to the process of going through information search.

In a study that analyzed web-browsing records using a data set of 2.3 billion distinct page views, Flaxman and colleagues (2016) defined four channels through which news stories can be discovered: direct, aggregator, social, and search. *Direct* discovery means a user has gone directly to a news domain (such as nytimes.com); the *aggregator* channel refers to platforms like Google News or Apple News where users are presented with a set of links of related news topics hosted on other sites; *social* involves the use of a social media platform, like Facebook, Twitter or an e-mail service; and *search* involves the use of a web query on a search engine like Google, Bing or Yahoo. They found that much of news consumption comes from individuals simply visiting the homepage for their preferred news outlet, which tended to be mainstream media sources. Their findings echoed other studies (e.g., Bakshy et al., 2015) that the use of social networks and search engines are associated with the highest levels of segregation by ideology (Flaxman et al., 2016). Thus, although social media users often obtain their news directly from news sites rather than from their social contacts, they remain ideologically isolated (Flaxman et al., 2016). Given that news sources themselves tend to link to similar perspectives in the stories they post (Turetsky & Riddle, 2017), this finding means that active gathering does not remove the possibility of echo chambers.

That noted, selective exposure and homophily do not always lead to blind acceptance of information. In an interview study of 58 people who had just chosen to watch a film on the Vietnam War in a movie theater, 28 disliked it, with 9 considering it propaganda and 7 saying they had become *more* sympathetic to America's war in Vietnam because they had viewed the film (Paletz et al., 1972). The researchers determined qualitatively that the American audience was annoyed and frustrated by the foreign film's unconventional structure and style and hectoring tone. This study illustrates that even with homophily, reactions to source material cannot be taken for granted.

Summary of sources of messages

Social media users may create content, observe a message or narrative, or seek one out. What people view is influenced by what they search for and what is being shared already in their social networks. Once they receive, create, or find information, genuine actors then have some kind of reaction, be it affective, cognitive, or both.

REACTIONS TO THE MESSAGE AND MESSENGER

Genuine actors react to the message and messenger they encounter. Psychology, particularly the fields of social influence, persuasion, and decision making, has generated many findings regarding how human beings process and judge messages (Brock & Green, 2005). We divide this section into primarily affective and cognitive reactions with the caveat that for at least two decades, researchers have increasingly understood how these two can impact each other and are interconnected (e.g., Loewenstein & Lerner, 2003; Sharot, Delgado, & Phelps, 2004). Thus, the factors described in the affect and cognitive sections will influence each other, often in subtle ways, even if they were often studied in isolation. In particular, affect is related to ideology and belief in complex ways (Papacharissi, 2017). For instance, beliefs are more likely to be changed if the piece of news is positive rather than negative (Sharot & Garrett, 2016). In both the United States and the Netherlands, sensitivity to feelings of disgust is associated with conservatism (e.g., Brenner & Inbar, 2015; Inbar, Pizarro, Iyer, & Haidt, 2012). Experiencing a threat may make liberals shift to conservatism, and a recent study suggests that inducing feelings of safety and security may shift some conservatives to more socially progressive stances (Napier, Huang, Vonasch, & Bargh, 2017). Given that political ideology can influence what types of arguments may be persuasive (Jost & Krochik, 2014), affect and cognition are not truly separate in this domain. We therefore also have a brief section on factors that are inherently and conceptually both cognitive and affective (e.g., intellectual engagement).

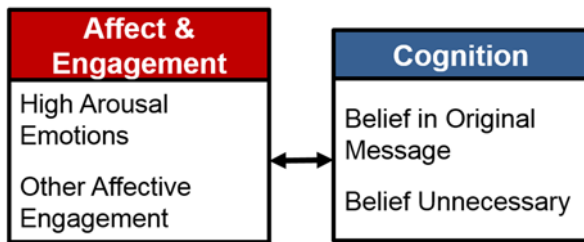


Figure 2. Reactions to the message and messenger

These sections are further organized: The affect section is divided into high arousal emotions and other affective engagement, and the cognition section is divided into factors that encourage belief and attitudes, and those cognitive reactions unrelated to belief (or such that belief is unnecessary; see Figure 2).

Affect and engagement

Affect, generally defined as emotions or feelings that may influence behavior, is likely a central factor in online engagement and sharing in social networks (Papacharissi, 2017). In this review, we conceptualize affect as a combination of two dimensions: arousal (engagement) and pleasure/valence (positive vs. negative affect or pleasure vs. displeasure; Russell, 2003; Watson & Tellegen, 1985). Affect can also include basic, discrete emotions such as anger, sadness, disgust, and happiness (Ekman, 1992a, 1992b), as well as blends of these discrete emotions and longer-lasting moods (Ekman & Cordaro, 2011). Despite rival theories in psychology over the nature of emotions and affect, the main theories agree that affect and emotions are universal human physiological processes; are influenced by culture in many ways; and involve appraisals, or the interpretation of the context in which the emotion occurs (Barrett, Mesquita, Ochsner, & Gross, 2007; Elfbein & Ambady, 2002; Russell, 2014). Affective reactions to initial narratives and messages will likely influence individuals' willingness to pass along those messages.

Communications scholars also identify affect as an element of information sharing. Papacharissi (2017) defines "affective publics" as both the space enabled by network technologies for the interaction between people, technology, and practices, as well as the perceived community that results from that interaction. She claims that sharing is a core function of affective publics. When actor nodes in a social network share information, they essentially become visible to others. Affect may impact engagement and the widespread sharing of certain content online and within social networks, such that affect "presents a way of incorporating intensity into our interpretations of experiences, both qualitatively and quantitatively, as intensity augments, but it also drives and suggests" (p. 17). Affect is thus deeply intertwined with networked contagion and virality.

High arousal-specific emotions

Past research has suggested that emotion is a factor in sharing behavior (e.g., Berger & Milkman, 2012; Hasell & Weeks, 2016; Peters, Kashima, & Clark, 2009). High arousal emotions are those that feel more intense and may entail greater physiological arousal. A high-arousal, positive emotion might be intense joy; fury is a high-arousal, negative emotion. Contentment is a low-arousal, positive emotion, and light sadness is a low-arousal, negative emotion. In general, stories and articles that elicit emotions are more likely to prompt an intention to share than stories and articles that do not elicit emotions. In researching the valence of hundreds of *New York Times* articles that made the most emailed list, Berger and Milkman (2012) found that positive content was shared more than non-positive content. The researchers also found that content with high arousal emotions like anger and anxiety boosted the likelihood that something might be shared, regardless of a positive or negative valence.

Research on non-digital information-sharing behavior suggests that emotions play a significant role in sharing and participants' willingness to pass along information offline, as well (Berger, 2011; Peters, Kashima, & Clark, 2009). In particular, the level of arousal of an emotion may make a difference. In a non-digital study of intention to share information, emotionality had a significant effect on participants' willingness to pass along anecdotes ($N = 160$; Peters, Kashima, & Clark, 2009). Anecdotes that had high or medium emotionality were

more likely to be shared than anecdotes with low emotionality. More specifically, anecdotes that aroused interest, surprise, disgust and happiness were shared more willingly regardless of the audience. Anecdotes that evoked sadness were not as shared, suggesting that although emotions are important to share behavior, some emotions are less of a factor. Given that sadness is considered a moderate/low arousal emotion (Berger, 2011; Watson & Tellegen, 1985), the Peters et al. (2009) study suggests that high-arousal emotions such as surprise, anger, distress, fear, and anger are more likely to be shared than low arousal emotions such as contentedness. Indeed, in a separate study, arousal, but not positive or negative valence, had a significant effect on intention to share news stories ($N = 93$; Berger, 2011). In that study, low arousal emotions were contentment or sadness, whereas high arousal emotions were amusement or anxiety.

In an example of how content triggering high-arousal emotions may impact sharing, a false story from the English corpus about Australia becoming the “most microchipped nation” was shared multiple times on Facebook (Appendix A, Table A1, story #433). In a public post on the user’s personal profile in 2017, one Facebook user shared a link to a version of the story on YouTube. The user added the commentary, “Do these people realise what they are actually doing to there body's [sic].this.is sooooooo worrying ..” (see Figure 3, post on left).



Figure 3. Facebook posts about fake story of Australia microchipping citizens

Another Facebook user posted a link to a version of the story on a site called survivaldan101.com. The Facebook user added commentary by writing, “And Apocalypse is already upon them ♥ Excellent job!! Everybody will see what will happen to them for accepting to be slaves of satan!! Stupids [sic] miserable animals!! They are not people any more!!” (see Figure 3, post on right). These comments support the work by Peters and colleagues (2009): The information presented in this article could arguably arouse interest, surprise and disgust in the user. By evaluating the commentary added by Facebook users, we can see that this story invoked worry and anger.

There has also been extensive research on online sharing behavior and intentions. Students were more likely to email an article if they had been jogging lightly in place, a task that increases physiological arousal (Berger, 2011). Although the sample was small ($N = 40$), the effect was large, with 75% of those who jogged versus 35% of those who did not sharing the article. This study suggests that it is the interpretation of the feelings of physiological arousal that encourages sharing, rather than the specific emotions that may accompany the physiological arousal. A separate study examined the motivations and behaviors of sharing by using semi-structured interviews with 40 Gen Y college-going consumers who forwarded video content (viral messages) in their online networks (Botha & Reyneke, 2013). The researchers showed both content-specific (applicable to a certain group) and general videos to participants in order to understand their emotional responses and to gauge whether or not the participants would share the content. The general video, which was described with the words “funny” or “laugh” was more likely to be shared; however, participants who did not find it funny did not feel compelled to pass it along. In addition, the more familiar the participants were with the content, the more likely they were to have an emotional reaction and to pass it on. Valence in this study also proved important: If participants had a positive emotional reaction to the video, they were more likely to pass it on, but if they had a negative (or no) emotional reaction to the video, they were not likely to share the video. However, the negative emotions captured in this study were disinterest or boredom, rather than high-arousal negative emotions like anger. Thus, although this study highlights the potential importance of positive affect, it also confounded arousal and affect valence.

Another way to examine the influence of affect on whether information is shared on social media is to examine the content of the messages themselves. Stieglitz and Dang-Xuan (2013) examined over 168,000 tweets related to several parliament elections in Germany in 2011. They used a sentiment analysis tool to categorize the tweets' content as positive sentiment, negative sentiment, mixed sentiment, and emotionally charged. They found that regardless of sentiment, tweets with a high degree of emotionality were retweeted more, and more quickly, than neutral tweets. When they examined the positive and negative sentiment of tweets and their retweetability, the researchers got mixed results between the different samples of tweets drawn from different parliamentary elections. However, the authors concluded that emotion-filled tweets were more likely to be disseminated, and disseminated quickly, than those with neutral sentiment. The use of such a large data set makes this research invaluable to the literature on share behavior. A different study using fictitious news sites and stories found that story valence had no effect on a user's likelihood to share news ($N = 307$; McIntyre & Gibson, 2016). This research used fictional stimuli, which may impact the findings of their research. Nevertheless, the mixed or null findings for valence suggest that emotion intensity/arousal may have a stronger and more consistent effect than valence on information-sharing behavior and intentions.

Similarly, a series of studies about the spread of tweets regarding polarizing topics (i.e., gun control, same-sex marriage, and climate change) suggested that emotional language and moral-emotional language predicted the retweet of messages within ideological networks (Brady, Wills, Jost, Tucker, & Van Bavel, 2017). Moral language alone did not predict retweets for gun control or same-sex marriage, but did for climate change (N s of entire tweet samples, including retweets, for gun control = 563,312; same-sex marriage = 47,373; and climate change = 413,611).

Indeed, a study of online rumors drew on theory and research from the 1940s and 2007 to suggest that rumors tend to fall into four types: those that express fear of a negative outcome, those that express hope for a positive outcome, those that express hostility toward a group of people, and those that express curiosity about intellectually puzzling rumors (Bordia & DiFonzo, 2007; Silverman, 2015). Three of these types involve strong, arousing emotions, and the fourth is an intellectually engaging state. In other words, rumors are spread due to a combination of threat management and sensemaking, and high arousal rumors are more likely to be shared (Silverman, 2015).

Other affective engagement

There is another affective reaction that involves positive valence and may entail moderate physiological arousal: The feeling one has when presented with something cute. It is possible that information, narratives, and pictures can get shared on the internet simply because they are cute (Abad-Santos, 2017; Nittono, Fukushima, Yano, Moriya, & Paterson, 2012). Some scholars suggest that cute things are popular because they produce positive feelings (Nittono et al., 2012). Creatures are identified as cute when they have infantile (babyish) features such as large eyes and large foreheads, heads large relative to bodies, and round cheeks (Alley, 1981; Glocker et al., 2009). Humans are thought to instinctively respond with caregiving desires to cute creatures (Glocker et al., 2009), even if those creatures aren't baby humans (Golke, Lisibach, Mast, & Lobmaier, 2013). However, very little research exists around the "cute-emotion," and no single term exists in English for this emotional response, although it is represented by the vocalization "aww," according to Buckley (2017). In an attempt to understand the fanfare and propagation of memes online surrounding a porg, a creature in the latest *Star Wars* movie, a writer for the news and opinion website Vox described the charismatic minifauna effect (Abad-Santos, 2017) based on the concept of charismatic animals (megafauna) from conservation biology (e.g., Ducarme, Luque, & Courchamp, 2013). The writer defines charismatic minifauna as "an umbrella term for small animals that capture the imagination and affection of humans." Abad-Santos (2017) notes that porgs are the top-searched character from the movie, according to *Reuters*, and the toy version has also been successful.

Other studies of affective reactions support the idea of attraction to cute things. Research exploring reactions to cute videos found that watching such content evoked *kama muta* (a social-relational emotion in Sanskrit that is often labeled as 'moved,' 'touched,' and 'heart warmed' in English) in participants ($N = 135$; Steinnes, 2017). When watching a cute video, participants also felt a stronger motivation to engage in communal sharing; had more intense bodily sensations; had more subjective feelings of being moved, touched, and heart warmed; and had more positive feelings than they did when watching the control video (Steinnes, 2017). These affective reactions may tie into fulfilling deeper needs and motivations. For example, even though ISIS tends to show

images intended to intimidate, they have also released photographs of soldiers with kittens (Whitehead, 2016). These images may have the dual purpose of communicating warmth as well as being a historical reference to a companion of the Prophet Mohammed, who was fond of cats (Farwell, 2014).

Emotions related to general enjoyment in the act of sharing itself may also contribute to an individual's motivation to share information. Research aimed at identifying motivations for sharing information on social networking sites found a positive relationship between sharing enjoyment and information-sharing behaviors ($N = 308$; Kim, Lee, & Elias, 2015). Also, Syn and Oh (2015) examined ten motivating factors for sharing on social media. They found that enjoyment was indeed a motivating factor when sharing information on social media, but it was not the strongest motivation, which was learning. Another aspect of human psychology that promotes deep engagement is human needs. The topic of fundamental needs will be covered in the section on motivation.

Summary of affect

In summary, narratives that elicit emotion, or highly arousing/intense emotions in particular, are more shareable in online social networking communities. Multiple studies have shown that narratives that elicit positive emotions, high arousal emotions (like surprise, disgust, fear, anger), or that contain high levels of emotionality generally are more likely to be shared than their low emotionality/low arousal counterparts. Affective responses to cuteness, and the enjoyment of sharing itself, may inspire sharing online, as well.

Cognition

In addition to individuals being influenced to share because of the emotionally intense nature of the content, cognitive reactions to the content and source also play a role. Cognition is not, of course, entirely free of or isolated from affect (e.g., Loewenstein & Lerner, 2003). The movie viewers in the Paletz and colleagues (1972) study had a negative emotional reaction to the movie's tone and style, which influenced how persuasive they found its message. This section focuses mainly on summarizing the sizable literature on factors that influence belief in an original message. However, belief is not always necessary for why individuals share narratives online. In a second subsection, we touch on those situations, which we observed in our qualitative research and anecdotally.

