This is a preprint of an article published in JASIST:

Choi, W., & Stvilia, B. (2015). Web credibility assessment: conceptualization, operationalization, variability, and models. *Journal of the Association for Information Science and Technology, 66(12),* 2399-2414. DOI: 10.1002/asi.23543

Web Credibility Assessment: Conceptualization, Operationalization, Variability, and Models

Wonchan Choi and Besiki Stvilia

Florida State University

Abstract

This paper has reviewed theoretical and empirical studies on information credibility with particular questions of how scholars have conceptualized credibility that is known as a multi-faceted concept with underlying dimensions; how credibility has been operationalized and measured in empirical studies, especially in the Web context; what are the important user characteristics that contribute to the variability of Web credibility assessment; and how the process of Web credibility assessment has been theorized. An agenda for future research on information credibility is also discussed.

Keywords: Web credibility, information credibility, framework for Web credibility

Introduction

This paper reviews theoretical and empirical studies on credibility assessment of online resources, which is also called *Web credibility* assessment (Fogg, 2003a). Information credibility is currently an important issue in the world of interactive information systems, in which people post and share information through various Web-based venues such as websites, blogs, social networking sites (SNSs), etc. Previous studies on credibility assessment in the interpersonal communication context have focused heavily on source credibility, which mainly referred to the characteristics of the speaker's ability to inspire confidence and belief in what was being said (Hovland, Janis, & Kelley, 1953). In particular, the measures employed in those studies mainly addressed source-related features, such as whether or not the speaker is intelligent, expert, respectful, honest, active, etc. Undoubtedly, source-related features still have a significant impact on the perception of credibility even in the Web context. However, scholars point out that the traditional cues and measures of source credibility may not be able to fully reflect the credibility of Web resources, considering the unique features of the current Web, such as the proliferation of peer-production mechanisms (e.g., Wikis) and social content creation communities using those mechanisms, and increasingly interactive ways of information dispersion (Chung, Nam, & Stefanone, 2012; Flanagin & Metzger, 2008; Hong, 2006b; Jessen & Jørgensen, 2012). For instance, Hong (2006b) and Chung et al. (2012) draw attention to media and genre-specific structural features of Web resources, such as domain names, navigation tools, and hyperlinks to other sites, that may not be addressed appropriately by the measures focused on source-related attributes in the interpersonal communication setting. Also, Jessen and Jørgensen (2012) highlight that authors' credential and authority markers/cues (i.e., source-related features) are not always available in online information, especially in user-generated resources; therefore, Web

credibility assessment does not necessarily rely on source credibility markers/cues. There are other cases where the provided source information is hard to interpret due to the convergence of multiple sources and the easiness of reproducing and redirecting one source to another (Flanagin & Metzger, 2008). Therefore, although the concept of Web credibility is rooted in the traditional concept of credibility (i.e., source credibility in interpersonal communication), it is necessary to identify appropriate credibility markers/cues, heuristics, and measures that can be enabled by the distinct features of Web systems and genres.

Over the past 7–8 years since the last review paper on information credibility (Rieh & Danielson, 2007) was published, a significant amount of new research has been done on Web credibility assessment, which warrants a new review. Furthermore, recent studies have examined Web credibility issues in new Web environments (i.e., social sites), which were not particularly addressed in the previous review paper on information credibility. The reviewed literature in the current review paper, therefore, includes theoretical and empirical studies on Web credibility in a variety of Web-based platforms, from the more traditional and static websites to the newer and more collaborative social websites, published in journals of information studies as well as communication, psychology, and human-computer interaction (HCI). At the same time, however, we review some of the older/classic studies of credibility which provide original definitions and conceptualizations of the concept of credibility, which then have been used in more recent studies and reviews of credibility assessment on the Web. Also, the paper devotes a good deal of space to reviewing theories and models that conceptualize the process of Web credibility assessment.

To assess credibility meaningfully, one has to first conceptualize the concept itself, and then operationalize the concept through a specific set of metrics and/or heuristics. In addition,

one needs to address the issues of credibility dynamics and measurement aggregation from different contexts. Accordingly, section one of the paper discusses how credibility has been conceptualized in the literature, reviewing various underlying dimensions of credibility. As the concept of Web credibility is derived from credibility in the interpersonal communication context, this section mainly reviews the traditional literature from psychology and communication that addresses the root concept, credibility, and attempts to define key dimensions of the concept. Although assessing credibility in the Web context shares common conceptualizations with credibility in the interpersonal communication setting (i.e., source credibility), it involves some operationalizations of credibility that are unique to the Web context. Hence, section two of the paper reviews the measures that have been used in the literature to operationalize and measure Web credibility. Furthermore, credibility assessment is dynamic and contextual. To model credibility meaningfully, it is important to understand how user characteristics may affect credibility assessment on the Web. Section three reviews the user characteristics that may influence Web credibility assessment, such as demographics, user involvement, and technology proficiency. Section four examines six theories and models for Web credibility assessment which provide aggregate views of credibility assessment, taking into consideration various attributes of online resources. Finally, the paper concludes with a discussion of future trends and directions of Web credibility research.

