



Credibility and trust of information in online environments: The use of cognitive heuristics

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Abstract

Networked digital media present new challenges for people to locate information that they can trust. At the same time, societal reliance on information that is available solely or primarily via the Internet is increasing. This article discusses how and why digitally networked communication environments alter traditional notions of trust, and presents research that examines how information consumers make judgments about the credibility and accuracy of information they encounter online. Based on this research, the article focuses on the use of cognitive heuristics in credibility evaluation. Findings from recent studies are used to illustrate the types of cognitive heuristics that information consumers employ when determining what sources and information to trust online. The article concludes with an agenda for future research that is needed to better understand the role and influence of cognitive heuristics in credibility evaluation in computer-mediated communication contexts.

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The view across the contemporary media landscape looks quite different today than it did even just a short time ago. Most striking is the explosion of information that is available via networked digital media technologies. An important consequence of this revolution in information sharing is the incredible opportunities for learning, social connection, entertainment, and personal enhancement it affords. At the same time, however, the vast quantity of and accessibility to information online has prompted concerns about credibility because the origin of information, its quality, and its veracity are less clear than ever before. This has resulted in an unparalleled burden on individuals to locate information that they can trust. Yet this is not an easy task, given that digital media complicate many of the means by which people traditionally go about evaluating information.

Of course, the problem of establishing credibility is not unique to digital media, as trusting information obtained via any medium has always presented problems for information seekers. And, as we have argued elsewhere (Flanagin and Metzger, 2008), digital media do not so much change the cognitive skills and abilities people need to evaluate credibility, as the proliferation of so much information online changes how frequently people are called upon to exercise those skills and abilities.

Common means by which people have traditionally reduced uncertainty about credibility include judgments based on personal knowledge or on vicarious information (e.g., reputation) concerning the trustworthiness of a source or piece of information, and by relying on traditional information intermediaries such as experts, opinion leaders, and information arbiters to help guide their credibility decisions. However, as more information has been migrated online, several of these traditional intermediaries have been removed through a process of “disintermediation,” which forces individuals to

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evaluate vast amounts of online information on their own (Eysenbach, 2008). Examples of disintermediation abound online, for example: customers buy products from online businesses without the help of sales clerks or travel agents, and patients are often expected to research and choose between different treatment options using information they cull from the web. Moreover, disintermediation is taking place in a context where people are forced to rely heavily on information that is increasingly provided solely or primarily online. Indeed, nearly half of users in the U.S. said that information gleaned from the Internet played a crucial or important role in at least one major decision in their lives (Horrigan and Rainie, 2006).

Set against this backdrop, this article discusses the ways in which digital networked media environments may alter traditional notions of trust, and explores research findings that examine how information consumers make judgments about the credibility and accuracy of information they encounter online. Based on this research, we discuss the use of cognitive heuristics in credibility evaluation, focusing specifically on how they are employed to assess the credibility of online information. Findings from recent studies are used to illustrate the types of cognitive heuristics that information consumers use when determining what sources and information to believe online. We end with an agenda for future research that is needed to better understand the role and influence of cognitive heuristics in credibility evaluation in the digital media environment.

1. Defining credibility

Scholarly interest in credibility dates back to Aristotle's writings on rhetoric and specifically on his notions of *ethos* (appeal based on the character of a speaker), *pathos* (appeal based on emotion), and *logos* (appeal based on logic or reason). More modern accounts of credibility define it as the *believability* of a source, and it rests largely on perceptions of the trustworthiness and expertise of the information source as interpreted by the information receiver (Hovland et al., 1953). This definition guided research on credibility in psychology and communication, which largely focuses on *source* credibility, typically conceptualized as the believability of a speaker and closely aligned with Aristotle's notion of *ethos*. Research in the field of information science has focused instead on the credibility of information, where the emphasis has been on believability of messages rather than speakers, which is somewhat akin to Aristotle's notion of *logos*. Attention to these varying conceptualizations of credibility is necessary in the digital realm, as determinations of credibility online may rest on evaluations of the source of some information, the message alone (as when source information is obscured), or on a combination of the source and the message.

2. Credibility in the current media environment

To appreciate the ways in which networked communication technologies have increased the complexity of determining credible sources and information accurately, it is useful to reflect upon the past. In the traditional media environment there were typically a limited number of sources and high barriers for access to the public dissemination of information. In this environment of information scarcity, credible sources were often characterized by such features as formal positions indicating particular training and education or by jobs requiring specific, relevant experience. Thus, credible sources of information were often easily recognized by virtue of their observable and verifiable credentials, which were rooted in specific qualifications or training. Although this system of bestowing credibility endures today in a number of domains, the evolution of networked information-sharing tools has significantly altered it in many cases.