Belief in the original message

There are several factors that influence readers to believe the content they read (see Table 1). At the highest level, these factors involve source and message credibility; conformation and related biases; message availability, accessibility, and fluency; framing; deliberate persuasive techniques; and individual differences of the target audience, or in this case, potential sharer. Two theories of persuasion—the elaboration likelihood model and the heuristic-systematic model—converged in their identification of two separate modes of persuasion and processing social information: heuristic (or peripheral) and systematic modes (or central; e.g., Chaiken & Maheswaran, 1994; Chen & Chaiken, 1999; Petty & Cacioppo, 1986; Petty, Cacioppo, Strathman, & Priester, 2005). Whereas systematic (or central) processing involves logically, attentively, consciously, and effortfully weighing the pros and cons of information, heuristic (or peripheral) processing entails using fast, simple heuristics and cues. Heuristic processing can only occur if the relevant heuristics are both available in memory and relevant (accessible) to the situation, with frequent use likely resulting in chronic readiness of the heuristic to be used (Chen & Chaiken, 1999). The scientific literature on cognition identifies these two modes as System 1 (heuristic) and System 2 (systematic). These modes have also been argued to be fundamentally different types of reasoning and memory in general, even beyond the processing of social information, and to have biological bases (e.g., Evans, 2003; Smith & DeCoster, 2000). Many, but not all, of the factors listed below involve activating one of these types of information processing.

Table 1. Selected cognitive reactions to messages

Cognitive factors
Source and message credibility
Confirmation and related biases
Message availability, accessibility, and fluency
Framing
Deliberate persuasive techniques
Individual differences of the target audience

Source and message credibility. The first set of factors, which generally but not exclusively involves heuristic thinking, entails credibility and attractiveness of the source, as well as message credibility (e.g., Heesacker, Petty, & Cacioppo, 1983; Pornpitakpan, 2004; Schwarz, Sanna, Skurnik, & Yoon, 2007; Swire, Berinsky, Lewandowsky, & Ecker, 2017). For example, one of the inaccurate news stories in our qualitative analysis was titled “NPR: 25 Million Votes For Clinton ‘Completely Fake’ – She Lost Popular Vote” (see Appendix A, Table A1, story #106 for more detail). *National Public Radio (NPR)* is commonly considered a high-standard and generally nonpartisan news source, though the American right considers it leftist and biased in favor of Clinton, or at least non-independent (Langlois, 2016). In this context, *NPR* may have been cited to either identify the source as credible or to imply that the story must be true because it conflicted with the perceived liberal bias of *NPR*. Facebook users reposting this story explicitly raised the issue of *NPR* as source credibility for liberals, such as “NPR? Wow! I think we all knew this to be true” and “My liberal friends will break their butts saying this is ‘fake News.’ ”

Both source attractiveness and credibility have consistent effects on persuasiveness, making a message more appealing (Petty et al., 2005; Pornpitakpan, 2004). Physical attractiveness seems to have a positive effect when perceived expertise of a source is low (Pornpitakpan, 2004). Source credibility is similarly often linked to message credibility. In a study of 220 students at a journalism school, individuals judged online information, but not advertisements, based on the perceived credibility of the web source (*New York Times* versus a personal home page; Greer, 2003). Quick cues and heuristics may indicate credibility even when the cues are not indicative of accuracy. For example, non-native speakers of English were rated as less credible than native speakers when stating trivia facts (Lev-Ari & Keysar, 2010). Although the participants were able to correct this bias when the accents were mild, they were unable to overcome this bias when the accents were heavy. In another study, claims were more likely to be believed when the individuals to whom they were attributed had easily pronounced names, even controlling for region of origin of those names (Newman et al., 2014). Source credibility can be judged by perceived authority (power), trustworthiness, and/or expertise (Pornpitakpan, 2004). For example, in our Russian corpus, the story on foreign nationals collecting biological material in Russia had a huge resonance in social media, possibly due to the fact that it was originated by President Putin and aired on national TV, and thus considered highly credible (see Appendix A, Table A2, story #1).

Expertise entails whether the source is perceived as making accurate statements (Pornpitakpan, 2004). For example, a series of studies suggested a small but consistent effect of having citations in a text on judgments of the truth of claims (Putnam & Phelps, 2017). The citations may serve as a heuristic for perceived correct expertise. Credibility can also be attributed because of a contrast to nearby information. In a large study ($N = 877$), a news story embedded in an impolite partisan blog appeared more credible by contrast, suggesting that context of a story may have effects on the perceived credibility of a narrative (Thorson, Vraga, & Ekdale, 2010).

In addition, individuals may believe sources because they are considered to be authorities or have positions of power (e.g., Contractor & DeChurch, 2014; Pornpitakpan, 2004). For example, in a study of online message boards associated with two Arabic-language news websites, writers often used quotations from the hadith (collected reports of the Prophet Muhammad’s actions and words) to persuade, point out shared meanings, and invoke authority (Boutz, Brugman, & Lancaster, 2017). On the other hand, when arguments are weak, high source credibility can be met with a backfire effect, with even less belief (Tormala, Briñol, & Petty, 2006).

Several studies have established source credibility as influencing share behavior online, specifically. Utilizing a subset of data from the Pew Research Center ($N = 1,264$), Weeks and Holbert (2013) found that

friending (adding to the social network) a journalist or news organization on social media increased the likelihood of disseminating news on social platforms. This finding was presumably due to the increased credibility of information coming from that source, although it could also be that the user was simply particularly interested in reading and sharing news, which is why he or she friended the news sources.

Additional work on news recommendations and Facebook friendship examined the role of opinion leadership and trust more explicitly. Turcotte, York, and Irving (2015) experimentally studied the relationship between exposure to news posted on social media and information-seeking intent and whether this relationship was affected by the perceived opinion leadership of the person sharing the news. The study ($N = 364$) found that if the participant regarded the friend as an excellent, trustworthy opinion leader, the relevant news outlet was considered more trustworthy; similarly, perceptions of poor information leadership led to negative trust in the news. The study also found that if participants received a news recommendation from a friend, they were more likely to seek out information from that news outlet. Additionally, if the sharing friend was viewed as a strong opinion leader, the participant was more likely to engage in additional information-seeking behavior. This study suggests that social interactions and relationships are important for information seeking and news consumption habits of internet users. However, the participants in this study were undergraduate students, so it is possible that different findings would surface with a more diverse sample.

Other research focuses specifically on credibility on Twitter. One study examined how social media information impacts assessments of source credibility, which the authors define as expertise/competence, trustworthiness, and goodwill ($N = 181$; Westerman, Spence, & Van Der Heide, 2014). Using mock Twitter accounts, the researchers found that the recency of updates on a Twitter page had a positive effect on cognitive elaboration (defined here as active involvement in information processing, namely, attention and recognition; see Defleur & Ball-Rokeach, 1989). Cognitive elaboration was then positively related to perceived source credibility, such that cognitive elaboration was a mediator between recency and perceived credibility. This study suggests that source credibility can be spurred not simply by using a heuristic cue, but by System 2 information processing, as well. A second study found that source credibility, as well as argument quality, influenced user perception of the usefulness of the content and information in anticipation of sharing the tweet (Ha & Ahn, 2011). Though this study examined a small sample of Twitter data ($N = 84$ Twitter users), it is still helpful to understand influencing factors of shareability on Twitter.

Another study found that news articles about the 2014-2015 Disneyland measles outbreak were more likely to be shared on Facebook at least once if they had statistics, which might be a heuristic sign of source or message credibility (Broniatowski, Hilyard, & Dredze, 2016). The same study also found that stories with a ‘gist’—which emphasized categorical contrasts on options (e.g., mercury in vaccines cannot cause autism because it is not in vaccines any more)—were more likely to be shared at least once. That study suggests that message credibility might entail specific types of rhetoric.

This literature suggests that source credibility is not only important in persuasion, it is relevant for online sharing behavior as well. In time, however, individuals may forget the trustworthiness of their source and simply remember what they heard (e.g., Hovland & Weiss, 1951; Schwarz et al., 2007; Swire, Berinsky et al., 2017). A range of cognitive biases influence attention, interpretation of information, and memory.

Confirmation and related biases. In this section, we cover the biases most immediately relevant to whether people believe information that they see online: confirmation bias, ‘myside’ bias, and motivated cognition. A variety of other cognitive biases exist, some of which overlap with other phenomena (e.g., anchoring and group polarization), and others we will not discuss here (e.g., optimism bias wherein good news is integrated into beliefs more than bad news; Sharot & Garrett, 2016).

A vast literature across disciplines suggests that individuals are motivated to seek out information that they already believe to be true; to disproportionately question or reject information that conflicts with their preexisting beliefs, including self-conceptions; and to unconsciously elevate confirming information (e.g., Flynn, Nyhan, & Reifler, 2017; Kahan, 2016; Lewandowsky, Ecker, Seifert, Schwarz, & Cook, 2012; Nickerson, 1998; Stanovich, West, & Toplak, 2013). Confirmation bias, myside bias, and motivated reasoning all have their roots in this very human way of processing information. Misconceptions can be difficult to change and belief systems can be unfalsifiable (e.g., Flynn et al., 2017; Friesen, Campbell, & Kay, 2015; Schwarz, Newman, & Leach, 2016; Washburn & Skitka, 2017). A specific aspect of these biases is that individuals are

more likely to be critical of information that contradicts their prior beliefs. Termed ‘biased assimilation’, participants in laboratory settings, Amazon Mechanical Turk³ workers, and general population participants have all been found to be more likely to be critical of science findings, for example, that contradict prior beliefs (e.g., Lord, Ross, & Lepper, 1979; MacCoun, 1998; MacCoun & Paletz, 2009; Washburn & Skitka, 2017).

At its worst, confirmation bias and its cousins can lead to ideological radicalization and extremism (Lilienfeld, Ammirati, & Landfield, 2009). These biases have been found to be unrelated to general intelligence (Stanovich et al., 2013) or ideology (conservative vs. liberal; Washburn & Skitka, 2017). Confirmation bias linked to misinformation or disinformation can be notoriously difficult to counter, as has been noted across a range of disciplines (Berinsky, 2015; Chan, Jones, Jamieson, & Albarracín, 2017; Ecker, Hogan, & Lewandowsky, 2017; Ecker, Lewandowsky, Fenton, & Martin, 2014; Ecker, Lewandowsky, & Tang, 2010; Lewandowsky et al., 2012; Nyhan & Reifler, 2010; Peter & Koch, 2016; Schwarz et al., 2016; Schwarz et al., 2007; Southwell & Thorson, 2015). This problem has resulted in new tools and processes attempting to counter confirmation and related biases (e.g., Cook & Lewandowsky, 2012; Dunbar et al., 2014).

It seems obvious that social media users similarly fall prey to confirmation bias, such that individuals seek out, believe, and share information online that confirms their prior beliefs. When social media users see a narrative that contradicts their belief, they may be more likely to question it rather than accept it. Misinformation and disinformation can spread easily on social media (Goolsby, 2013). These phenomena are not harmless: Countering antivaccination attitudes, which are based on misinformation or disinformation and propagate online, has become a major public health necessity (e.g., Dredze, Broniatowski, Smith, & Hilyard, 2016; Horne, Powell, Hummel, & Holyoak, 2015). Outbreaks of previously controlled diseases such as measles are assumed to be caused by a rise in these attitudes (e.g., Horne et al., 2015). Months before a Zika vaccine was ready, there was a rise in tweets promoting antivaccine pseudo-scientific claims (Dredze, Broniatowski, & Hilyard, 2016). One narrative built on existing dislike of Monsanto, the agrochemical company, to claim that increasing microcephaly among infants was caused not by the Zika virus, but by a mosquito larvicide allegedly made by Monsanto; a second conspiracy theory suggested the increases in microcephaly were caused by existing vaccines (Dredze, Broniatowski, & Hilyard, 2016).

Although this research focuses on the cognitive aspects of these held beliefs, the intense fear of harm to children likely also has an impact on the propagation of this misinformation/disinformation. Indeed, cognition and affect may interact in complex ways to influence information sharing online. Using panel survey data collected during the 2012 presidential election ($N = 1,004$), Hasell and Weeks (2016) studied how partisan media use elicited emotions such as anger and anxiety, which in turn may contribute to the sharing and posting of political news on social media. They found that pro-attitudinal (in-line with self-identified political party) news use was positively associated with increased levels of anger directed at the opposing party candidate, whereas such news use was unrelated to anxiety. Further, anger directed at the opposing party’s candidate had a positive and significant effect on information sharing, but no relationship existed for anxiety.

This study suggests that seeking out pro-attitudinal, partisan news leads to anger, which may then lead to information sharing. These findings are significant because they suggest that the cognitive biases that lead to selective information gathering may then lead to anger if the message aligns with prior beliefs properly (as opposed to in Paletz et al., 1972), which then prompts sharing of information. For example, a fake story we examined, entitled “Trump Was Right: CIA Director Clapper Just Leaked Something HUGE About Government Spying,” was shared on Facebook by multiple users (see Appendix A, Table A1, story #193). The users who shared the story appeared to do so because of their pro-attitudinal relationship to the content. For example, one user added commentary that said, “Once again, Trump was right!” A Facebook page also posted the story, added commentary to the Facebook post bearing the link: “Donald Trump was right all along. Right during the Yates Hearing, CIA Director Clapper Got up and leaked something HUGE. Help get this 2 Million shares and comment “Trump was Right” (see Figure 4; in fact, Clapper did not leak anything, see Appendix A, Table A1).

Message availability, accessibility, and fluency. A set of cognitive biases related to message availability, accessibility and fluency may be particularly likely to be relevant to social media use. ‘Availability’ means the

³ Amazon’s Mechanical Turk is a marketplace where individuals sign up for brief tasks for small pay, including data de-duplication, identifying objects in a photograph, and taking part in experiments.

message is easily raised from memory, and ‘accessibility’ refers to the relevance to the situation (Chen & Chaiken, 1999). ‘Fluency’ refers to when a message is easy to read or understand, although it has also been measured as repetition (Garcia-Marques, Silva, & Mello, 2016). Essentially, these three aspects of a message entail how easy it is to recall (retrieve from memory) and how often one has been exposed to it. A message is also considered more believable due to how much the message is relevant to the matter at hand and how quickly one can understand it, a phenomenon that likely occurs through System 1 (fast) information processing (Garcia-Marques et al., 2016). Ease of recall can be a subtle cue for how valid a fact or narrative is. When pointed out that ease of recall is being used as a cue, it can be discounted (Schwarz et al., 1991; Schwarz et al., 2007). In addition, there may be a link between fluency (ease in processing), familiarity, and perceived truth (Schwarz et al., 2007).



Figure 4. Facebook posts of fake news about CIA Director Clapper

Most relevant to social media, repetition and familiarity with a message—or a messenger—increase the likelihood that people will remember it and think it is true (e.g., Garcia-Marques et al., 2016; Silva, Garcia-Marques, & Reber, 2017). For example, faces were deemed to be more credible when they were repeated, even if they were not perceived to be more familiar than less repeated faces (Brown, Brown, & Zoccoli, 2002). Even repetition of a photograph of a hypothetical speaker makes that speaker’s message more persuasive (Weisbuch & Mackie, 2009). This normal human tendency is why so many retractions fail, as they often repeat the initial claim in a simple, easy-to-understand way. Identifying a claim as false can, after a time delay, leave an increased familiarity with the claim, while the warning that it was false is forgotten (Skurnik, Yoon, Park, & Schwarz, 2005; Swire, Ecker, & Lewandowsky, 2017). Corrections are more effective when they include a trusted source, or at least a counterintuitive partisan source, such as a Republican correcting the rumor that a new health care bill involves death panels (Berinsky, 2015). Other ways to increase the effectiveness of corrections include providing explanatory detail and affirming facts (versus retracting myths; Swire, Ecker, & Lewandowsky, 2017).

Repetition has been identified as a deliberate tactic to increase belief in propaganda that is spread via computational methods, such as bots (Chessen, 2017; Paul & Matthews, 2016). For example, Paul and Matthews (2016) contend that the current Russian propaganda model involves flooding social media with their messages, focusing on volume, speed, and multiple channels, and disregarding consistency. A study using 39 coordinated social bots that had 25,000 followers tested the power of multi-source repetition in a natural experiment on Twitter (Mønsted, Sapieżyński, Ferrara, & Lehmann, 2017). Attempting to spread relatively benign and/or

positive hashtags, they found that repetition from multiple different sources led to more sharing than from a single source. By experimentally creating a botnet, this study managed to disentangle the effects of repetition from the effects of homophily that would naturally occur. Repetition from seemingly different sources may serve a function of increasing the source credibility of any one source, as well as provide informational social influence and social comparison such that the target perceives the message as widely believed (see section on norms).