Conceptualization of Credibility

According to the Oxford English Dictionary, credibility is defined as "the quality of being trusted and believed in" (Credibility, n.d., para. 1). As the dictionary definition indicates, the concept of credibility is based on specific qualities or virtues (i.e., underlying dimensions), such as trustworthiness, which are involved in making people believe something. In the

literature, the "something," an object of credibility assessments, has varied depending on main interests and approaches of research. The "something" can be a speaker in interpersonal communication and psychological research; an organization or group, as in the management sciences; media, such as television or the Internet in mass communication research; information resources in the information sciences, etc. (Rieh & Danielson, 2007).

Even though the main objects of credibility assessments have varied among fields, scholars seem to agree upon the idea that credibility is based on a person's (e.g., a listener, a user, or a recipient) perception, rather than the objects of assessments (O'Keefe, 1990). That is, the essential part of credibility assessments concerns how people perceive "something" as credible, which then should theoretically be applicable for all types of credibility assessments regardless of the objects under investigation (e.g., source, message, media, etc.). In this regard, the initial investigations on credibility done in interpersonal communication and psychological research can provide a foundation for conceptualizing credibility. This section traces the discussions on conceptualizing credibility and identifies the key dimensions of credibility that are most frequently (commonly) mentioned in the literature (see Table 1 below).

Dimensions of Credibility in Interpersonal Communication

Gaziano and McGrath (1986) propose the one-factor model of source credibility. The factor analysis in the study shows that twelve items (e.g., being fair, unbiased, trustworthy, complete, factual, accurate, respectful, sensitive, etc.) are grouped together in a single factor, named credibility. However, most of the scholars consider credibility a multi-faceted concept with underlying dimensions. Hovland et al. (1953) define the *trustworthiness* and *expertness* of the communicator (i.e., source) as determinant of the credence given to them, which highly influences the receiver's judgment of whether to accept or reject the message generated by the

communicator. McCroskey and Teven (1999) add the third dimension, *goodwill*, to the two-factor model of source credibility (i.e., trustworthiness and expertise). Berlo, Lemert, and Mertz (1969) suggest another three-factor model of source credibility: *safety*, *qualification*, and *dynamism.* Whitehead Jr. (1968) proposes the four-factor model, consisting of *trustworthiness*, *competence*, *dynamism*, and *objectivity*. Giffin (1967) argues that five factors play important roles in forming the perceived credibility of the source: *expertness* (authoritativeness or intelligence), *character*, *goodwill*, *dynamism* (or activity), and *personal attraction* (likability or affiliation). Table 1 below is the summary of the dimensions of credibility suggested in the literature.

Table 1

Underlying Dimensions of Credibility in Interpersonal Communication

	Trustworthiness	*Expertise*	*Dynamism*	*Goodwill*	*Objectivity*	*Personal attraction*
Hovland et al. (1953)	✓	✓				
Berlo et al. (1969)	✓	✓	✓			
McCroskey & Teven (1999)	✓	✓		✓		
Whitehead Jr. (1968)	✓	✓	✓		✓	
Giffin (1967)	✓	✓	✓	✓		✓

Key Dimensions of Credibility: Trustworthiness and Expertise

Some scholars point out that the disagreement in defining the concept of credibility can be derived from the limitations of the factor analytic methods used to identify the construct's core dimensions (O'Keefe, 1990; Taraborelli, 2008). As shown above, the most frequently used

approaches for analyzing the construct (i.e., credibility) were creating candidate items relevant to credibility and validating them by using the factor analytic techniques. The variances in creating and validating those candidate items might have caused the disagreement. Acknowledging the limitations in defining the concept of credibility, we aimed to identify the most frequently used terms or 'expressions' used in the literature to conceptualize credibility: trustworthiness and expertise (see Table 1 above). Several scholars addressing credibility issues in the Web context also see that credibility is fundamentally based on two primary dimensions of credibility, trustworthiness and expertise (Fogg, 2003a; Metzger, 2007). More recently, the Encyclopedia of Library and Information Sciences has explained that trustworthiness and expertise are the two key dimensions of credibility (Rieh, 2010). Thus, we use this two dimensional conceptualization of credibility as an operational definition for the concept to organize the rest of the review. In particular, it is used to review and analyze various context-specific operationalizations and cues of credibility found in the literature.