Accordingly, several scholars have addressed the question of what is new about digital media that makes the need for effective critical evaluation more pressing today (Metzger et al., 2003; Rieh and Danielson, 2007). This discussion focuses on why digital media present new challenges with regard to credibility and its assessment, which is examined in the next section.

3. Specific challenges for credibility evaluation in an age of networked technologies

Today, few question that digital networked media have profoundly changed the information landscape. As mentioned earlier, perhaps the greatest change is that digital media have provided access to an unprecedented amount of information available for public consumption. Until recently, the enormous cost and complexity involved in producing and disseminating information limited the number of information providers, who generally had substantial financial investment in the media apparatus. As networked communication technologies lowered the cost of information production and dissemination, the amount of easily-accessible information increased tremendously. One consequence of the increased information abundance is the accompanying issue of finding the best information to meet one's needs from among the

enhanced number of possible information providers. In many cases this involves locating the most *credible* information, which is the focus of this article.¹

Another consequence of the proliferation of information is that online information may not be subject to the same degree of filtering through professional gatekeepers and, as a result, digital information may be more prone to being out of date, incomplete, or inaccurate (Metzger et al., 2003; Rieh and Danielson, 2007). Callister (2000), for instance, argues that traditional solutions to credibility such as granting credibility to some representative believed to provide reliable information (e.g., the government) or granting it by credential (e.g., expertise) only work when there is a limited number of sources and when there are high barriers for access to public dissemination of information, since these conditions create a meritocratic filtering process—only those with something of merit to say are published, put on the air, or allowed to teach/practice (2000:412). Moreover, in conditions of information scarcity, it is possible for professional gatekeepers to filter much of the information available, and these gatekeepers have incentives to uphold credibility standards. By contrast, information abundance online makes traditional models of gatekeeper oversight and quality control untenable due to the sheer volume of information that would need to be vetted.

Others have noted that online information sometimes lacks traditional authority indicators such as author identity or reputation (Fritch and Cromwell, 2002; Metzger, 2007). Yet, source information is crucial to credibility because it is the primary basis upon which credibility judgments rest (Sundar, 2008). In some cases, source information is unavailable, masked, or entirely missing from a web site, blog, wiki, and so on. In other cases, source information is provided, but difficult to interpret, such as when information is co-produced, re-purposed from one site or application to another, or when information aggregators display information from multiple sources in a centralized location that may itself be perceived as the source. In any case, these issues prompt concerns about the credibility of online information because they create uncertainty regarding who is responsible for information and, thus, whether it should be believed (Rieh and Danielson, 2007).

Fears about credibility within the digital media environment also stem from the fact that there are few standards for quality control and evaluation online. There are no universal standards for posting information on the Internet, and digital information may be easily altered, misrepresented, or created anonymously under false pretenses. The malleability of digital information exacerbates potential problems of information reliability, given that the alteration of digital information is difficult or impossible to detect. In addition, the global nature of the web makes it challenging to enact standards for quality control in the form of government regulation.

The credibility of digital information may also be suspect relative to information traveling via more traditional media due to channel convergence and conflation of content types afforded by digital technologies. Some have suggested that visual and other types of distinctions that were once clear between, for example, information and advertising content, are not so easily distinguished in the digital environment (Alexander and Tate, 1999). Examples include sponsored and unsponsored links on search engine result pages and ads embedded in web page content. Indeed, Burbules (1998) suggested that because information is presented in a similar format on web sites, a psychological “leveling effect” is created that puts all information on the same level of accessibility and, thus, all sources on the same level of credibility.

Moreover, technological features of the Internet and search engines also can create a kind of “context deficit” for digital information that exacerbates source confusion (Eysenbach, 2008). The hyperlinked structure of the web makes it psychologically challenging for users to follow and evaluate various sources as they move from site to site. For example, research has demonstrated that source and message information can become confused or disassociated in users’ minds almost immediately after performing searches for information online (Eysenbach and Kohler, 2002). As a result, commercial information is often blurred with information produced for other purposes in Internet users’ minds.