In addition to repetition increasing the perception of truth, how the message itself is presented can influence perceptions of its veracity (Garcia-Marques et al., 2016). ‘Processing fluency,’ or how easy it is to process a message, affects its judged truthfulness if individuals are not motivated or able to engage in more in-depth processing (System 2; Alter & Oppenheimer, 2009). Both visual and linguistic fluency have been found to have similar effects (Alter & Oppenheimer, 2009). These perceptual aspects provide quick heuristic cues. The research reviewed earlier on how accents and difficult to pronounce names can harm source credibility are considered to be caused by problems with fluency (Lev-Ari & Keysar, 2010; Newman et al., 2014). These processing cues can be extremely simple: For example, claims shown in colors that made them easier to read were judged as more likely to be true than claims that were more difficult to read (Reber & Schwarz, 1999). Rhyming aphorisms seem truer than non-rhyming ones, and easy-to-read font is more likely to inspire confidence (for a review, see Alter & Oppenheimer, 2009). The presence of a relevant photograph, or a verbal description of one, similarly inflated judgments of whether claims were true (Newman, Garry, Bernstein, Kanter, & Lindsay, 2012). On the other hand, disfluency, such as in difficulty in the visual clarity of text, can slow down information processing to the extent that it can even disrupt confirmation bias (Hernandez & Preston, 2013) and can enable the detection of misleading questions (Song & Schwarz, 2008). Similarly, although there is generally a positive effect for persuasion using imagery appeals (i.e., imagining a positive product experience), if the imagination task is difficult (low fluency, e.g., not vivid), the persuasion may backfire, resulting in stronger feelings *against* the persuaded attitude (Petrova & Cialdini, 2005). Similarly, it is possible that using font and color of online messages to manipulate fluency can either promote belief or slow down readers—although the latter is likely to encourage readers to skip a social media post.

Framing. Framing can bias information in a subtle way (Lakoff, 2010; Pratkanis & Aronson, 2001; Wagner & Gruszczynski, 2016). Although the definition and measurement of framing differs across disciplines and intellectual traditions (Cacciatore, Scheufele, & Iyengar, 2016; Scheufele & Iyengar, 2015), framing generally refers to how meaning is constructed, specifically to “*select some aspects of a perceived reality and make them more salient in a communicating text, in such a way as to promote a particular problem definition, causal interpretation, moral evaluation, and/or treatment recommendation for the item described*” (Entman, 1993, p. 52, italics in the original). As a construction of social reality, both the media and individuals are thought to have some power in shaping how others (both individuals and the media) view the world (Scheufele, 1999). For example, whether to support a Ku Klux Klan rally could involve an argument that focuses on either free speech or public safety issues (Druckman, 2001). Fake news stories may contain some true information, but be framed in such a way as to be wildly misleading. In a study of misleading framing, it was harder for participants to remember factual stories with incongruent headlines than with congruent headlines, and a misleading headline changed the perceived valence of faces, even if the faces shown in the accompanying photographs were of people not mentioned in the story (Ecker, Lewandowsky, Chang, & Pillai, 2014).

For example, in our qualitative analysis of fake news stories, one story claimed that Mueller’s team could be disbarred for Clinton conflicts of interest (see Appendix A, Table A1, story #107). Special counsel Robert Mueller, a Republican, at the time of this writing (2017-2018), is investigating ties between the Trump campaign and Russian officials, particularly in relation to the 2016 American presidential election. The fake news story argued, among other claims, that Mueller sold American uranium to the Russians on behalf of Hillary Clinton. This story used framing to attempt to discredit Mueller in the eyes of readers in two ways. First, it reframed and misrepresented what was true in the story. As part of a law enforcement effort between the Republic of Georgia, Russia, and the U.S., Mueller had delivered a 10-gram sample of highly enriched uranium confiscated from smugglers in Georgia to Russia for forensic examination (Snopes, 2017). Second, on Twitter, this headline link was often spread paired with a photograph of Hillary Clinton, rather than Mueller (see Figure

5). In tying the less-recognizable Mueller to Clinton via photograph, it is likely those spreading the story were attempting to discredit him simply by associating his story with her unpopularity with the target audience.

Individuals reading and passing on narratives on social media may therefore select, create, propagate, and be influenced by the framing of said narratives. They may reject frames that are discordant with what they currently believe (see confirmation bias section), but also reinforce a particular view of reality. Groshek and Al-Rawi (2013) conducted a descriptive study of framing in the 2012 presidential election online campaign by examining over 1.42 million tweets and Facebook statuses and comments. In examining official Facebook pages, they found that the candidates were more positively framed than their opponents; however, on both their own walls and their opponent walls, both candidates' names co-occurred with the words 'President' and 'vote'.

Framing can also occur by driving what topics are discussed at a national level. More recently, King, Schneer, and White (2017) were able to recruit 48 small media outlets to publish articles on subjects they approved (e.g., immigration, jobs, climate, water, education policy) on randomly assigned dates. Using an experimental design over time, they were able to detect a causal effect on page views, which then acted as a mediator on both Twitter discussions on the articles' subjects and the national Twitter conversation measured as the number of social media posts in the general domain. The results from this study were dramatic: The authors estimated that their intervention resulted in a total of 13,166 additional social media posts, or a 62.7% increase in social media posts over a week, compared to an average day's volume (or 10.4% relative to a week). In this case, they did not frame a particular issue in one way or another, but helped direct the national social media conversation.

The power of framing may have limits, however. A two-experiment study ($N_s = 265$ and 151 undergraduates) suggested that framing only has an effect on different considerations of an argument, and thereby overall opinion, when the source was judged as credible (here, in the sense that it was judged in possessing relevant knowledge and was trusted to reveal that knowledge; Druckman, 2001). By choosing 48 different media outlets, King and colleagues (2017) may have been able to overcome this issue.

Deliberate persuasive techniques and requests. Of course, individuals may explicitly try to persuade others to share information online or ask others outright to share information online. For example, one Twitter user posted a photograph of himself and his mother, stating "I asked Mom what it would take for her to stop smoking cigarettes: she told me 10k retweets because I could never get that. Please help.. [sic] I'd like for her to see me graduate college and do much more." This explicit request appeals to viewers' sympathy, although it is unclear what the outcome would be. Individuals may accede to a request, but they also might resist it or the message might even backfire (e.g., Petrova & Cialdini, 2005; Tormala, Briñol, & Petty, 2006).

The psychological field of persuasion includes a range of techniques to get people to do what someone wants them to do (Brock & Green, 2005; Pratkanis & Aronson, 2001). This area is most relevant to social media information sharing when the initial message sender is explicitly asking the target reader to share it. For example, the foot-in-the-door technique entails making progressively larger and larger requests, with a time delay between them (e.g., Freedman & Fraser, 1966). Anecdotally, we noticed Facebook posts that are similar to chain messages, where an original poster asks, "Who will share this meme?" or says "Most people will not share this post, will you?" Many persuasive techniques rely on fundamental human needs such as impression management and self-consistency (see Motivation to Share). In the case of the foot-in-the-door technique, people comply with a larger request because it is consistent with their previous behavior. Research suggests that reciprocal language that indicates a project backer receives something in return for their funding (e.g., "also receive two" and other phrases) and clear expectations are both predictive of success in online crowdfunding



Figure 5. Twitter posts linking photograph of Clinton to story about Mueller

campaigns (Mitra & Gilbert, 2014); additional research could examine what makes people share links to those campaigns.

Individual differences of the target audience. Individual differences such as age, ideology, and critical thinking capabilities can make some of these cognitive biases more or less impactful. For example, older adults (> 65 years old), compared to younger adults (< 30 years old), have been found to be worse at recalling that a remembered message was inaccurate after corrections (Skurnik et al., 2005; Swire, Ecker, & Lewandowsky, 2017). That noted, in a recent study of fake news, age was positively correlated with predicting correct beliefs about news headlines—meaning that older adults were actually more likely to correctly identify if news was real or fake (Allcott & Gentzkow, 2017).

Individual differences in critical thinking and dispositional tendencies, not surprisingly, can affect whether an individual performs poorly on tasks designed to trigger heuristics and biases. For example, some individuals have a stronger need for cognition, or a desire and enjoyment to engage in thinking deeply about topics, whereas individuals with a lower need for cognition are less likely to expend cognitive resources (Cacioppo, Petty, Kao, & Rodriguez, 1986). Individuals with a higher need for cognition are more likely to engage in System 2 thinking, versus individuals with a lower need for cognition, who are more likely to be persuaded by heuristics (Cacioppo et al., 1986; Cacioppo, Petty, Feinstein, & Jarvis, 1996). Controlling for general cognitive aptitude (here measured with the SAT), both a disposition for critical thinking (comprised of both open-mindedness and a need for cognition) and a tendency to be able to reason independently of prior beliefs enabled participants to resist biased thinking ($N = 793$; West, Toplak, & Stanovich, 2008). Similarly, individuals with lower levels of cognitive ability were less likely to respond to corrected new information: The influence of the incorrect information persisted, whereas individuals with higher levels of cognitive ability made more appropriate attitude adjustments when presented with corrected information ($N = 390$, De Keersmacker & Roets, 2017).

Political ideology is also associated with motivated cognition. A large study of over 77,000 participants suggests that conservatives are more likely to process information heuristically, including being more persuaded when a source is similar, and are less explicitly persuaded by scientific evidence (see Jost & Krochik, 2014, for the study and an in-depth review). Some of these effects may be due to a tendency for liberals to generally score higher on a need for cognition and openness, and conservatives to score higher on a need for cognitive closure (need for a firm answer and to end ambiguity), and self-deception. This is not to say that conservatives are always going to engage in motivated cognition and liberals will not: a different study of 1,347 adults provided evidence that both liberals and conservatives engaged in science denial (Washburn & Skitka, 2017).

Other cognitive reactions rendering belief unnecessary

Throughout this section, we have described cognitive factors that may influence belief. However, individuals may share information online that they do not believe in, either because they explicitly disagree with it or because it has other features deemed worthy for sharing. One reason why individuals may share online is to show others something they do not believe in. Naïve realism is a widely-held social understanding that (1) I (the thinker) observe an objective reality, and my attitudes follow from this unbiased view of reality; (2) others will be rational social observers, meaning, they will generally share my beliefs if they had the same information and are open-minded; and (3) a failure to share my views is because that other person has different information, is irrational, or is biased (e.g., by self-interest or ideology; Ross & Ward, 1996). A flaw in this lay understanding is that individuals may consider themselves to be unbiased, and others to be biased. Therefore, in attempting to persuade others, social media users may share not only narratives and messages that they believe in, but demonstrate how very wrong they feel others are. For instance, the shocking Russian story about the sleep experiment in which, allegedly, a gas stimulant was used to keep participants awake for 15 days causing unexpected change of behavior and even death, was shared by some Facebook users along with explicit comments expressing strong disbelief, for example, “Бред какой-то!..” (“Delusion of some sort!”) or “Что за хуйня” (“What the [expletive]”; see Appendix A, Table A2, story #5).

It is also possible that individuals share narratives they do not believe in because they consider the story to be ridiculous. A Russian-speaking Facebook user shared the story about a Soviet military pilot who successfully flew his jet under the municipal bridge in the city of Novosibirsk, leaving crowds of spectators in awe (see

Appendix A, Table A2, story #4) with a playful comment: “Да ладно!!!” (“Come on!!!”); yet another left a note in English: “Russian James Bond,” suggesting that these users did not necessarily believe the content but still shared the story, perhaps to elicit amusement in others (see section on both affect and cognition). Similarly, the Russian story about foreigners collecting biomaterial from Russian nationals (see Appendix A, Table A2, story #1) triggered multiple shares on Facebook accompanied by humorous comments such as “Из анализа станет ясно, кто ел импортозамещенный сыр на пальмовом масле, а кто санкционный” (“The analysis will reveal who ate the import-substituted cheese made with palm oil and who ate the sanctioned one”). These comments suggest that it seems irrelevant for their authors whether or not the content is believable. These examples illustrate a possible gap in the literature: that confirmation bias, or belief in general, may not be required for sharing information online.

Novelty, with or without belief, may also be a factor in information sharing. A recent study of over 126,000 true and false news stories spread online found that false stories were retweeted faster, farther, and more broadly than true stories (Vosoughi, Roy, & Aral, 2018). In trying to understand this finding, the authors found that the false stories were significantly more likely to be novel. Although they could not make a causal claim using this dataset—that novelty caused individuals to share false stories more—this research does suggest that novelty should be examined as a possible factor. It would also be worth examining the mediators of a possible effect for novelty. Is it that novelty itself is attractive, and/or that social media users are motivated to share novel information in order to educate their audiences?

Summary of cognition

This section reviewed the literature on many of the psychological factors that influence whether individuals believe what they see and hear, as well as some situations where belief may be unnecessary for sharing behavior. In terms of cognition, we detailed a large, but likely not exhaustive, range of factors that influence individuals’ belief in an original message: source and message credibility, confirmation and related motivated cognition biases, message availability and fluency, framing, persuasive techniques, and individual differences on cognitive biases. We also recognize based on our qualitative research that individuals may share information online that they do not believe.

Both affect and cognition

Although any of the cognitive or affective factors can occur in combination or can influence each other, some factors inherently include both affect and cognition: entertainment, humor, and intellectual engagement. Chen and Sin (2013) found “entertainment” to be a motivating factor, in a survey of 16 motivation factors to share misinformation ($N = 171$). Similarly, using twenty-five in-depth interviews, Whiting and Williams (2013) found that 64% of respondents reported that they used social media for entertainment, and many mentioned using social media for humor and comic relief. In addition, people are more likely to share videos online if they are perceived to be entertaining or useful (Yang & Wang, 2015). In an example of sharing for humor or entertainment, along with a link to a story with the headline “BREAKING: Michelle Obama Pregnant... And Here’s the Father” a Facebook user wrote, “Laugh for the Day” (see Figure 6; see also Appendix A, Table A1, story #150). This comment suggests that although the user is posting the link, they probably do not believe the content. Humor (i.e., funny memes) elicits an affective response, but also generally requires some cognition to understand. Neuroscience work by Goel and Dolan (2001) describes successful jokes as having two components: both a cognitive juxtaposition of mental sets, and an affective feeling of amusement.

As noted by DiFonzo and Boridia (2007), one type of rumor that is spread is driven by curiosity and intellectual engagement. Intellectual engagement may fall under the category of a general affective state of pleasant physiological arousal (Watson & Tellegen, 1985), although it clearly has a cognitive component as



Figure 6. Facebook post showing amusement

well. Curiosity behaviors in new media environments, at group and individual levels, are moderated by personal, contextual and situational factors (Arnone, Small, Chauncey & McKenna, 2011), which span cognition and affect. Intellectual curiosity, which can be either intrinsically or extrinsically motivated, has been studied as a predictor of academic performance (Powell, Nettelbeck & Burns, 2016; von Stumm, Hell & Chamorro-Premuzic, 2011), demonstrating the cognitive component of intellectual curiosity. Additional types of mixed cognition-affect reactions may occur, as well.⁴

Summary of reactions by genuine users

Genuine actors will naturally react to the message they read and the messenger they encounter. Based on insights from psychology, we categorized these reactions into those related to affect and engagement (e.g., high arousal-specific emotions such as surprise or disgust) and those related to cognitive factors that influence belief, including factors that prompt individuals to engage in heuristic thinking, with entertainment, humor, and intellectual engagement as inherently both (see Figure 7). However, believing in the content of the message is not necessary for individuals to share it online. Likewise, intense emotions are not necessary in order for individuals to rely on heuristic thinking—they may occur due to normal cognitive processes. However, diffuse autonomic arousal, or ‘flooding,’ can occur and is hypothesized to invoke fight-or-flight behaviors as well as prompt the individual to rely on overlearned behaviors and have trouble processing new information (Buehlman, Gottman, & Katz, 1992; Ekman, 1984; Gottman, 1991). Indeed, threat can narrow information processing in certain circumstances (Staw, Sandelands, & Dutton, 1981), although it can also increase focus and creativity on the topic of threat (De Dreu & Nijstad, 2008). Separately, persuasive appeals are more likely to include emotional language (Rocklage, Rucker, & Nordgren, 2018). Thus, it will be important to examine the interaction of affective and cognitive reactions.

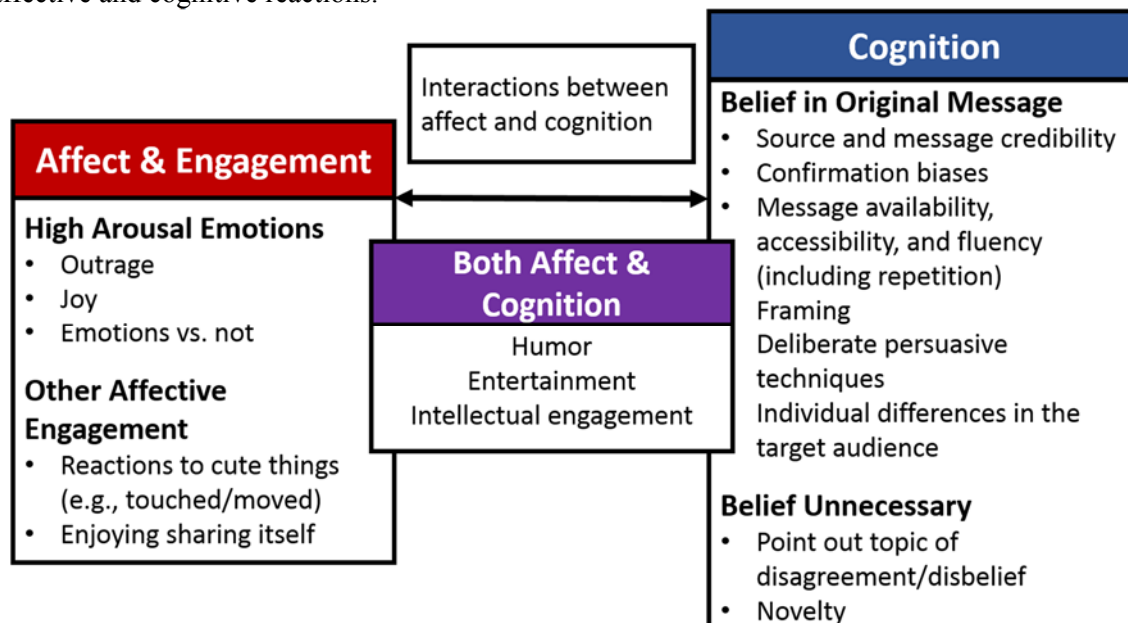


Figure 7. Affective and cognitive reactions to social media content (detailed)

MOTIVATION TO SHARE

Both affective and cognitive reactions to an original message can increase the motivation to share that information. Some of these motivations may, in turn, influence affect and cognition, such as by making certain

⁴ One topic not covered here is individuals' reactions to pornographic content, which may also spur reactions that may or may not motivate sharing behavior.

messages more persuasive. This section focuses directly on different types of motivation. Hermida (2014) suggests that people share to express themselves, bond, maintain relationships, show people they care, enrich themselves through giving, and because of the currency of news. Similarly, Fidel (2012) identifies several motivations to share information: helping others, getting information in exchange (Pollock et al, 2003), and promoting a certain way of thinking (Althaus & Tewksbury 2002). Others suggest that materialists and narcissists are motivated to use Facebook to fulfill self-regulation needs related to those individual differences (Ozimek, Baer, & Förster, 2017). These and other motivations will be categorized either as **needs** or **sociopolitical and economic motivations**. These specific motivations will be described in more detail below, drawing on the literature on both motivation and online sharing intentions. This section goes beyond the psychological literature to include research by non-psychologists on why individuals want to share online. Many of those studies touch on multiple factors simultaneously.

In addition, motivations need not be mutually exclusive, in that the same individual may experience multiple desires simultaneously (e.g., impression management, accuracy, and economics when presenting one's professional self). For example, the motivation to help others may be altruistic (not otherwise elaborated on in this section), but may also fulfill needs for affiliation via bonding with others or self-consistency by acting in line with one's self-image of being a helpful person.

In addition, non-genuine actors have human motivations. Those who create sockpuppets, bots, and troll farms (described in more detail in their own section) have their own motivations for making sure information is shared. In addition to sociopolitical and economic motivations, trolls can be motivated to cause strife because of the sense of power it gives them (Hardaker, 2010).

Of note, motivations to share have both internal and external components. The motives to share entail internal psychological needs. But, engaging with one or more audiences inherently involves outward-facing, or external components, such as relationships and interactions with others. Social media audiences can be constrained to a small set of a user's friends, the whole world, or any group in between.

Needs

The psychological literature details several motivations that all humans have, including needs for impression management, self-affirmation, self-enhancement, and status (Aronson, Cohen, & Nail, 1999; Beauregard & Dunning, 1998; Steele, 1988); accuracy (e.g., Cialdini & Goldstein, 2004; Darke et al., 1998); self-consistency (Higgins, 1987; Swann, 1983; Wood, 2000); and affiliation and belonging (Baumeister & Leary, 1995; McGhee & Teevan, 1967). There may be individual differences with all of these, such that individuals are stronger or weaker on different needs (e.g., Darke et al., 1998; McGhee & Teevan, 1967).

Impression management and self-enhancement

Online and within social media networks, many users engage in image management or status-building behaviors. Impression management occurs when people try to influence how others view them, and so is a behavior directly related to self-enhancement motives. Self-enhancement motives are when individuals are motivated to maintain, or even increase, their self-esteem and status, including in relation to others (Aronson et al., 1999; Cialdini & Goldstein, 2004; Steele, 1988). Status seeking in this context would involve "how sharing news in social media helps one to attain status among peers" (Lee & Ma, 2012, p. 333), contributing to image management and individuals' online reputation. These factors could motivate users to share certain content, especially news content, within their networks. In a study of sharing inaccurate information on social media sites, four factors contributed to sharing, one of which was "self-expression and status seeking" (Chen & Sin, 2013, p. 2). Related work by Lee and Ma (2012) examined news sharing in social media and similarly identified factors associated with sharing. They found support for the hypothesis that status seeking would be positively associated with users' intention to share news on social media (Lee & Ma, 2012).

Self-consistency motives and social identity

Another motive related to, but sometimes in conflict with, image and impression management is self-consistency (Cialdini, Trost, & Newsom, 1995; Higgins, 1987; Swann, 1983). In addition to being motivated to

look good, individuals are also motivated to act in ways consistent with their beliefs (e.g., Higgins, 1987; Swann, 1983) and to change their beliefs to be consistent with their actions (e.g., Fazio, Zanna, & Cooper, 1977). This motive can act in ways contradictory to self-enhancement, as when someone holds a strong self-conception of not being competent at a specific type of task. This need may be related to social and group identity effects. If a person categorizes himself as a member of a particular group, that group may be particularly relevant to social comparison (Wood, 2000). Individuals may thus be motivated to hold attitudes similar to other members of a group, if that group identity is relevant (Wood, 2000). In addition, when individuals share a common group identity, they may be more susceptible to group influence and stereotyping in anonymous computer-mediated communication settings in particular (e.g., Postmes, Spears, & Leah, 1998). Although the literature has not yet covered self-consistency motives with regards to sharing information online, it may be worth researching whether such needs are relevant. For example, if a person believes strongly in animal rights and thinks of herself as an animal rights proponent, she may feel compelled to forward a meme about animal rights in order to avoid dissonance and act in a way consistent with her beliefs.

Accuracy

A theme throughout the psychology of social influence is a need for accuracy (e.g., Cialdini & Goldstein, 2004; Darke et al., 1998). This need is thought to underlie both informational social influence (Baron, Vandello, & Brunsman, 1996; Cialdini & Trost, 1998) and the importance of source credibility (expertise and authority; e.g., Contractor & DeChurch, 2014). Informational social influence is an influence that arises when others' behaviors (e.g., actions, words) are assumed to give information about reality (Deutsch & Gerard, 1955). Informational social influence is especially strong in ambiguous situations (Baron et al., 1996). For example, pilots may assume that other pilots flying away from a mountain range have information about weather in that area—namely, that the weather in the range is safe—but without asking them, that assumption may be incorrect (Paletz, Bearman, Orasanu, & Holbrook, 2009). In times of crisis, individuals may turn to social media for information, and then assume that others know more than they do, even when they do not (Hermida, 2014). For example, during Japan's devastating tsunami, people turned to Twitter to share information about their safety or danger and often retweeted requests for help (Acar & Muraki, 2011). However, these social media users realized they could not distinguish legitimate messages from lies, or whether a plea for help had been answered already or not (Acar & Muraki, 2011).

A need for accuracy—be it particularly strong in a specific individual or fundamental across people—may influence sharing information online. Individuals may argue with others online or share information that they think presents a more accurate view of reality. In our Russian corpus (see Appendix A, Table A2, story #3), we encountered several posts on Facebook, VKontakte, and Twitter that corrected information posted by other users. For instance, the story about American soldiers repainting U.S. fighter jets in Russian colors to allegedly use them for a false flag attack was corrected by former military men and others who provided links to an article about American aggressor squadrons that openly use aircrafts that resemble adversary colors for training purposes. Bobkowski (2015) conducted research investigating information utility, or content that helps consumers gain knowledge, develop an opinion, perform an action or reinforce an already-held position. In two experiments ($Ns = 270, 275$), Bobkowski found that the perceived information utility of content mediated the actual information utility on news-sharing intention. That is, the more useful information a piece of content is believed to have, the more shareable that content becomes. The study also examined the role opinion leaders play in sharing news with information utility and found that a user's perceptions of his/her own opinion leadership affects perceived information utility of news, regardless of the actual information utility. Thus, if you think you are an opinion leader, you are more likely to think that the news you share contains useful information.

Another study examined the motivation of users to share hyperlinks on Twitter (Holton, Baek, Coddington, & Yaschur, 2014). The study ($N = 396$) utilized snowball sampling of Twitter users who actively used links in their tweets. The research identified eight potential motivations for link-sharing, and six accounted for the majority of variance: information sharing, interpersonal utility, passing time, convenience and entertainment, information seeking, and control and promoting work. Information sharing was the most salient factor (Holton et al., 2014). The researchers also found that the higher the motivation for seeking information, the more likely a participant was to post on Twitter. Though this study looks specifically at Twitter, there are studies that suggest

information sharing is important across online platforms. Importantly, whereas interpersonal utility may fall under affiliation (see below), information seeking and sharing seems most closely related to a need for accuracy. ‘Information sharing’ as a response category for a motivation to share information, however, is circular: It is possible it could be motivated, itself, by other factors such as self-enhancement.

Finally, a separate study examining the motivations to share inaccurate information, specifically, found four major factors: entertainment, information seeking, socializing, and self-expression or status seeking ($N = 200$, Chen & Sin, 2013). This study is particularly interesting because it looks specifically at the sharing of “fake news” or misinformation, and yet still found that information seeking was a major factor.

Affiliation

Humans have a fundamental need to bond with each other and, if possible, to not dissolve those bonds (Baumeister & Leary, 1995; Cialdini & Goldstein, 2004). Social interactions cannot be understood without accepting this fundamental need. Individual differences taken into account, the need for affiliation and belonging encompasses and raises many types of behaviors and expectations, including conformity and reciprocity (e.g., Contractor & DeChurch, 2014; McGhee & Teevan, 1967). This need can provide a motivation to share information online.

Several studies look to the need for affiliation and belonging, specifically via the building of social ties and the building of the virtual community. According to Uses and Gratification (U&G) theory, people interact with each other to achieve a sense of belonging (Rubin, 1986). A different theoretical model identifies five factors that could contribute to the social media sharing of tacit knowledge (i.e., insights, know-how, and implicit knowledge learned via experience): social interaction, experience sharing, observation, informal relationship/networking, and mutual trust (Panahi, Watson, & Partridge, 2012). At least three of these factors pertain to affiliation (mutual trust, networking, and social interaction).

Empirical studies have also suggested that affiliation is a relevant motive for sharing information on social media (Lee & Ma, 2012; Ma & Chan, 2014). After surveying 203 participants who reported having prior experience using social media to access news stories, Lee and Ma (2012) found that prior social media sharing experience and socializing were the two most salient factors motivating participants’ intention to share news on social media. Socialization in this context referred to building social ties. However, this study only surveyed graduate and undergraduate students, which somewhat limits the scope of the findings. Similarly, in another study, Ma and Chan (2014) studied the motivations for college-bound high school students to share information on an online learning platform. They examined two constructs: perceived online attachment motivation (POAM), which is “the degree to which an individual believes that he or she can improve his or her social interaction and the sense of communion with others on an online learning platform” (Ma & Chan, 2014, p. 52), and perceived online relationship commitment (PORC), or the perception of relationship persistence. The authors found that both POAM and PORC had significant and direct influence on online sharing. Though this study only involved college-bound high school students, it still drew a clear connection between social interaction, online relationships, and online sharing. Finally, Kim, Lee, and Elias (2015) examined personal and environmental motivations for college students to share information on social networking sites ($N = 308$). They found that the expectation of positive social outcomes and the perceived strength of network ties significantly predicted sharing activities on social networking sites. The researchers concluded that “the motivation to seek social recognition and strengthen relationships among social networks leads to more frequent sharing activities” (Kim, Lee, & Elias, 2015, p. 303). Here, social recognition would involve impression management, but motivation to strengthen relationships entails a need for affiliation.

These three studies suggest that with younger adults, affiliation is a major motivation for sharing information online. However, the participants in these studies are younger, and in a different life stage than the general population. Some research has used non-student samples: In a study of Facebook and Twitter users aged 18 and up from Amazon’s Mechanical Turk ($N = 433$), social engagement was identified as the second biggest indicator of sharing information (after learning; Syn & Oh, 2012). In this study, social engagement was defined as feeling connected to others. Indeed, for Facebook users, social engagement was the biggest motivator for sharing information (Syn & Oh, 2015).

Reciprocity, or the practice of exchanging ideas or information for mutual or community benefit, is an activity that directly supports affiliation and belonging. It has also been identified as a motivating factor for

sharing on social media. Holton, Baek, Coddington, and Yaschur (2014) suggested that information sharing was the most salient factor, but they also state that users post links on Twitter with the “expectation of reciprocation from others in the network” (Holton et al., 2014, p. 39). Research on individual motivations for knowledge sharing in virtual communities ($N = 282$) similarly found that reciprocity had a positive and significant effect on both the quality and quantity of knowledge sharing behavior (Chang & Chuang, 2011). In a study of a professional virtual community in Taiwan ($N = 310$), contributing to the successful functioning and growth of the virtual community was of central importance to the knowledge contributors, demonstrating the importance of affiliation and belonging (Chiu, Hsu, & Wang, 2006). Factors such as social interaction ties, reciprocity, and identification increased individuals’ quantity of knowledge sharing, but did not necessarily increase information quality.

An earlier qualitative study used online observations of listservs and semi-structured interviews ($N = 57$) to establish five common activities across three different online environments: request, appreciation, announcement, clarification, and sharing knowledge (Hew & Hara, 2007). The researchers also found that institutional practice knowledge and personal opinion were the most common types of knowledge shared. They found that the most common motivation for knowledge sharing was reciprocity, and the second most common was collectivism. Both of these motivations suggest a desire to contribute community-wide knowledge. Though this research examines knowledge sharing on Internet-based listservs rather than via social media, it is valuable to the discussion on broad motivations for knowledge sharing in virtual communities.

Individual differences may influence social media use via these different psychological needs. In a study of undergraduates ($N = 184$), the agreeableness of the participants, as well as the tendency to have negative emotions, was associated with belongingness and affiliation-related motivations and behaviors (Seidman, 2013). Conscientiousness was related to more careful online self-presentation, and extraversion was associated with more frequent use of Facebook. In other words, relatively stable personality traits may influence the type, content, and degree of sharing that individuals do on social media, in part because of differences in both motivations and whether social media information sharing is seen as a way to fulfill those needs.

In summary, different aspects of affiliation and belonging motivations are associated with users sharing information on social media, including reciprocity and desires for social engagement, social interaction, online relationship building and strengthening, and networking.