Finally, understanding credibility in the online environment is especially problematic since there are many potential “targets” of credibility evaluation that often are at work simultaneously. Taking the example of Wikipedia, credibility judgments can be made at the web site level (is Wikipedia a credible source of information?), at the content level (is a specific entry within Wikipedia credible?), or regarding specific information author(s) (are specific contributors to Wikipedia credible?). Of course, these various targets can work in concert or at odds with one another, such that in combination the complexity of their credibility judgment is even more pronounced. Research has confirmed this complexity, as studies have shown that the source and content of information interact in intricate ways to affect users’ credibility judgments (e.g., Flanagin and Metzger, 2011).

¹ Of course there are many other information seeking goals that people may have when they search for information online. For example, besides seeking the most credible information possible, people may want the most succinct or the most entertaining information and would adjust their cognitive behavior accordingly. Although beyond the scope of this article, an examination of information seekers’ goals that are related to credibility would help to better understand the phenomenon as a whole, as well as the generalizability of findings from studies of the cognitive mechanisms behind online credibility evaluation processes.

4. Credibility evaluation online

A common assumption about how people evaluate online information is that people are *motivated* to evaluate the information they receive to determine its trustworthiness.² A corollary of this assumption is that people engage in effortful evaluative processes in order to be certain of information or source credibility. Although many types of information exist online (e.g., text, video, audio, etc.), the credibility literature has focused primarily on textual information presented on web sites. For example, researchers have examined the credibility of ecommerce, political, news, and health web sites, as well as wikis, blogs, microblogs, and other types of text-based web content. With that in mind, recommended approaches to online information evaluation typically include five criteria that users should employ, including checking the accuracy, authority, objectivity, currency, and coverage or scope of the information and/or its source (Metzger, 2007).

Accuracy refers to the degree to which a web site or other source is error free and whether the information can be verified offline. The *authority* of a web site may be gauged by noting who authored the information, what the author's credentials and qualifications are, and whether the site is recommended by a trusted other. *Objectivity* involves identifying the author's purpose for providing the information and whether the information provided is fact or opinion, which also includes understanding whether there might be commercial intent or a conflict of interest, as well as the nature of relationships between linked information sources (e.g., the meaning of "sponsored links" on a Google search output page). *Currency* refers to how up-to-date the information is, and *coverage* refers to the comprehensiveness or depth of the information provided. These recommendations require a range of activities on the part of users, from simple visual inspection of a web site to more laborious information verification and triangulation efforts.

Yet, research shows that people rarely engage in effortful information evaluation tasks, opting instead to base decisions on factors like web site design and navigability. Fogg et al. (2003), for example, found that online information consumers' main consideration in credibility assessment was the visual design elements of web sites, rather than any content or source information. They argue that because web users do not often spend a long time at any given site, they likely develop quick strategies for assessing credibility. They say, "one could argue that people typically process web information in superficial ways, that using peripheral cues is the rule of web use, not the exception" (2003:15). Moreover, people report verifying the information they find online for its credibility only "rarely" to "occasionally," and tend to use verification strategies that require the least effort to perform (Metzger, 2007).

These findings are consistent with some recent credibility studies (Hilligoss and Rieh, 2008) and with theories from information processing and cognitive science (Sundar, 2008; Taraborelli, 2008). The Limited Capacity Model of message processing (Lang, 2000), for example, finds that because people have limited cognitive capacity, they rarely process all aspects of messages they receive, and instead select only some salient features to encode, store, and retrieve. Similarly, Fogg's (2003) Prominence-Interpretation Theory of web credibility suggests that not all elements of a web site can be noticed or selected by users, and so not all elements will enter into their credibility evaluations. These perspectives share the notion that people do not always invest their full mental capacities in information evaluation tasks.

Indeed, cognitive scientists have long understood that people have constraints on their ability to process information. The idea of *bounded rationality* (Simon, 1955) stipulates that people are not always able to act perfectly rationally due to limitations imposed by the human mind (e.g., non-infinite computational resources) and by external conditions (e.g., non-infinite time). Bounded rationality is based on the principle of least effort and takes into account the fact that decision makers "must arrive at their inferences using realistic amounts of time, information, and computational resources" (Gigerenzer and Todd, 1999:24). As such, individuals' behavior is *adaptive* in that people seek to find an optimal balance between cognitive effort and desired outcomes. One form of bounded rationality is *satisficing*, which is when people do not use all of their cognitive resources to obtain optimal outcomes, but instead use just enough to provide a sufficiently optimal outcome for the context.

These ideas have been applied in information foraging theory, which says that whenever feasible, humans will choose behaviors that "optimize the utility of information gained as a function of interaction cost" (Pirolli, 2005:351). Although the web has reduced some costs of information search by increasing information accessibility, there are still significant costs of interacting within online environments in terms of time, given the vast amount of available information. Satisficing may thus be a common strategy used by Internet information seekers (Pirolli, 2005).