Sociopolitical and economic motivations

Individual social media users are not the only ones who may react to and have motivations to share information online. Entities that represent groups, companies, organizations, and nations will also have motivations, or even explicit agendas. These entities include those who create and drive non-genuine actors. Online news sites may share information in order to get money via clicks via advertising revenue (Allcott & Gentzkow, 2017; Kahin & Varian, 2000; Mitchell, Holcomb, & Weisel, 2016). Writers, designers, and artists, including freelancers and small companies, use social media to advertise, build a brand and audience, and communicate with customers. Even large companies will monitor and spread information via social media for advertising and public relations, as well as engage with consumer complaints online (Berthon, Pitt, Plangger, & Shapiro, 2012; Hermida, 2014; Neti, 2011). Individuals may seek to gain more followers and social media influence, in the hopes of building fame (e.g., Confessore, Dance, Harris, & Hansen, 2018). Politicians and companies may use social media to push a brand, not unlike attempting to control a narrative (Golbeck, Grimes, & Rogers, 2010; Hong & Nadler, 2011; Oates & Moe, 2016). Some may provide disinformation or misinformation to push an ideological agenda to support a particular political candidate, whereas others who personally oppose a candidate may still spread news in favor of him in order to make a profit (Allcott & Gentzkow, 2017).

Beyond those outright economic motivations, state actors or subgroups within a nation may have nefarious agendas, such as disrupting discourse, undermining confidence in institutions, changing norms, and even swaying elections (Agarwal, Al-Khateeb, Galeano, & Goolsby, 2017; Sydell, 2017; Waltzman, 2017; Woolley & Howard, 2017). Autocracies may wish to control the narrative so as to control the populace, and take advantage of the ease of using social media to do so (Oates, 2016; Woolley & Howard, 2017). Terrorist and right-wing groups may also share information online to control narratives about themselves, to recruit, and to establish their brand (e.g., Benigni et al., 2017; Boutz, Benninger, & Lancaster, in press; Bowman-Grieve, 2013;

Caiani & Wagemann, 2009; Derrick, Sporer, Church, & Ligon, 2016; Vidino & Hughes, 2015). By gaining a place of influence within a social network, these individuals can disseminate their messages both repeatedly and more widely (Pfeffer & Carley, 2013). These motivations, goals, and agendas should not be ignored when examining the propagation of information via social media.

Summary of motivations

The reviewed literature identifies multiple motivations underlying individuals' drive to share information on social media. We categorized these motivations using the psychological concept of **needs** that all humans have (i.e., need for impression management and enhancement, need for self-consistency and social identity, need for accuracy, and need for affiliation). Groups and individuals within a society may have additional motivations; we categorize these as sociopolitical and economic motivations. In addition, non-genuine actors are driven by their creators' human motivations to share information. There may be individual differences in these motives, such that for some people, some of these motives are stronger than others. Individuals may thus also have different thresholds for sharing behavior, such that some share online more easily than others, based on how well they feel that information sharing on social media provides an outlet for these needs and how appropriate they feel their behavior is. In addition, these motivations are not mutually exclusive.

CONTEXT AND MATCH BETWEEN CONTEXT AND MODEL COMPONENTS

Individuals do not ingest, react to, and share narratives and information in a vacuum: They are constantly surrounded by a greater social context. This context includes cultural factors, including norms about sharing information, norms generally or about the topic in question, and existing narratives and framing; the language in which the social media is shared; and the individuals' social networks. Not only can each of these factors have an impact on sharing, but whether the original message is congruent or incongruent with culture, narratives, and language may have an impact on how the user seeks out, views, responds to, and perceives that message. On a sociological level, this context includes the user's placement within a social network. In addition, the greater context includes the perceived audience of the user, and the user's possible desire to share for that particular audience. The context also includes the social media platforms themselves, but this aspect of context will be discussed in the section on the platforms and users' ability to share.

Culture, narratives, and language

Cultural differences have been studied in anthropology, but also in cross-cultural psychology and cultural psychology. In anthropology, the focus is on understanding the richness of a culture from the inside of societies. Among others, definitions of culture include the inherited conceptions and symbols by which people communicate and perpetuate knowledge (e.g., Geertz, 1973) and a complex whole that includes beliefs, knowledge, morals, laws, arts, and customs of a society (e.g., Tylor, 1871, cited in Bennett, 2015). In psychology, culture is examined as a system of shared, learned, and communicated meanings that exist within individuals' minds (Rohner, 1984), as well as the institutions and shared practices produced by these systems (e.g., Morling & Lamoreaux, 2008). Both conceptions of culture are relevant here.

Cross-cultural psychology examines culture as different dimensions that exist to varying degrees across different cultures. Some of the dimensions examined include individualism-collectivism (e.g., Hofstede, 2001; Markus & Kitayama, 1991; Triandis, 1989, 1995); naïve dialectical thinking (Peng & Nisbett, 1999; Spencer-Rodgers, Williams, & Peng, 2010); tightness/looseness (e.g., Gelfand, 2012; Gelfand, Nishii, & Raver, 2006); and face, honor, and dignity cultural logics (e.g., Leung & Cohen, 2011). Individualism and collectivism represent the degree to which individuals within a culture see themselves as interdependent with others and fitting into a particular social system, versus independent actors. High levels of naïve dialectical thinking involve implicit assumptions that the world is full of contradiction and change, such that contradictions are tolerated without requiring synthesis or dissonance (Spencer-Rodgers et al., 2010). More prevalent in East Asia, the level of naïve dialectical thinking (as opposed to linear thinking) is associated with a perception that negative and positive emotions are not in conflict (Schimmack, Oishi, & Diener, 2002; Spencer-Rodgers, Peng, & Wang, 2010) and that personality traits thought of in the West as contradictory are more likely to be viewed

as coexisting within the same person (Boucher, 2011; Spencer-Rodgers, Boucher, Mori, Wang, & Peng, 2009). Tightness/looseness refers to the degree to which a culture enforces, sanctions, and emphasizes its norms, regardless of what they are, with stricter cultures considered to be more on the ‘tight’ end of the spectrum. The face, honor, and dignity cultural logics describe, in part, how individuals respond to threats, and what types of threats are more or less impactful in different cultures (Lueng & Cohen, 2011). In face cultures, the valuation of the self is mainly external and within the context of a hierarchy that requires harmony and humility. Honor cultures involve both internally and externally granted value of individuals, and the context is a competitive environment where threats need to be answered. Dignity cultures involve an internal valuation of a self of inalienable worth, and the presumed context is of autonomous, independent people. Cultural differences have been found for many of these dimensions between and within countries (e.g., Gelfand et al., 2011; Harrington & Gelfand, 2014; Hofstede, 2001).

Each of these cultural differences (and others) may influence online communication behavior generally (e.g., Choi, Im, & Hofstede, 2016), as well as inform individuals’ reactions to what they see online, world events, and so on, and also affect their motivations to pass along narratives. For example, individuals in more individualistic culture may be more motivated to express themselves (Markus & Kitayama, 1991). What looks like self-enhancement in individualistic cultures may be different in collectivistic cultures, where self-criticism could be more valued than presenting oneself as the best (e.g., in Japan; Heine, Lehman, Markus, & Kitayama, 1999). In other words, it is possible that individuals in more individualistic cultures may share information online about their achievements, whereas individuals from Japan might be more likely to share examples of their growth or humility. A study of the content of Twitter messages by 100 Japanese versus 100 American college students contradicted this prediction (Acar & Deguchi, 2013). There was no difference in the percent of self-promoting tweets, Japanese were more likely to have self-related (especially women) or TV-related tweets, and Americans were more likely to have friends and family, sports-related, and news-related tweets (Acar & Deguchi, 2013). Japanese users were also less likely to ask questions on Twitter compared to Americans, a finding that was interpreted to be indicative of the hypothesized high-context and harmony-focused culture of the Japanese. However, this study did not compare the topics or form of self-expression, nor did it examine aspects related to sharing inaccurate information. Also, the participants were young, and it is possible that there are norms around social media sharing that are not entirely aligned with historical cultural norms.

Other cultural dimensions could also imply differences in the content and form of sharing on social media. Individuals from cultures with greater naïve dialecticism are less likely to be surprised by contradictory evidence (Choi & Nisbett, 2000), and so have different affective reactions to such contradictions. If there are norms about what types of information are considered appropriate to share, those norms may be more strongly held and enforced in tight cultures. Differences in honor, face, and dignity logics affect how individuals respond to threat (Leung & Cohen, 2011). In cultures that emphasize face, individuals change their self-definitions based on how others see them and face is heavily based on one’s role (Ho, 1976; Kim, Cohen, & Au, 2010). In honor-oriented cultures, on the other hand, individuals gain status and positive reputations from challenge, and in dignity-oriented cultures, the ideal is that each individual has intrinsic value that depends on one’s own moral actions rather than others’ insults or threats (Leung & Cohen, 2011). Therefore, individuals from different cultures may react differently to disinformation or misinformation that is intended to be threatening or to elicit certain emotions.

Going beyond cross-cultural psychology, there is research on what are termed ‘master narratives’, or a “transhistorical narrative that is deeply imbedded in a particular culture” (Halverson, Goodall, & Corman, 2011, p. 14), where culture could refer to an ethnic, social, or religious group. Master narratives are more powerful and persistent than individual narratives, and they vary between countries (Chew & Turnley, 2017). A possible master narrative for the United States would be that it is the land of the free, where individual liberty against tyranny is a central value that it fights for domestically and internationally—for certain instances of tyranny and freedom. An example of a master narrative for Russia might be the one of space exploration that views Russia (and especially the Soviet Union) as the great power with advanced space technology and a revolutionary and extremely successful space program.

Finally, language differences between countries may have an impact on what is shared and why, depending on the different meanings (see Wierzbicka, 1997; 2003, for insights from cross-cultural pragmatics). Not only are languages different across (and within) nations, but how language is *used* may be different. For example,

Gelfand and colleagues (2015) conducted a study examining the types of language used in dyadic negotiation agreements in both Egypt and the United States. Rational and logical language that predicted integrative agreements in the United States hindered negotiation in Egypt, where language (Arabic translated into English for coding purposes) that promoted honor gain and strength was more likely to result in more integrative solutions ($N = 35$ U.S. dyads and $N = 29$ Egyptian dyads; Gelfand et al., 2015).

Another way in which cultural differences may have an impact on sharing information online may be when *mismatches* occur in language, culture, or narratives. In an analysis of Twitter activity published in the *New York Times*, the American far right was found to have attempted to influence the 2017 French presidential election: More than one-third of the millions of posts linked to political hashtags originated in the United States (Scott, 2017). However, few went viral in France. According to the analysis, the American far right failed to gain traction in France because they copied their own images and languages without modification. For instance, the American far right's use of the Pepe the Frog anti-Semitic/racist character as an unofficial mascot in their messaging likely repulsed French readers, who associate frogs with a slur against the French (Scott, 2017). They also used English in their memes, which is not a preferred language of the French for historic reasons.

Academic research supports the importance of match. Framing persuasive arguments in line with moral values of conservatives versus liberals undermined (if against) or encouraged (if for) support of conservative and liberal candidates, respectively ($N = 392$; Voelkel & Feinberg, 2017). A field study of ISIS's use of hadith, or the collected actions and words of the Prophet Mohammed, quantified how ISIS modifies their messages and language in their propaganda for different audience segments (Boutz, Benninger, & Lancaster, in press). Researchers found that ISIS used more apocalyptic prophecies in their English-language print propaganda than in their Arabic-language print propaganda. Because the frequency of their Arabic and English media were different, however, it was possible that the difference in language was also due to the greater time scale of the different media—two years for the English magazines versus three months for the Arabic videos and six months for Arabic magazines. Nevertheless, this study suggests that ISIS takes part in strategic framing, aiming certain messages to certain audiences.

To our knowledge, there is no (or little) research examining differences in social media sharing behavior across different cultures, in contrast with the relatively larger body of work examining market segmentation, targeting, and positioning. Given these cultural, language, and other differences, we would anticipate differences in what narratives and messages resonate and make sense, the cognitive and affective reactions to information, and the degree to which different messages are shared. Not only may different messages resonate (or not) with various groups, but how those messages are worded may also have an effect on sharing behavior.

Norms and comparisons within a social group

Another important aspect of the social context that may influence each of the other factors involved in whether people share information is the perception of what others believe. Certain messages and narratives may be more persuasive simply because of the presence of others who believe them, particularly socially important others (e.g., Paluck & Shepherd, 2012). Normative social influence occurs when individuals are persuaded by observing the actions or beliefs of others (e.g., Cialdini & Goldstein, 2004; Nolan, Schultz, Cialdini, Goldstein, & Griskevicius, 2008). Descriptive norms, or norms about what is perceived as what most people do (Cialdini, Kallgren, & Reno, 1991), can be created even without direct observation (Nolan et al., 2008) and may increase a specific behavior (e.g., conserving water in hotels by reusing towels; Cialdini et al., 1991; Cialdini et al., 2006; Nolan et al., 2008). Individuals who are motivated to examine poll data (e.g., people engaging in systematic processing) were more likely to take into account the number of people being polled, whereas those using heuristics were influenced by consensus and not poll numbers in trying to judge the truth (Darke et al., 1998). In other words, people acting on heuristic thinking will take the majority opinion as evidence for reality and are less likely to take into account how large the group being sampled really is. Similarly, even if participants are told that repeated messages come from a single source, the repetition may cause them to infer that a familiar opinion is the one that is widely held (Weaver, Garcia, Schwarz, & Miller, 2007). The power of repetition noted previously is likely to be persuasive not only because the message is easy to recall, but because the social media user believes others think it is true.

The social context of what others believe may do more than simply reinforce a single attitude or behavior; it can also make it more extreme. Group polarization, which describes how groups shift opinions in a previously

preferred direction to be more radical, has been studied for decades within social psychology (e.g., Isenberg, 1986; Myers & Lamm, 1976). Group polarization in general seems to be caused by a combination of effective persuasion and social comparison (Myers & Lamm, 1976). Social comparison effects may be stronger when the comparison group shares the same social identity and is relevant to the issue at hand (Wood, 2000). Group polarization may be even stronger in anonymous online settings than in settings where individuals are face-to-face (e.g., Sia, Tan, & Wei, 2002). Specifically, when an individual observes others arguing a similar perspective to his or her own, he or she views the perspective as normal, even when it may actually be radical compared to other groups. On the one hand, this social psychological phenomenon can occur and may be a driver of polarization within echo chambers, as well (e.g., Flaxman et al., 2016). On the other hand, a small qualitative study suggests that when individuals seek out diverse political information and engage in respectful political discussions online, they can avoid polarization ($N = 21$, Semaan, Robertson, Douglas, & Maruyama, 2014).

The social context of what others believe and how they behave—or the perception thereof—may therefore not only sway belief and behavior in the same direction, it can make it more extreme. These phenomena may occur online as well as in face-to-face settings. From the sociological perspective, the structure, not simply the content, of a social network can have an effect on information sharing.

Ties, strong and weak, within the social network

The social media user's placement within her or his social network, the strengths of the ties within the network, and the composition of the network are additional aspects of social context that may affect sharing behavior. The study by Vosoughi and colleagues (2018) suggested that network structure did not explain the differences in the spread of false and real news, but social network variables are important for information sharing more generally. A rich literature exists on the power of influencers within social networks (e.g., Amoozgar & Ramezani, 2013; Pfeffer & Carley, 2013; Zhao, Wu, Feng, Xiong, & Xu, 2012). The mobilization of networked publics is in part caused by groups coalescing into actual communities, which then activates ties and enables information sharing (Papacharissi, 2017). For example, a series of experiments examining word-of-mouth sharing both on social media using LinkedIn and MBA students ($N = 50$) and in person using randomly assigned groups ($N = 240$) suggests that communication with a close other might motivate consumers of a product to share more negative information, whereas communicating with a distant other might induce consumers to share more positive information (Dubois, Bonezzi, & de Angelis, 2016). Social ties online thus play a role in how people share information within their networks. Different social relationships can each be important to information sharing: weak ties, strong ties, and homogenous networks, which implies that people in a network are similar to one another.

Some studies suggest that weak ties are important for content contagion and dissemination. A large-scale study of 253 million participants, over 75 million URLs, and over 1 billion unique participant-URL pairs over a seven week period examined the role of both strong and weak ties in information dissemination online (Bakshy, Rosenn, Marlow, & Adamic, 2012). This study used four types of interactions to determine tie strength between two users, including the frequency of private interactions via Facebook messages, public interactions in the form of comments on posts, the number of real-life coincidences captured by Facebook (i.e. being tagged in the same photo), and the number of online coincidences (i.e. commenting on the same post). The authors found that participants were more likely to share a link when the original sharing friend was a close tie. However, weak ties are responsible for the transmission of novel and diverse information, or information that is not likely to be seen or exposed anywhere else, which increased the novelty of information in a network. This study found three additional reasons for the diffusion of information on Facebook: (1) an individual shares a link on Facebook and the exposure causes a friend to re-share that same link, (2) friend connections are relatively homogenous so the two friends visit the same websites and share links independently of one another, and (3) an individual shares a link outside of Facebook and exposure to *that* link causes one person to share the link on Facebook. They also found that the majority of the influence comes from weak ties.

Other research from marketing can help us to understand the spread of information and how social ties and trust play a role in that process. Based on a study about electronic word-of-mouth, researchers built a model of the role of social relationships (social ties, homophily, trust, and interpersonal influence) and consumer attitudes and behaviors (Chu & Kim, 2011). The conceptual model suggested that tie strength can be positively related to

consumers' intention to seek and pass on product-focused information on social media. In a survey study of 363 undergraduate students, the researchers found that homophily was *negatively* related to opinion seeking and opinion passing behavior, although this finding contradicted previous research that suggested similar individuals share information with each other. Their findings did, however, suggest that trust is an indicator of engagement. The higher level of trust users have in their social connections, the more likely they are to engage in opinion sharing, opinion giving, and opinion passing behavior.

Another study points to close relationships being imperative for sharing information. The goal of Stutzman's (2006) research was to develop quantitative metrics about social network community participation on college campuses and analyze attitudes about the use of social networking communities and sharing practices in general. After surveying students about their use of social networking communities, Stutzman found that participants were most comfortable with friends accessing their social networking accounts, and they were less comfortable with family, classmates, and strangers accessing their account. This study examined the sharing of identity information, rather than news content, and used a small sample size (20 undergraduates, 18 graduate students). However, the general findings about share behavior could be relevant to other types of sharing, in that these findings may be indicative of what types of information students may want to share with different kinds of members of their network.

Community structure and homophily are also potential social context factors affecting sharing behavior. Weng, Menczer, and Awn (2013) presented a practical method for translating data about community structure into predictive factors about what information would spread widely. In their study, they used epidemic models to suggest that they could predict the virality of memes based on early spread patterns and community structure. They identified the "trapping effect," which described the way communities cripple the spread of information because they act as traps for random flow. Similarly, Pfeffer, Zorbach, and Carley (2014) suggested that due to the highly connected nature of network clusters, often information simply echoes within a network. They also argued that a lack of diversity in a network contributes to filter bubbles that emphasize singular topics or points of view. Essentially, Pfeffer and colleagues suggested that group polarization does not simply occur because of social comparison and persuasion factors; it also occurs because of the structure and diversity of a social network, which also increase the speed of message transmission.

Yet another important aspect of social networks for information sharing is the size of one's audience online. For instance, in general, users visit YouTube, the video-sharing site, to view videos rather than to share them; they do not fully utilize the sharing and community features of the site (Halvey & Keane, 2007). However, Halvey and Keane (2007) found a relationship between the number of subscribers a user has and the number of videos the user uploaded: The bigger the network, or more subscribers, the user had, the more likely they were to engage in sharing and uploading behavior.

Perceptions of the particular audience may also be a factor for sharing behavior. Barasch and Berger (2014) conducted six studies to examine audience size and what impact it had on the types of content shared. They make a distinction between "broadcasting," or speaking to a large audience or multiple people, and "narrowcasting," or speaking to a smaller audience or fewer people. In a study of word-of-mouth sharing, they found that when broadcasting and explaining an imaginary day in an email, participants ($N = 192$) mentioned fewer events that made them look bad, reframed events to make themselves seem less negative, and used less negative speech. Barasch and Berger further suggested that narrowcasting, in this case to close friends, increased participants' ($N = 128$) willingness to share useful information. Another study ($N = 265$) on news discussions on Facebook found that when participants were able to involve their online friends in the discussion, they felt more closely involved and felt a stronger sense of community (Oeldorf-Hirsch & Sundar, 2015). The closeness of online ties has also been studied as an indicator of propensity towards electronic word-of-mouth behaviors. Tie strength is positively related to a social media users' intention to seek out and share product-related information (Chu & Kim, 2011). In other words, the social context—here, the audience size and who the audience was—variously influenced individuals' affiliation motives, as well as their self-enhancement/impression management and accuracy motives. These motives and reactions to the audience thus influenced the content and type of information shared. This research examined both online and traditional word-of-mouth sharing, linking elements of the social context to individual motivations.

Summary of context

This section tackled three major aspects of the social context: culture, social comparison of beliefs and norms, and the structure and composition of one's social network. These factors may have an impact not only on sharing behavior directly, but also on motivations and reactions to narratives and information. Culture, whether conceptualized as cross-national dimensions or culture-specific narratives, may impact how a particular piece of information is viewed, for instance. Comparisons between one's own beliefs and that perceived to be held by one's social group may influence how socially acceptable it is to state a particular belief. Echo chambers of people with the same belief may become more extreme. Indeed, these contextual factors also interact with each other, such that culture can be associated with structural differences in social networks (e.g., individualism positively associated with ego-centric social networks versus more interdependent networks; Na, Kosinski, & Stillwell, 2015). Although the reviewed studies have complex and mixed results with regards to social network ties, it is certain that connections on social networking sites matter and are imperative to the spreading of information. This research also suggests that community structures, the composition of the community (homogeneous or diverse), perceptions of the specific audience, and network size are important factors in the spread, propagation and virality of information online.

NON-GENUINE ACTORS

The psychological literature on cognition and affect presumes an individual acting within the world, responding to information from their own perspective. However, individuals also have explicit agendas: They may be members of groups that have sociopolitical goals or economic motives. The sharing and spreading of both high-quality and low-quality information on social media are not reserved for human actors and accounts. Within social media communities, there are both genuine and non-genuine actors. Non-genuine actors, or users who are not human or who are deceitful about their identities, include social bots, sockpuppets, and trolls (e.g., Agarwal et al., 2017).

Bots

Social sharing can be performed automatically with the help of computer programs, like social bots. Ferrara, Varol, Davis, Menczer, and Flammini (2016) describe a 'social bot' as a "computer algorithm that automatically produces content and interacts with humans on social media, trying to emulate and possibly alter their behavior" (p. 96; see also Varol, Ferrara, Davis, Menczer, & Flammini, 2017). Many social bots are quite sophisticated and can build social networks and produce credible content with natural human-like patterns (Ferrara et al., 2016). Some social bots are used to provide a helpful service such as posting weather, news, and publications, or they may coordinate volunteer activities (Confessore et al., 2018; Ferrara et al., 2016; Lokot & Diakopoulous, 2016; Varol et al., 2017). Bots can even be used to detect social spammers via harvesting information online (Lee, Caverlee, & Webb, 2010). In late 2017, Facebook admitted to investors that two to three percent of regular visitors, or 60 million accounts, could be fake (Shane & Isaac, 2017). Similarly, Twitter's general counsel testified before Congress that five percent or more than 16 million fake accounts exist on their platform (Shane & Isaac, 2017), although others estimate that between 9 and 15% of Twitter accounts could be bots (Varol et al., 2017).

'News bots', which automate the production of news and information, can be useful to personalize content and cover events quickly (Lokot & Diakopoulous, 2016). These types of bots have been observed across social networks like Twitter, Facebook, Reddit, and Wikipedia (Confessore et al., 2018; Lokot & Diakopoulous, 2016; Shane & Isaac, 2017). Lokot and Diakopoulous (2016) found that news bots have several functions, including informing readers, reporting on/recommending breaking news, enabling discovery, investigating difficult to obtain information, providing critique or opinion, and providing services or entertainment. The function of 'informing' was the overwhelming intention of the news bots in their sample. In one of their samples from DataSift, the researchers identified several bots that were made to look like news feeds, but were actually spam bots that led to ad-filled pages, which suggests that news bots are perceived as valuable to spammers. It is not clear, however, that all news bots are attempting to emulate or interact with humans and thereby fit the definition of social bots.

Social bots can also be harmful (Confessore et al., 2018; Ferrara et al., 2016). Ferrara and colleagues (2016) note that bots can contribute to the spread of unverified information because they may automatically retweet posts without verifying or checking information. Social bots can also be built by malicious entities. These bots can “mislead, exploit, and manipulate social media discourse with rumors, spam, malware, misinformation, slander, or even just noise” (Ferrara et al., 2016, p. 98). Bot behavior can give the impression that a piece of information is highly popular, which may lead a bot or a real human to acquire disproportionate influence (Confessore et al., 2018; Cook, Waugh, Abdipanah, Hashemi, & Rahman, 2014; Ferrara et al., 2016). Bots can also be used to manipulate the amount and content of information and narratives (Cook et al., 2014). On a large scale, bots can potentially endanger democracy by manufacturing fake political support, cause panic during emergency situations, promote terrorist propaganda and recruitment, manipulate the stock market, and disseminate rumors and conspiracy theories (Cook et al., 2014; Ferrara et al., 2016; Shao et al., 2017; Varol et al., 2017). Importantly, botnets, or social networks of bots, can generate the perception of homophily, and thus create a false sense of community bonding, group consensus and polarization, social influence, and repetition of a message. Because emotions are contagious on social media, “elusive bots could easily infiltrate a population of un-aware humans and manipulate them to affect their perception of reality, with unpredictable results” (Ferrara et al., 2016, p. 99).

The creation of tools to detect bots has thus become an urgent need (e.g., Chu, Gianvecchio, Wang, & Jajodia, 2010; Varol et al., 2017; Villamarín-Salomón & Brustoloni, 2009). Bots can be characterized by social connectivity, information flow, and clustering. In an attempt to detect bots on Twitter, Varol and colleagues (2017) found that simple bots have bimodal reciprocity distributions, and accounts more likely to be bots have smaller reciprocity scores, likely because “simple bots follow users at random” (p. 6). In their study, bots were analyzed using a machine learning classifier, and the stronger the likelihood that the account was a bot, the higher the score. With regards to information flow, simple bots tended to retweet each other, while frequently mentioning sophisticated bots. The more sophisticated bots retweeted, but did not mention humans. Clusters exhibiting high average bot likelihood/detection scores exhibited these properties: (1) legitimate-looking accounts promoting themselves, (2) spam accounts that are active but have limited followers, and/or (3) accounts that frequently use automated applications to share content from other platforms like YouTube or Instagram or post links to news articles.

Bots have been used to spread false or misleading news, as well as propaganda from state actors and radical groups (Agarwal et al., 2017; Arnsdorf, 2017; Shao et al., 2017; Woolley & Howard, 2017). Shao and colleagues (2017) investigated the role of social bots in spreading fake news online. The researchers crawled 15,053 articles published by seven fact-checking organizations and 389,569 “unsubstantiated or debunked claims” from 122 websites known for publishing false or misleading news. They also used the Twitter API to collect over one million public posts linking to fact checks and over 13.5 million public posts linking to false claims. The researchers found quantitative empirical evidence that social bots spread misinformation and disinformation online; indeed, a few accounts were responsible for a large portion of the traffic. They also identified three manipulation strategies used by social bots: (1) they were active in amplifying fake news early on, before a claim went viral; (2) they targeted influential users through replies and mentions; and (3) they disguised their geographic locations. All of these tactics leave ordinary users vulnerable to retweet bots who post false news.

Nefarious social bots can be used by state actors (foreign governments), advertisers, and hackers in an attempt to create viral moments and promote misleading content within social networks. In our own examination of false news stories on social media, we found that bots were used extensively, especially on Twitter, to promote fake stories. Though these bots tweeted using natural human language, the very fact that multiple accounts used the exact same words was indicative of bot behavior (see Figure 8). An ordinary user who lacks knowledge about bots and their behavior may see these tweets, all pointing to the same story, and incorrectly assume that the story is popular, widely-shared, and worthy of reading or viewing. Because many social networks rely on contagion, and repetition is a strong heuristic for truth and consensus, this tactic becomes problematic when the information being shared by bots is false, misleading, and/or damaging.

A recent update from Twitter revealed that during the ten weeks preceding the 2016 presidential election, there were more than 3,814 accounts identified as being connected to a propaganda effort by a Russian government-linked organization, the Internet Research Agency (Twitter Public Policy, 2018). Those accounts

posted 175,993 tweets, with approximately 8.4% of them being election related. Twitter also identified over 50,000 automated Russian-linked accounts tweeting election-related content. In the days following this announcement, Twitter notified 677,775 Twitter users who had followed one of these accounts or tweeted or liked content from these accounts during the election period (Twitter Public Policy, 2018).

Of course, this problem is not unique to Twitter. Roger McNamee, an early investor in Facebook, discussed the problem of the Facebook business model and algorithm in an op-ed for *Washington Monthly Magazine* (2018). In light of the 2016 presidential election in the United States, he discussed the influence and power of social bots. He wrote that Russians identified users who would be susceptible to the message and used Facebook's advertising algorithm to target them with pro-Trump messages and anti-Clinton conspiracy theories. Then, it is likely the Russian bots and trolls created an illusion of widespread support that could have reached tens of millions of users (for full quotation, see Appendix B). McNamee's claims have been echoed by, or similar to, reports by multiple researchers investigating this phenomenon (Arnsdorf, 2017; Oates, 2016; Paul & Matthews, 2016; Sydel, 2017). McNamee (2018) goes so far as to suggest that bots impersonating humans should be banned from the platform. At the very least, he suggests that bots should be explicitly labelled so that users can block them.

Not all bots are successful: It seems that they need to gain social capital, such as by gaining a large number of followers (Murthy et al., 2016). In addition, the recent study of false and true news stories spread via Twitter found the same patterns for the relative success of false news stories regardless of whether likely bots and their tweets were removed or not (Vosoughi et al., 2018). The bots affected the spread of false and true news stories roughly equally, suggesting that it was the humans who were more likely to spread false news stories. A weakness of the study is that it only examined fact-checked false and true stories. The breadth of emotions and novelty in non-fact-checked true stories may well be greater than in fact-checked true stories. In addition, successful groups of bots may be key to disseminating *specific* messages widely (Paul & Matthews, 2016). For example, one of the fake news narratives chosen independently by the Russian-speaking member of our research team and one of our English monolinguals simply did not propagate. This story was about the purported assassination by radioactive isotope of a former homosexual lover of Putin's (see Appendix A, Table A1, story #70). When we asked ourselves why this story did not spread, two potential reasons were raised: (1) this story was initiated by a perhaps less popular fake news site, and (2) it was not picked up by bots. Unlike many of the other stories, in searching Twitter for evidence of this story, no bots, as well as very few humans, seemed to pick it up.



Figure 8. Likely bot activity on Twitter

Sockpuppets and troll farms

In addition to bots, there are other types of non-genuine users on social media. The phenomenon of multiple user accounts being controlled by a single individual or organization, and used for the same purpose, is widespread (Liu, Wu, Han, & Zhou, 2015). These accounts are known as 'sockpuppets'. Sockpuppet content can be shared or driven by either bots or live humans (or cyborgs, a mix of the two; Chu et al., 2010). These accounts are disguised as having different identities without any contact with each other, but they have similar sentiment orientations and behaviors (Liu et al., 2015). For example, a group of sockpuppet accounts could all extol the praises of a specific public figure. Accounts controlled by a single individual are considered sockpuppets, whereas accounts controlled by multiple people who have the same purpose, and who likely work for the same organization, are called meatpuppets (Liu et al., 2015). The information disseminated by these communities, or "gangs," can give the impression of widespread sharing and consensus, when in fact, this sharing is carefully coordinated by manipulative actors.

Identifying sockpuppets automatically can be difficult, but researchers have built algorithms to attempt to detect these accounts (e.g., Bu, Xia, & Wang, 2013; Solorio, Hasan, & Mizan, 2013). The detection algorithm

built by Bu, Xia, and Wang (2013) used a social network model that links accounts based on whether or not they have similar attitudes to topics in which both of them participate in discussion. The edges in this model take into account writing styles (Bu et al., 2013). This model speaks to the characteristics of sockpuppets and meatpuppet communities. Some researchers have used authorship attribution techniques, which require large amounts of text to determine differences between authors, with mixed success (e.g., Crabb, Mishler, Paletz, Hefright, & Golonka, 2015; Solorio et al., 2013). Crabb and colleagues (2015), for example, used bigrams to detect sockpuppets in Russian on Twitter in a small sample, and had moderate success in identifying a handful of news bots. Bigrams are pairs of letters within and across words (e.g., ‘honey badger’ would include the bigrams ho, on, ne, ey, y(blank), (blank)b, and ba). The strength of using bigrams is that they are generally language-agnostic.