² This idea parallels Sperber's concept of "epistemic vigilance" in interpersonal interaction (e.g., Sperber et al., 2010). Epistemic vigilance refers to a suite of mechanisms that help individuals detect whether information they receive from others is true. It is thought to be evolutionarily based because, while communication brings essential benefits, it carries risks for the recipient of the communication of being intentionally or accidentally misinformed because there is no sure way to determine whether to trust communicated information that can eliminate any and all misinformation. "Given that the stakes are so high," they write, "it is plausible that there has been ongoing selective pressure in favour of any available cost-effective means to least approximate such sorting" (2010:369).

Together, these theories of information processing suggest that Internet information consumers likely cope with the perceived costs of information search and overload by using strategies that *minimize* their cognitive effort and time, through the use of *cognitive heuristics*. Cognitive heuristics constitute information processing strategies that ignore information to make decisions more quickly and with less effort than more complex methods, and thus they reduce cognitive load during information processing. According to Gigerenzer and Todd (1999:14), heuristics “employ a minimum of time, knowledge, and computation to make adaptive choices.” While in some views heuristics are thought to lead to biased or faulty information processing (Tversky and Kahneman, 1974), research shows heuristics can serve an important function in helping people cope effectively with the vast quantities of information they encounter every day, and very often lead to accurate decisions (Gigerenzer and Todd, 1999).

Sundar (2008) was perhaps the first to propose that credibility evaluations online are guided by heuristic processes. He argues that cues in web-based content and in the structural features of the technology itself likely trigger heuristics that aid credibility evaluation. He calls for research to investigate heuristic processes of credibility evaluation, and he proposes the MAIN model to guide examinations of the credibility heuristics that stem from four technological features or “affordances” inherent to the Internet, including *modality* (e.g., whether information is presented as text, audio, or video), *agency* (e.g., users’ perceived source of the information), *interactivity* (e.g., whether one can serve as both source and receiver of information), and *navigability* (e.g., ease of locating relevant information). The MAIN model suggests several heuristics tied to each affordance that likely play a role in people’s credibility determinations. Taking up Sundar’s call, researchers have begun to seek empirical evidence of heuristics used in credibility evaluations (e.g., Hilligoss and Rieh, 2008; Metzger et al., 2010; Sundar et al., 2009).

5. Heuristics used in credibility evaluation

A recent study that focused specifically on the use of cognitive heuristics in credibility judgments found ample evidence of their presence during a variety of online information evaluation tasks (Metzger et al., 2010). 109 participants who took part in one of 11 focus groups conducted across geographically diverse areas of the U.S. confirmed that, in information rich environments, they often do not have the cognitive capacity or time to evaluate information systematically, and instead invoke a diversity of heuristics to evaluate credibility, loosely titled *reputation*, *endorsement*, *consistency*, *self-confirmation*, *expectancy violation*, and *persuasive intent*.³ As Gigerenzer and Todd (1999) explain, however, it is difficult to sort heuristics into mutually exclusive categories because many decision-making situations elicit multiple heuristics, heuristics can be combined and recombined, and they can be nested. This was evident in the credibility heuristics that emerged from the Metzger et al. study, which are described next.

5.1. The reputation heuristic

The reputation, or name recognition, of an online web site or source serves as a heuristic credibility cue allowing information seekers to avoid more effortful processing of online sources and information. The reputation heuristic is likely psychologically rooted in more basic heuristic principles of favoring recognized alternatives over less familiar ones. Gigerenzer and Todd (1999) show people attribute greater value to recognized alternatives compared to unrecognized alternatives, which they call the “recognition heuristic.” Familiarity with a source, if even in name only, likely also plays a role here, and research on persuasion shows that familiar sources are often judged to be more credible than unfamiliar sources, independent of message characteristics such as argument quality (O’Keefe, 1990).

The reputation heuristic may also be a subset of the “authority” heuristic in credibility assessment, which finds that “a major criterion for assigning credibility to a web site is whether the source is an official authority or not” (Sundar, 2008:84). Further evidence for this type of heuristic comes from Hilligoss and Rieh’s (2008) study, which found that the degree to which a source was considered a primary or official source served as a heuristic means of judging credibility, and from Koh and Sundar (2010) who experimentally manipulated web site authority and found significantly higher trust ratings for sites considered more authoritative.