Recently, a particular group of non-genuine actors has come to the attention of the public: members of troll farms (Chen, 2015; Myers, 2018). A troll in this context is a computer-mediated communication user who presents as a sincere member of a group but who actually intends to cause or exacerbate conflict for their own amusement (Hardaker, 2010). Trolls in general may include genuine actors who consciously or unconsciously are divisive, but for this review, we focus on trolls that are non-genuine actors. Investigative reporting and purported whistleblowing identified a Russian troll farm (the Internet Research Agency) that has been active since 2011, the goal of which was to disrupt real-life American, Russian, and other communities (Carroll, 2017; Chen, 2015, 2016; Filipov, 2017; Myers, 2018). In February 2018, this group was indicted by an American grand jury for engaging “in operations to interfere with elections and political processes” (*United States of America v. Internet Research Agency LLC*, 2018). The goals of this group were to sow doubt, confusion, disgust, anger, and dissent, not only via spreading hoaxes to cause real-world panic (Chen, 2015), but also by arguing multiple sides of issues that were already polarizing in the United States, such as immigration and race relations (Carroll, 2017; Chen, 2015, 2016). The Russian trolls would pose as multiple individuals from different walks of life in the United States, engage with each other, and were known to go as far as getting activists to hold protests (Adams & Brown, 2017). These individuals share information, and even argue with each other, not due to genuine reactions to information they read, but for a sociopolitical purpose. This troll farm was viewed by the American intelligence community as part of a larger Russian influence campaign falling in line with particular political and economic motivations (Office of the Director of National Intelligence, 2017). In examining why information is spread online, it is important to take into account these sorts of actors in addition to genuine users.

Summary of non-genuine actors

Non-genuine actors, including social bots and sockpuppets, are automated or manipulated to post information and sentiment to various social media platforms. Though not all social bots and sockpuppets are nefarious, there is evidence that some of these non-genuine accounts—especially on Facebook and Twitter—are maliciously managed, by hackers or state actors, to spread misinformation and spam.

ABILITY TO SHARE

It does not matter what an actor’s reaction to social media messages is, whether s/he is motivated to share, or whether a botnet is activated if no one can actually post. Not everyone has access to social media platforms. The ‘digital divide’ both within the United States and across the world means that those who are poor are less likely to have access to technology (although the divide may be narrowing; Debatin, 2008). Even if a person has internet access, s/he may not wish to use social media, and certain demographic groups may be more or less likely to have adopted social media. For example, Twitter users in the United States tend to be younger than the average person (Gayo-Avello, 2011).

Perceptions of being able to share: efficacy and experience

The perception of being able to do a behavior, or efficacy, is an important part of the intention to do so and the actual behavior (Ajzen, 1991). There are practical and technical skills involved with sharing content online. Those skills and familiarity (or lack thereof) with online platforms such as social media sites may be impacting

users' motivations to share content in these communities. Several studies look at prior experience with social media, or social media self-efficacy, as a motivating factor. Social cognitive theory (SCT) states that user behavior may be influenced by prior experience (Lee & Ma, 2012). Lee and Ma (2012) surveyed 203 participants who had prior experience using social media to access news stories. The researchers found a significant relationship between prior social media experience and intention to share (and seek) information. More recently, Syn and Oh (2015) identified ten factors associated with sharing on Facebook and Twitter ($N = 433$). They found that efficacy was positively related to sharing on social media, with efficacy defined as not just believing that they could share, but believing that they could find helpful or liked information. These researchers also found differences among platforms, with efficacy having a stronger effect on sharing on Twitter than Facebook, and gender differences, with male users more motivated by efficacy in general. These findings suggest that both prior social media experience and belief in the utility of what one shares can be important to sharing information online.

Social media affordances

Beyond perceptions of being able to share, there is the reality of whether a person can actually share information online. Social media networks, platforms, and websites offer their users what has been termed *affordances*. Affordances, a term first coined by Gibson (1979), was intended to mean “an action possibly available in the environment” (Evans, Pearce, Vitak, & Treem, 2017, p. 37). This concept has since been applied widely to technology to take into account the structure between an object (or technology) and a user, which either enables or constrains potential outcomes (Evans et al., 2017). There are two major types of affordances that we discuss in this section: sociotechnical affordances that involve the interaction of behavior and technology, and practical affordances that are inherent in the platforms themselves.

Sociotechnical affordances

Majchrzak, Faraj, Kane, and Azad (2013) discussed knowledge-sharing engagement and social media affordances in the context of communal workplace conversations. Knowledge-sharing engagement, in this context, refers to knowledge that is made publicly available by posting in a collective good, like tweet or blog, with recipients able to interpret, modify, and use that knowledge as they wish. The four affordances they suggested are metavoicing, triggered attending, network-informed associating, and generative role-taking. *Metavoicing* is described as “engaging in the ongoing online knowledge conversation by reacting online to others' presence, profiles, content and activities” (Majchrzak et al., 2013, p. 41). In other words, metavoicing involves the affordances related to reacting to others' behavior and presence. *Triggered attending* is defined as engaging in a conversation only when an automated alert notifies the individual of a change. *Network-informed associating* and *generative role-taking* refer to taking part in online conversation based on ties to relationships and content, and by taking part in specific roles that sustain the community and encourage productive dialogue. All of these affordances are important to understand in order to fully grasp the opportunities and normative behaviors associated with knowledge sharing on social media.

Even within the same platform, different channels of communication can enable different levels or types of communication. In a study that looked specifically at Facebook ($N = 141$ participants), researchers found that channels of communication within social networks matter. Emotions expressed in private messages were more intense and less positive than emotions expressed in network-visible posts (i.e., the timeline), which were less intense and more positive (Bazarova, Choi, Sosik, Cosley, & Whitlock, 2015). Given the importance of intensity and arousal to how individuals react to and intend to share messages, this finding suggests that the interaction of the type of and privacy level of the communication channel influences actual sharing behavior.

Practical affordances of platforms

On a practical level, social media platforms make creating content, building networks, and sharing information relatively easy for users—but in different ways. Each of the major social media platforms have practical constraints and opportunities that enable sharing information. Facebook, one of the most widely used social networking services in the world, simplifies sharing information online. On the platform, users create

profiles and build networks of “friends.” Users are able to post their own content (links, photos, videos, text, etc.), and they are also able to “like” and “share” content within the network with a click of the “like” or “share” buttons. Users can also comment on posts. Within each individual post, users have a maximum of 63,206 characters to use in their posts. As of fall 2017, the “like” button was supplemented by emojis for sadness (crying), anger (a partially red emoji face with lowered eyebrows), love (heart), laughter (“haha,” a laughing face), and surprise (“wow,” an open-mouthed face), enabling a greater range of explicit emotional reactions. Facebook also enables the user to limit whether their friends can share their posts or not. VKontakte (ВКонтакте or InContact), run by a Russian company, is similar to Facebook in terms of its capabilities. Although it is available in multiple languages, it especially gears towards Russian-speaking users.

Twitter, a popular microblogging platform, has sharing functionality built into its interface. On the platform, users create profiles and build networks by following other accounts, and similarly, acquiring followers. Users can post information (links, photos, videos, text, etc.) to their own feed. On Twitter, users now have 280 characters to use, whereas before fall of 2017, the limit was 140 characters. Twitter users can also “favorite” (similar to Facebook’s “like”) or “retweet” (or share) information from other accounts with a simple click. Users can also include other account holders’ usernames in a Tweet; if this occurs, Twitter may notify the flagged user. Both Facebook and Twitter have private messaging capabilities, although they have different features and constraints.

Reddit, a social news aggregation site popular in the U.S., is also used to share information and viral content. Reddit users can subscribe to smaller communities (called “subreddits”) and post their own content (links, photos, videos, text, etc.). Within any post, users have up to 40,000 characters to use. They can also engage with content and information posted by others and then “upvote” or “downvote” content based on the user’s approval or disapproval of the content.

Though much of the research about sharing and propagation on social media focuses on Facebook and Twitter, and little research exists about sharing on Reddit, there is some work on the aggregation platform. One study from computer science examines the lifespan and propagation of information on the site (Haralabopoulos, Anagnostopoulos, & Zeadally, 2015). The researchers scraped two subreddits (“r/new,” “r/rising”) almost hourly over a period of two months. During this 60 day period, almost 1 million posts were obtained for analysis, and more than 100,000 posts met the domain scraping criteria. The researchers found that positive and entertaining content were the most shared within the network, and Reddit posts were mostly popular within the first few hours after their creation. They also found that very few pieces of content on Reddit go “viral.” In addition to reinforcing our argument that entertaining content is shared, this study implies differences between Reddit and, for example, Twitter, where posts are often widely propagated.

Summary of ability to share

The act of sharing information online depends on the actor’s ability to share, that is, having access to social media platforms, being willing to use social media, and being familiar with relevant technology. Several social media affordances also play a role in whether people share online content. These affordances are both sociotechnical (i.e., the way people interact with technology) and practical (i.e., capabilities of specific platforms that allow users to create content, build networks, and share information).

CONCLUSION AND DISCUSSION

This paper contributes to the study of the propagation of information in general and narratives in particular by reviewing a broad multidisciplinary literature relevant to why individuals share information on social media. By leveraging theory and empirical findings from information sciences, psychology, sociology, and more, we created a model of information sharing that covers multiple dimensions of narrative propagation to include the sources of information, affective and cognitive reactions to the messages, motivations to share, and the ability to share, as well as genuine and non-genuine actors. The process of information sharing necessarily requires evaluation of the information itself and the current situation, among other factors, as well as explicit or implicit decisions based on this multitude of factors. By examining 20 different fake news stories in two different languages as they appeared in social media, we were able to illustrate factors and also identify potential gaps in

the literature on information sharing. One potential gap was that material may be shared that does not require belief (though there was research on ‘entertainment’ as a motive). Similarly, there exists a broad literature on culture generally, but more research could be conducted specifically to examine the effects of culture, including mismatches between culture and messages, on sharing online.

Although we considered many factors related to sharing, this paper is not exhaustive. For example, we did not discuss whether the inherent truth in the original message contributes to the likelihood of it being shared (see Vosoughi et al., 2018). It is possible that only the *perception* of truth is important for information sharing, and even that is not always the case (see the section on belief being unnecessary). Because of the sheer number of potential factors, we did not necessarily identify which would moderate which others, other than identifying some factors that could increase and other factors that could suppress information sharing. For example, one issue for sharing is whether future employers can view one’s social media content, and how much privacy the settings allow. Individuals are not necessarily comfortable with strangers seeing their social media content (Stutzman, 2006), and may want to share some types of information with some individuals and different information with others. For example, individuals may want to share pictures of their children with friends and family, but not with professional acquaintances. In this case, impression management, norms about what is appropriate to share, and the ease of privacy settings may interact with each other to influence sharing behavior. Nevertheless, this review provides a strong basis from which to conduct new research.

The logical next phase of research is to quantify the different factors identified in this review—specifically, in the social media domain. First, researchers should identify existing and novel ways of measuring successful or extensive virality, dissemination, and propagation. Then, researchers could create new measures of the other factors to use in social media field studies (e.g., confirmation bias; high arousal emotions; culture or narrative match). For instance, Gelfand and colleagues (2015) have created an honor dictionary to detect honor words in corpora, as a measure of honor logics. One could test whether the degree of match between the use of honor words in an individual’s tweet history and specific news stories predicts the sharing of those news stories. By associating measures with different levels and types of successful propagation, we can better understand why and how different narratives and messages are propagated widely and some are not. For example, in our qualitative analysis, the one story that utterly failed to be shared was about the alleged murder of Putin’s supposed lover. Other fake stories seemed to us to be similarly unbelievable, yet they spread. Although we speculated that the failure was due to the irrelevance of the story to Russian and related botnet agendas, it is also possible that, simply, *no one* cared: The story failed to elicit outrage, and no one’s social network shared it.

Once metrics have been created, researchers can generate specific hypotheses to test in field studies and/or experiments. Given that most of these factors have been examined in isolation—either disciplinary isolation or isolation driven by the nature of conducting experiments—field studies are important to determine the relative weights of these factors. For instance, one hypothesis might be that confirmation bias is a necessary but not sufficient condition for sharing misinformation and disinformation. Confirming messages may be seen by social media users with great frequency already because of homophily. Those narratives that are passed along may need something more, such as a high-intensity emotion, or the perception that the audience would welcome the message. Future research could also test fluency online, such as examining Facebook’s new feature that entails putting colors and patterns on brief posts to determine whether those with clear colors/patterns are shared or liked as much as ones with more difficult to read colors/patterns. Although it is widely agreed that affiliation and impression management are strong motives for sharing information online (e.g., Hermida, 2014), it would be interesting to test whether self-consistency is a factor. Further, it would be useful to conduct studies that combine and compare different affective and cognitive factors within the same experiment.

This area lends itself to rich and varied research. However, it is crucial that research that utilizes user-generated content—as in the case of social media—is held to the same ethical standards as any other type of research. Ethical considerations include not only concerns pertaining to the collection of social media data (e.g., whether the data should be considered private or public), but also concerns related to research methods (e.g., instances when people are manipulated on social media via injected posts that serve the purposes of the research study). Although experimental methods may be necessary for determining which factors are most important for information sharing, care should be taken to ensure that the research does not cause harm or rely on deception.

The problems of fake news, disinformation, and misinformation require a multidisciplinary approach (Lazer et al., 2018). This review exists at a point when communication online—both its content and structure—are

changing rapidly. Is the future all bots arguing with bots, as computational propaganda becomes so sophisticated as to be indistinguishable from humans (Chessen, 2017)? Scenarios in which bots conflict with each other already occurs, as organizations create and rally bots to stave off bot attacks, and editor bots undo each other's changes on Wikipedia (Tsvetkova, Garcia-Gavilanes, Floridi, & Yasseri, 2017). Changes in policies and features of social media platforms may alter what individuals, and bots, can actually do. Nevertheless, we contend that the fundamental psychology, sociology, and political communication behind sharing will likely be the same for the foreseeable future, such that the insights from this review will remain relevant. The next step is to determine which of these factors have the most impact here and now.

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APPENDIX A: METHODOLOGY OF THE QUALITATIVE ANALYSIS OF FAKE NEWS STORIES

The goal of this qualitative analysis was to determine if there were factors that were missing from our review of the literature. We identified 20 narratives/fake news stories: 15 in English and 5 in Russian.

For the English fake news stories, we (the first and second authors) used a random selection of 15 news stories from the Golbeck Fake News corpus (Golbeck et al., 2018). The Golbeck et al. (2018) corpus includes both satirical and fake news stories. In an Excel file, it contains a numeric ID, a headline of the story, a link to the original story, a link to the rebuttal story, and a value as to whether it is fake news or a satirical story. The corpus also includes a collection of text files each populated by a full story. We randomly selected 15 from the fake news set of the corpus. The original ID from the corpus, the story headline, a summary of the story, and the rebuttal ‘truth’ are in the first four columns of Table A1. The summaries are our own, not taken directly from the corpus, which provides the headline and the full story.

Using keyword searches (see the far-right column of Table A1), we searched Facebook and Twitter for mention of these stories. In addition, we searched Reddit for the English stories and VKontakte (a Russian-based Facebook-like social media platform) for the Russian stories. We also started searching blogs using BlogTracker (<http://blogtrackers.host.ualr.edu/Blogtrackers/index.jsp>), but after independently having no success in using the tool to find specific narratives for at least one story, we focused on Google and within-platform searches of Reddit, Facebook, and Twitter. While reading the news stories as they were portrayed and shared on social media, we each asked ourselves, “What do you think made this user share this story?” We considered:

- Features of the story itself
- Features of the sharer
- Features of the original source
- Features of the audience for the sharer
- Features of the greater context
- Things the user says as to why he/she was sharing the story

For all of these features, we documented our observations, links, and quotations. If we could not find much mention, we also asked ourselves, “Why would this story not be shared much?” and similarly went through the different features noted previously. We went through different stories independently. After we finished going through the stories independently, we met together with the third author, who had conducted a slightly different process in finding and examining the Russian fake news stories (see below). We pooled the features we identified and discussed how they would change our model, and we have included them as illustrative examples in our paper. Changes to the model included the importance of non-genuine actors and identifying sharing where belief was unnecessary.