This research suggests that when choosing between sources, people are likely to believe a source whose name they recognize as more credible compared to an unfamiliar source, even with little inspection of the actual content of the site or source credentials. Indeed, several instances of participants relying on the reputation heuristic were mentioned by

³ Each focus group consisted of 7–12 participants who responded to a common set of questions about their Internet use and online information evaluation strategies developed by the researchers. Demographic information collected from participants revealed a fairly diverse sample based on age, gender, race, education, income, and Internet experience. Focus groups were conducted by trained members of professional research firms in Alabama, Arizona, California, Florida, Maryland, Massachusetts, Minnesota, Ohio, Texas, and Washington. Complete details of the methodology used in this study are described in Metzger et al. (2010).

participants in the study of credibility heuristics by Metzger et al. (2010), across many different types of online information seeking topics and situations. The reputation heuristic is thus related to the *ad verecundiam* fallacy from argumentation theory, which involves inappropriately appealing to authority, for example on a topic outside an expert's field or when there is no expert consensus. It takes advantage of a human tendency to believe that prestigious people cannot be wrong. The reputation heuristic may also be underpinned by some of the same principles at play in the endorsement and consistency heuristics that are discussed next because reputation is built on consistent social endorsement.

5.2. The endorsement heuristic

The *endorsement* heuristic suggests that people are inclined to believe information and sources if others do so also, without much scrutiny of the site content or source. People tend to automatically trust sites and sources that are either recommended by *known* others, or that come from *unknown* persons in the form of aggregated testimonials, reviews, or ratings (Metzger et al., 2010). Trust derived from known others may be underpinned by another form of heuristic reasoning known as the "liking/agreement heuristic" (Chaiken, 1987). The liking/agreement heuristic argues that people often agree with those they like, and has been documented extensively in studies of social cognition and persuasion. Trust derived from aggregated information from unknown others likely stems from the *ad populum* fallacy and what Sundar (2008) calls the "bandwagon heuristic" whereby people assume that if many others think something is correct, then it must be correct—and thus credible.

Sundar demonstrated that the bandwagon heuristic does influence credibility evaluations. Using an ecommerce site, the researchers manipulated web site content cues, such as star ratings and sales rank, to affect bandwagon perceptions (e.g., how likely others were to buy a product). Higher bandwagon perceptions resulted in significantly higher ratings of product credibility and purchase intent (Sundar et al., 2009).

Social endorsement is a powerful heuristic: People sometimes place more emphasis on this heuristic than their own first-hand information or feelings about information they encounter online. Metzger et al. (2010) found that a large quantity of endorsements from others regarding an unfamiliar online source or web site can overcome people's initial skepticism about that source or web site.

5.3. The consistency heuristic

Another common strategy for judging credibility is validating information by checking to see if information across different sources is consistent (Metzger et al., 2010). Although checking more than one source of information requires more effort than the other heuristic strategies, it is still a relatively fast and frugal means of arriving at a credibility judgment relative to the more laborious methods of researching a source's credentials or last information update, considering potential bias, etc. Also, the validation process is often rather superficial: evidence shows that people typically look at very few sites to decide whether some information is consistent (Metzger et al., 2010).

The consistency heuristic for credibility evaluation may be a variant of the endorsement and reputation heuristics, inasmuch as it operates under the principle that people tend to believe things if others believe them, or Chaiken's (1987) idea of the "consensus heuristic," where people assume consensus implies correctness. Indeed, the consensus and consistency heuristics are close relatives, except that whereas consensus implies that a lot of people agree on something, consistency merely requires agreement with one other independent person or source.

5.4. The self-confirmation heuristic

There is a tendency for people to view information as credible if it confirms their preexisting beliefs and not credible if it counters their existing beliefs, regardless of how well-argued, duly researched, appropriately sourced, and so on, it is (Metzger et al., 2010). This illustrates a type of *self-confirmation bias* that affects credibility judgments. Confirmation and belief biases are observed widely in the psychology literature. The confirmation bias is a tendency to notice and place greater weight on information that supports one's beliefs, while overlooking or undervaluing information that refutes those beliefs (Klayman and Ha, 1987). The belief bias is the propensity to endorse a conclusion when it is consistent with what one believes to be true, even if the conclusion is not based on sound logic (Evans et al., 1983).

With regard to processing online information, several studies show that Internet users tend to select content that is consistent with their attitudes and opinions, and that people tend to evaluate attitudinally-consistent information more favorably than inconsistent information (e.g., Fischer et al., 2005). Moreover, biases toward attitudinally-consistent information appear to be accentuated when gathering information online, where lack of time and motivation often restrict users' ability to evaluate all of the information retrieved in a typical search (Fischer et al., 2005). In line with this work, there is evidence that people tend to avoid information that is contrary to their existing beliefs, and otherwise employ selective

filters to assist them in determining the credibility of information they find online—for example, by stopping searches when people find information that confirms their belief (Metzger et al., 2010).

The self-confirming heuristic likely stems from the *false consensus effect*: Research in cognitive psychology finds that people tend not only to believe that their own opinions are right but that they are also widely shared by others (Ross et al., 1977). Such cognitive biases serve as ego defense mechanisms, resulting in a tendency for people to evaluate ambiguous information in a way that is beneficial to their own needs or interests.

5.5. *The expectancy violation heuristic*

People often employ an expectancy-violation heuristic when evaluating the credibility of information online, whereby if a web site fails to meet their expectations in some way, they will immediately judge it as *not* credible. The research by Metzger et al. (2010) shows that some forms of expectancy violations occur when web sites ask for more information than necessary or provide more information than is requested by users, or when web sites present users with something they did not ask for or that is unexpected. Most prevalent, however, are expectancy violations stemming from the presence of typos or grammatical errors, and also poor site design, visual appearance, or navigation, all of which result in strong negative credibility evaluations. Bad spelling, grammar, layout, and overall design are also likely to decrease evaluations of credibility. Germane to all of these is whether a web site meets the test of professionalism; Internet users frequently note that professional-looking content and smooth site navigation positively impact their credibility evaluations (Metzger et al., 2010).

Expectancy violations are known to cause arousal and distraction, which compel attention to the violation, causing people to appraise the violation and its meaning (Burgoon et al., 1995). Moreover, Fogg's (2003) Prominence-Interpretation Theory of credibility suggests that violations will be noticed and used to (negatively or positively) appraise credibility. As such, expectancy violations operate as heuristics in that they enable quick judgments of credibility without much consideration of message arguments, source qualifications, and other more effortful methods of information evaluation.

The expectancy-violation heuristic is likely underpinned in part by the “effort heuristic” (Kruger et al., 2004), which is the human tendency to value objects based on how much effort went into producing them. An alternative conceptualization of this is as an “effort equals quality fallacy” because greater effort does not necessarily or always result in greater quality (e.g., consider a student who exerts a lot of effort on an assignment but still receives a poor grade). Moreover, a type of psychological “halo effect,” which refers to the tendency to attribute favorable characteristics to attractive people or objects, may also be at play here. In this case, people expect credible sources to present information professionally as a reflection of their expertise and attention to detail (i.e., the amount of effort invested in producing the information). When web-based information conforms to those expectations, users tend to grant it credibility, or at least are willing to give it the benefit of the doubt. When a web site does not conform to appearance or functionality expectations, however, users often judge it harshly and are prone to dismiss it as non-credible.

5.6. *Persuasive intent heuristic*

The persuasive intent heuristic is the tendency to feel that information that may be biased is not credible. Commercial information is particularly susceptible to triggering this heuristic. Advertising, for example, is a very strong negative credibility cue, and especially when the advertising is unexpected (Fogg et al., 2003; Metzger et al., 2010). The presence of advertising cues people to think that they are being manipulated, which appears to elicit an immediate defense mechanism that leads people to mistrust information without further scrutiny. This is similar to research in social influence, which commonly finds that persuasion is resisted and/or reduced when targets are made aware of a source's persuasive intent, likely because people believe the source may be biased and thus not credible.

The persuasive intent heuristic seems to be affectively-based, arising from fears of unknown others' nefarious manipulation. Consequently, users try to detect ulterior motives that might underlie the information they find online. In many cases, people note that this is a primary cue that they use to determine credibility, often using it as a heuristic stopping rule for credibility judgments (Metzger et al., 2010).

In sum, the five heuristics discussed here have been shown to be compelling factors in people's credibility evaluation processes (Metzger et al., 2010). And, as noted earlier, several of the heuristics identified may derive from lower-order principles of reasoning and intuition. This list of heuristics, however, is by no means exhaustive.

Many other heuristics are likely invoked during online credibility evaluations of the types of web-based information discussed here, as well as other types of information that are accessible online (e.g., video). Indeed, Sundar's MAIN model (2008) suggests several other heuristics that may impact credibility judgments, for example, “coolness” or “novelty” heuristics that could produce quick favorable credibility impressions of new web sites or content, or the “prominence” heuristic that may lead to higher attributions of credibility to sources that appear higher in search engine

results pages prior to inspection of the source or its content. What this suggests is that more research is needed to understand how people invoke heuristics as they make judgments about credibility.