Table A1. English fake news stories from Golbeck et al. (2018)

ID	Story headline	Story summary	Truth	Keywords (in different combinations)
150	BREAKING: Michelle Obama is Pregnant – and Here’s the Father	Claims that Michelle Obama is pregnant with another child and the father is “former White House Social Secretary” James MacTaggart. The story also claims Michelle is moving back to Chicago.	According to Snopes.com, the claims that Michelle Obama is pregnant are false.	Michelle Obama, pregnant, MacTaggart
433	Australia becomes most microchipped nation	Claims that people in Australia are paying \$150 to get RFID microchips permanently embedded under their skin. The chips the article claims, can be used as loyalty cards in stores and allow people to receive discounts.	According to Snopes.com, this story is false and misleading. However, it may have stemmed from a piece about an entrepreneur in Sydney, Australia, who started a business that arranges for people to get microchip	Australia, microchip, microchipping

ID	Story headline	Story summary	Truth	Keywords (in different combinations)
			implants completely voluntarily.	
52	BREAKING: Obama PERSONALLY Called Harvard And Ordered Them To Reverse Malia's Suspension	Claims that Malia Obama was arrested in Chicago for purchasing six pounds of marijuana in 2015 and was suspended from Harvard. The story claims that Barack Obama called the president of Harvard to demand her suspension be overturned.	Snopes.com states that this report is completely false. Malia Obama was not arrested in Chicago and was not suspended from Harvard.	Malia Obama suspended, Malia Obama Harvard suspension
374	CHILD SUPPORT SAID TO END BY BEGINNING OF 2018	Claims that President Donald Trump and Congress voted to end child support.	This report is false; Snopes.com has found no reports of the President or Congress intending to end this program. Snopes claims this information was generated by a prank website.	Child support, Trump
212	Trump Wins Dangerous "Pakistan Gambit" That Spells "Total Doom" For U.S. Democratic Party	Claims that President Donald Trump removed a \$225 million military aid package to Pakistan to pressure them into surrendering a Pakistani woman to U.S. authorities. The testimony by said woman could ruin the Democratic Party, claims the article.	At the time this report was produced, Trump did not withhold any aid funding from Pakistan. There was also no evidence that Trump pressured Pakistan to release a Pakistani woman to U.S. authorities.	Pakistan Gambit, Pakistan military aid, Trump Pakistan
154	Lady Gaga's Twitter Attack On Melania Trump Lands Her In Handcuffs When The Two Meet Face To Face	Claims that Lady Gaga criticized and insulted Melania Trump on Twitter and was then arrested.	Politifact found that Lady Gaga was never arrested. The photo that ran in the article (supposedly showing Gaga being arrested) was actually a photo of another star being escorted into a courthouse in 2013.	Lady Gaga and Melania Trump, Lady Gaga arrested
193	Trump Was Right: CIA Director Clapper Just Leaked Something HUGE About Government Spying	Claims that retired CIA director James Clapper admitted to unmasking – though did not elaborate on the process -- President Trump.	In a full transcript of the hearing with former Acting Attorney General Sally Yates and former Director of National Intelligence, James R. Clapper Jr., posted on the <i>Washington Post</i> website, there is no evidence to support this claim.	CIA Clapper Government Spying, CIA Director admits government spying
560	Trump consoles Jehovah's Witnesses on Russia ban as he worships with them	Claims that, after Russia's Supreme Court banned Jehovah's Witnesses, President Donald Trump and First Lady Melania Trump (along with Vice President Pence and his wife) attended an evening meeting of the Jehovah's Witnesses in Washington, D.C.	Although Russia's Supreme Court did uphold the decision to label Jehovah's Witnesses an "extremist" group, Trump made no comment about the ruling and did not attend a Jehovah's Witness meeting.	Trump, Jehovah's Witnesses, Russia
156	Van Full Of Illegals Shows Up To Vote	Claims Fox10 in Phoenix reported that 9 Hispanic illegal immigrants in	Snopes.com reports that there is no truth to any element of	van illegals Clinton fraud

ID	Story headline	Story summary	Truth	Keywords (in different combinations)
	Clinton At SIX Polling Places, Still Think Voter Fraud Is A Myth?	a white van were going from polling stop to polling stop in AZ illegally voting multiple times for Hillary Clinton before being caught. (This story was recycled for the Alabama 2017 special election for senator, simply moved to AL.)	this story. It also makes no sense, as poll workers would have immediately called authorities. Attached photograph is from a prior hoax story. The original story was posted on a satirical / fake news site.	
536	DEMOCRAT GOVERNOR & CLINTON INSIDER BUSTED Trying To COVER UP MASSIVE VOTER FRAUD... TRUMP WAS RIGHT	Cites the Public Interest Legal foundation (PILF) claiming that more than 5,000 noncitizens were registered to vote and were bumped from the voter rolls, and that they were only pulled because they self-reported they shouldn't be voting. Claims a cover-up by local election officials in Virginia instructed by the Democratic VA governor's political appointees, and ties this to Trump's claims of massive voter fraud.	Snopes counts as false the related claims by the <i>Washington Times</i> regarding messy voter rolls; the spin and conclusions were rejected by an Old Dominion professor, the original author of a study of people incorrectly being on rolls, and argued against by other researchers using different methodologies who came to different conclusions entirely. A Quora contributor pointed out that the original PILF report does not distinguish whether they were noncitizens of the U.S. or of Virginia (i.e., citizens who moved), and does not distinguish whether the people on the rolls voted when they lived legally in the state or not.	voter fraud democrat McAuliffe
332	Hillary Clinton: Women Only Voted For Trump Because Their Husbands Told Them To	Claims Hillary Clinton said in an interview with <i>NPR</i> that "Women will have no empathy for you because they will be under tremendous pressure — and I'm talking principally about white women — they will be under tremendous pressure from fathers, and husbands, and boyfriends and male employers, not to vote for 'the girl,' " She supposedly also said she took responsibility for the loss, that women liked and respected her but were afraid to stand up to the "oppressive Patriarchal hand" the often "forces" them to hide their allegiance to womankind. Claims Clinton blamed "Bernie Bros" for bullying Democratic women into avoiding her in favor of Bernie Sanders.	Snopes notes that this is an oversimplified version of an <i>NPR</i> interview. Clinton discussed a conversation with Sheryl Sandberg, who Clinton says did say some of the content attributed in the false story to Clinton herself. It was raised in the context of sexist, vile attacks online from [seemingly] Sanders supporters that made Pantsuit Nation have to become a private site because of the attacks. Earlier in the interview, Clinton did say that she didn't win the vote of white women.	women only voted for Trump because husbands (Twitter) women voted Trump husbands told them Clinton (Reddit)
59	IRS GIVES AFTER-SCHOOL 'SATAN CLUB' TAX-EXEMPT STATUS IN 10 DAYS, CHRISTIANS WAIT YEARS	Claims that reports ("piles of government records") by Judicial Watch show that a Satanic cult running an "After School Satan Club" applied for tax-exempt status Oct. 21, 2014 and received it Oct.	Snopes notes that Judicial Watch has filings in 2014 for Reason Alliance, a nonprofit that sponsors the After School Satan clubs (which actually do reasoning and social skills activities to counter evangelist after-school Christian clubs),	Satan club tax-exempt

ID	Story headline	Story summary	Truth	Keywords (in different combinations)
		31, 2014, while the IRS makes conservative groups wait years.	but the clubs were not created until 2016. ASS clubs do not have tax-exempt status. There is no evidence or language re: "fast tracking" in the application or response from 2014.	
106	NPR: 25 Million Votes For Clinton 'Completely Fake' – She Lost Popular Vote	Claims that <i>NPR</i> published a study by the Pew Center revealing that over 25 million Hillary Clinton votes were completely fraudulent based on being dead or multi-state voters. Cites a Pew study saying that more than 1.8 million dead people are registered to vote and 24 million registrations are either invalid or inaccurate (<i>NPR</i> , 2012). Links all of these 24 million cases to voting for Clinton.	Snopes notes that <i>NPR</i> published an article in 2012 about a 2012 Pew Research Center report noting that 24 million voter registrations are no longer valid or are significantly inaccurate (e.g., people moving states or dying); but <i>NPR</i> noted there was little evidence that this situation led to widespread or any voter fraud.	25 million votes Clinton lost popular NPR
70	A Russian Writer Claiming To Be Putin's Lover Found Dead In His Swiss Apartment	Claims writer Louri Michaelievitch, a former personal assistant of the Russian president, was found dead in his Swiss apartment due to a radioactive agent, a rare Russian product named TCDD Dioxin. Says in 2011 he wrote a book titled "I was Putin's lover" which resulted in him having an arrest warrant and seeking asylum in Switzerland.	According to Snopes, this is an old story that appears every now and then since 2014 on fake news sites. Snopes has no other details but that the photograph is of a Russian-American figure skater who is not Louri Michaelievitch.	Putin lover dead apartment Louri Michaelievitch writer Russian Swiss murder(ed) gay (e.g., "Putin lover murder", "Putin lover dead Louri writer", "Louri Michaelievitch", "Russian writer Putin lover dead", "Putin gay lover dead", "Putin lover murdered")
107	CONFIRMED: Mueller Team Can Be Disbarred For Clinton Conflicts In Trump Case	Claims that Hillary Clinton colluded with the Russians in selling uranium, and that Mueller was handpicked to give a sample to the Russians and flew to Moscow, according to publicly available documents. This particular story has several other narratives in it about Clinton, specific members of the Mueller investigative team, claims that Mueller oversaw a secret surveillance program that spied on Trump's phone calls for years, claims that Preet Bharara is on Mueller's team, etc., but we [the researchers] focused on the narrative that Mueller gave uranium to the Russians.	Snopes calls this story a mix of truth and lies. Specifically, Mueller did deliver a 10-gram sample of highly enriched uranium confiscated in Georgia to Russian authorities in 2009 for forensic examination as part of international law enforcement efforts. Snopes does not address the other issues, but Preet Bharara does not seem to be on the team at all.	Mueller disbarred Clinton conflicts

The Golbeck et al. (2018) corpus only included English-language fake news. In order to broaden the cultural and linguistic coverage of this small study, the third author independently assessed five Russian stories. For the five Russian stories, three were selected from the Snopes website (snopes.com) by entering the keyword ‘Russia’ and choosing articles that were rated as “fake” in the website’s Fact Check section. Then, we used relevant Russian keywords (see Table A2) to find original stories in Russian on a given topic (these were stories #3, #4, #5 from Table A2). An additional story from the Snopes website chosen independently without conferring with the first and second author about Putin’s lover (see #70 story in English) did not yield any results in social media in Russian and thus was not included in the analysis. The remaining two selected stories (#1 and #5) were current stories reported on Russian TV. These two stories were specifically selected because after first watching them on Russian TV (Channel 1), the Russian-speaking third author later came across contradictory information that either discredited the original story or added explanations that significantly changed the original message.

After identifying the five stories in Russian, the researcher searched BlogTracker using the Russian keywords from Table A2. Because, as in the case of the searches in English, the Russian searches in BlogTracker did not return any results related to the five stories, the researcher opted for searching directly in Facebook, VKontakte, and Twitter, using the Russian keywords from Table A2. English translations for the ease of the reader are provided in parentheses (Table A2, last column). As with the English stories, the Russian-speaking author went through the series of questions noted previously. She documented her observations and quotations and met with the other two authors to discuss the ways the identified features would contribute to the model.

Table A2. Russian fake news stories

ID	Story headline (Russian and translated in English)	Story summary	Truth*	Keywords**
1	ДНК как сырье для «генетической бомбы»: зачем американцам биоматериал россиян DNA as a material for a "genetic bomb": why do Americans need the biomaterial of Russians?	At the Council for Civil Society and Human Rights meeting, which was transmitted on national TV, President Putin announced that some foreign forces are collecting biological material from Russian nationals and are doing it purposefully and professionally. He ended with a question of who and why might want to collect biomaterial of Russian nationals. His comments immediately triggered a huge wave of responses in social media including anti-American and anti-Putin sentiments and speculations about a possible biological attack.	The Pentagon issued an explanation that the U.S. Air Education and Training Command collects biological material to conduct musculoskeletal research aimed at identifying the different biomarkers associated with injury. The research lab did not specifically target Russians, but because the set of samples for the treatment group was procured from a U.S.-based company that provided samples from a specific population (Russians), the samples for the control group needed to be collected from a similar population, in order to continue the research.	биоматериал, биологический материал, биоматериал Россиян, собирать биоматериал, собирает биоматериал (biomaterial, biological material, biomaterial of Russians, collect biomaterial)
2	Серия похищений в Подмосковье: исчезают инвалиды Series of abductions in the Moscow region: people with disabilities are disappearing	In September 2017, the Russian media reported on a number of missing Russian citizens, usually elderly or people with disabilities, in the Moscow region. According to relatives, the missing people were supposedly kept in slavery and forced to beg in the streets of Moscow.	According to the Investigative Committee of the Russian Federation, the results of the investigation did not confirm the news about mass abductions in the Moscow region. A criminal investigation was brought up in a few specific cases and revealed that the missing people were found and were not kept in slavery or forced to beg (e.g., a	похищение, похищения, Подмосковье (abduction, abductions, Moscow region)

			teenager ran away from home after a dispute with his parents). However, at least one criminal case is still being held investigating a disappearance of a disabled man in the Moscow region.	
3	Хамелеоны войны: Военные ВВС США перекрасили свои самолеты - их теперь не отличить от российских Су-34 Chameleons of War: U.S. Air Force repainted its aircrafts - they are now undistinguishable from the Russian Su-34	In October 2016, images of Americans repainting U.S. fighter jets in Russian colors were circulated online with claims that the jets were repainted to be used for a "false flag" attack on Syria or another country.	According to Snopes, for training purposes, fighter jets are commonly painted to resemble aircrafts of potential adversaries. The site provides a video and an article on the topic, showing Marine Corps publicizing the practice.	самолет, истребитель, перекрасить, перекрасили, Американцы (airplane, fighter jet, repaint, repainted, Americans)
4	Легендарный полет Валентина Привалова Valentin Privalov's legendary flight	A photograph of a Soviet MIG 17 aircraft flying under a bridge in the city of Novosibirsk in 1965 is occasionally circulated in social media. One version in LiveJournal claims that the Soviet military pilot Valentin Privalov flew the plane in front of a crowd of spectators, entering the small space under the bridge at a speed of 700 kilometers per hour "like a silver arrow."	According to Snopes, the photograph is a photo collage and was created by the Museum of Novosibirsk to illustrate what such a flight might have looked like.	Привалов, Новосибирск, мост, полет (Privalov, Novosibirsk, bridge, flight)
5	Почему «русский эксперимент со сном» всё еще наводит ужас Why is the "Russian sleep experiment" still horrifying us	The story describes a horrific experiment conducted in the Soviet Union in 1940s, in which Soviet researchers kept five people awake for 15 days by using a gas stimulant.	According to Snopes, this is a fictional story that was originated on Creepypasta in 2010.	эксперимент, сон, спать, эксперимент со сном (experiment, sleep, to sleep, sleep experiment)

Notes: *In the case of two Russian stories (#1 and #2), the 'truth' represents officially issued statements from the Pentagon and the Investigative Committee of the Russian Federation, respectively. We accepted them as known facts and did not further investigate their truthfulness.

**Keywords were used independently and in different combinations in Russian; translation is provided in parentheses.

APPENDIX B: ROGER MCNAMEE QUOTATION

Roger McNamee, an early investor in Facebook, wrote an opinion piece for *Washington Monthly* magazine. The following lengthy quotation is relevant to this paper:

“We theorized that the Russians had identified a set of users susceptible to its message, used Facebook’s advertising tools to identify users with similar profiles, and used ads to persuade those people to join groups dedicated to controversial issues. Facebook’s algorithms would have favored Trump’s crude message and the anti-Clinton conspiracy theories that thrilled his supporters, with the likely consequence that Trump and his backers paid less than Clinton for Facebook advertising per person reached. The ads were less important, though, than what came next: once users were in groups, the Russians could have used fake American troll accounts and computerized “bots” to share incendiary messages and organize events. Trolls and bots impersonating Americans would have created the illusion of greater support for radical ideas than actually existed. Real users “like” posts shared by trolls and bots and share them on their own news feeds, so that small investments in advertising and memes posted to Facebook groups would reach tens of millions of people. A similar strategy prevailed on other platforms, including Twitter. Both techniques, bots and trolls, take time and money to develop—but the payoff would have been huge.” (McNamee, 2018)

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