6. Future directions in online credibility and cognitive heuristics research

The consideration of cognitive heuristics in decision-making about credibility online raises a number of questions that serve to guide future research. For instance, the reputation, endorsement, and consistency heuristics are all premised on the notion that if a number of people use information, recommend it, and agree with it, then it is credible. Although this notion can work well for evaluating credibility, it is potentially problematic in its reliance on group opinion, which is subject to problems of crowd behavior, and may falsely equate credibility with popularity. Discounting information as not credible when it is unpopular, for example, may lead to myopic and inaccurate evaluations of credibility. On the other hand, accumulating evidence suggests that heuristics are not only more efficient information processing strategies, but can be *equally* effective as more cognitively demanding strategies in decision making (Gigerenzer and Todd, 1999). One corresponding avenue of research, therefore, should focus on the question of whether and under what circumstances the use of heuristics leads to good or bad credibility decisions, and whether some credibility heuristics (e.g., consistency or reputation) lead to better decision outcomes than others (e.g., self-confirmation).

Further research is also needed to understand how often heuristic versus more analytic strategies are used in credibility evaluations, and under what conditions users employ one strategy over the other. Existing research in this area finds that Internet users may exert more or less effort in determining the credibility of online information depending on the information-seeking context and the information seeker (Metzger, 2007; Taraborelli, 2008). The dual processing model of credibility evaluation, based on the Elaboration Likelihood Model (Petty and Cacioppo, 1986) and the Heuristic-Systematic Model (Chaiken, 1987) of information processing, theorizes that online information seekers will pay more attention to information quality cues and perform more rigorous evaluations under conditions of high motivation compared to when motivation is lower (Metzger, 2007).

These theories of information processing suggest that motivation is probably affected by the consequentiality of the information sought for the information seeker, with information of greater consequence (e.g., health or financial information sought to make a decision) often being scrutinized more systematically and information of lesser consequence (e.g., entertainment information during a casual search) subject to more heuristic processing. Yet it is unlikely to be so simple. High motivation to evaluate information may not preclude heuristic processing of that information, but rather may supplement it. Indeed, studies show that both processing modes may co-occur in the same context (e.g., Petty and Cacioppo, 1986).

In any case, understanding users' motivations to process information using more or less cognitive effort is an important first step toward understanding how often and when specific heuristics may be invoked during credibility evaluation. For example, Chaiken's Heuristic-Systematic Model (HSM) proposes three broad motives for information processing that may impact the use of heuristic and systematic strategies: accuracy, defense, and impression management. Applied to credibility evaluation, specific predictions might be that defense-motivated information seekers will be more likely to use the self-confirmation heuristic in credibility evaluation because of its propensity for ego-enhancement, whereas impression management-motivated users might more readily employ endorsement or bandwagon heuristics in their efforts to reduce any negative interpersonal consequences of making a credibility judgment that differs from their peers. By contrast, accuracy-motivated users might more frequently use the consistency heuristic to increase confidence that the information they obtain is not anomalous and is thus credible.

Similar to this notion, motivation may also to some extent be an intrinsic quality of individual information seekers. For example, people may vary in their cognitive styles, such as their need for cognition, decision making style, experiential versus rational information processing style (Epstein et al., 1996), or social trust; moreover, demographic variables and Internet experience or skill may impact the amount of effort people are willing to exert on credibility evaluation online as well. Sundar (2008) points out that the use of any heuristic is contingent on whether it is accessible in an information seeker's cognitive system, and so it is reasonable to expect that some of these factors may impact how accessible certain heuristics are in people's minds. For example, the social endorsement heuristic may be more accessible for Internet users who have greater experience with using social media, or users who engage in creating user-generated content more extensively, than users with less of these experiences because they may be more familiar or comfortable with using aggregated social information, and thus be more trusting of it. Similarly, older Internet users may have more cues regarding authority cognitively accessible based on their greater life experience, and thus adults might rely on the reputation heuristic when making credibility judgments more often than do children. Finally, the consistency heuristic may be more easily accessible for users who have received some form of digital information literacy training because a common component of that training is to verify information across multiple sources, and thus we might predict that people who have been trained will use this heuristic more than people who have not.

Online information seeking situations also likely evoke multiple heuristics that may be useful in credibility evaluation, so another research concern is how people cope with conflicting heuristics (Sundar, 2008). An example of this is when bandwagon effects appear to validate information that is, nonetheless, presented in a sloppy manner and thus violates the expectancy violation heuristic in appearance. Under this kind of circumstance, which heuristic is privileged and how do people reconcile the dissonance they might experience? One possibility is that various heuristics or types of heuristics are ordered hierarchically in cognition, or that they interact with specific individual-level traits or attitudes. For example, for users who are more steeped in social media, endorsement or bandwagon heuristics might prevail even when the expectancy violation heuristic is triggered by some socially-authored information, given the possible greater trust these users afford to user-generated information. Other possibilities when multiple or conflicting heuristics are triggered include such questions as whether certain combinations of heuristics have additive or multiplicative (or countervailing) impacts on credibility judgments, and whether the temporal order in which heuristics are accessed in cognition during evaluation influences the credibility decision that is ultimately reached. Research on the HSM suggests that when heuristic and systematic strategies co-occur during information processing, the judgmental implications of the processing mode used first may bias the nature of the other mode (Chaiken and Maheswaran, 1994). Similar processes may be at work with credibility heuristics, such that heuristics triggered earlier during an evaluation episode (e.g., expectancy violation) may impact how heuristics triggered later (e.g., authority) get factored into the overall credibility judgment. A great deal of research is necessary to sort out these processes and their potential explanations.

Finally, there is increasing reliance by individuals on more social means of online information processing and evaluation (Metzger et al., 2010). The potential for peer-to-peer credibility assessment can be seen in numerous web-based applications, ranging from “credentialing” activities present on eBay or Amazon, to microblogging activities on Twitter, to topical discussion forums in which individuals provide firsthand experiences and opinions on a host of topics. These increasingly interactive venues that rely on user-generated information require research exploring how individuals use social and group-based information to arrive at credibility decisions.

Because social media applications provide new potential for evaluating information credibility, often by undermining traditional authorities, research in this domain should concentrate on perspectives that illuminate the social nature of information and potential status differences across information sources. For example, Social Identity Theory (SIT; Tajfel and Turner, 1986) proposes that people identify more firmly with their relevant social groups (i.e., an ingroup) over other groups (i.e., outgroups), and that this identification drives people’s attitudes and behaviors. In the context of social information venues available online, SIT suggests that information viewed as originating from groups with which individuals identify strongly should be viewed as more credible than information from outgroup members. Theoretically, then, SIT might provide a means to understand how individuals sort through the vast amount of user-generated data available to them online: perspectives from fellow group members—signaled through markers of shared group identity like common peer networks in social media or online profiles online indicating shared location or interests—are likely to be perceived as more credible than outgroup members’ views. Theories of group processes such as SIT also generate interesting hypotheses regarding the use of particular heuristics in credibility evaluation. For example, SIT suggests that the social endorsement heuristic may be rendered more accessible in cognition when information seekers recognize endorsements as coming from ingroup (versus outgroup) members, and when information seekers’ own group identity is especially salient.

Other heuristics are sure to play an important role in group-based credibility indicators online as well. For example, research shows that the perceived credibility of messages in Twitter is related to heuristic cues such as the presence or absence of personalized user avatar images (a sort of authority heuristic) and the degree to which Twitter users are “followed” by others (a bandwagon heuristic) (Morris et al., 2012). It is also likely that commercial web sites that include social recommendations can elicit competing credibility heuristics of authority versus bandwagon heuristics, as when consumers are confronted with customer ratings or reviews alongside official manufacturer information or industry seals of approval that conflict with each other (Sundar et al., 2009). Similarly, Wikipedia may also evoke heuristics based on authority versus bandwagon and wisdom of crowds. And, in spite of their use, there is evidence that social information such as aggregated ratings can be suboptimal due to the heuristic processing of such information. A study of Amazon ratings, for example, found that although people pay attention to the average rating of a product they are considering purchasing, they are less likely to factor the number of ratings into their evaluations, even though both pieces of information together are crucial to interpret ratings information effectively (Flanagin et al., 2011).

Ultimately, cognitive science offers useful insights into how people cope with the challenge of evaluating credibility online. This research shows that, under specific circumstances, people use strategies that maximize their information gain to information-assessment cost ratio, through the use of cognitive heuristics. Identifying and inventorying the heuristics that people use during credibility assessment in the online environment is an important first step in developing parsimonious theoretical explanations of information evaluation behavior online. In addition, understanding the heuristic processes used in information evaluation can help educators and others to design intervention strategies to increase Internet users’ information literacy, and thus, help people avoid deception, manipulation, and persuasion by

misinformation in the contemporary media environment, which is critical as people increasingly turn to online sources for information used to guide their decisions.

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