Trustworthiness captures the perceived goodness and morality of the source (Fogg, 2003a). Thus, the perception that a source is fair, unbiased, and truthful contributes to the trustworthiness of the information (Rieh, 2010). Wilson (1983) mentions that a person is regarded as trustworthy if he or she is honest, careful about what he or she says, and disinclined to deceive. Hovland et al. (1953) say that the degree of confidence in the communicator's intent to communicate a valid assertion is considered to be the communicator's trustworthiness. *Expertise* is defined as the perceived knowledge, skill, and experience of the source (Fogg, 2003a). From the perspective of source credibility in interpersonal communication, expertise is considered as the extent to which a communicator is perceived to be a source of valid assertion

(Hovland et al., 1953). Wilson (1983) says that a person is competent in some area of observation or investigation if he or she is able to observe accurately or investigate successfully.

Operationalization of Credibility on the Web

Operationalization is "the process by which a researcher defines how a concept is measured, observed, or manipulated within a particular study" (Burnette, 2007, p. 636). This process enables the researcher to define the meaning of the concept under investigation, translating the theoretical and conceptual variable of interest into a set of specific 'measures.' A *measure* is "a relation associating the attribute-level distributions of real-world entities or processes with numbers or symbols" (Stvilia et al., 2007, p. 1722). Thus, a measure examining Web credibility characterizes a specific attribute of Web-based resources by a number or a symbol that can be used for systematic and/or objective credibility assessments.

Fogg's (2003a) framework suggests three main sources of Web credibility measurement that can be used to categorize various measures identified in the literature: (1) operator, (2) content, and (3) design. Even though these three categories correspond to the traditional typologies of credibility, such as source, message, and media credibility (Metzger, Flanagin, Eyal, Lemus, & McCann, 2003; Rieh & Danielson, 2007), Fogg's framework is specialized for Web credibility assessment, labeling and defining each category appropriately for Web-based resources.

The first category of the Web credibility framework, *operator*, is defined as "the organization or person offering the site" (Fogg, 2003a, p. 173). The operator can be interpreted as a source in the conventional setting. As the credibility of a speaker (i.e., source) is considerably important evidence for people to judge the credibility of the message from him or her in interpersonal communication, credibility of an operator, who runs a website, is an

important object of assessment for judging the credibility of the website. For instance, whether or not the operator of the website is respectful, or whether it is a profit or nonprofit organization can be some of the markers/cues that influence users' perceptions of websites' credibility.

Content is the second category of the Web credibility framework. Fogg (2003a) defines content as "what the site provides in terms of information and functionality" (p. 173). Currency, accuracy, relevance of content, and endorsement by a respected outside agency (e.g., the Health on the Net foundation; HON) are the message-related markers/cues that boost Web credibility. In addition, Fog (2003a) considers functionalities that a website can provide for users as the other aspect of content. Examples include the archive function that allows users to search past content on the website and customizability that allows tailoring pages to individual users.

Design is the third category of the framework, which is largely about the structural attributes of websites. Fogg (2003a) specifies that four key design elements come into play for Web credibility assessment: *information design* (the structure of information on each page and throughout the site—e.g., organization of information); *technical design* (how the site works from a technical standpoint—e.g., search function is powered by a respected search engine); *aesthetic design* (how things look, feel, or sound—e.g., whether or not the site is professionally designed); and *interaction design* (moment-by-moment experience of users as they go through the steps to accomplish their goals—e.g., easy to navigate).

We use the two dimensional conceptualization of credibility by Hovland et al. (1953) (i.e., trustworthiness and expertize) mapped into Fogg's (2003a) *Web Credibility Framework* to guide the organization of the credibility operationalization discussion in this section. In particular, to connect the dimensions of the credibility conceptualization with relevant credibility measures found in the literature, we organized those measures by the three categories of the Web

credibility framework by Fogg (2003a) and then mapped to the two key dimensions of credibility. This cross-mapping exercise produces six categories (i.e., source trustworthiness; source expertise; content trustworthiness; content expertise; design trustworthiness; and design expertise) that form a more elaborate conceptualization for understanding relationships among the key dimensions of credibility, related measures, and objects of those measures (see Table 2 below). The following subsections use this new, extended framework to further sort out the measures, specifying which measures could be applicable for each of the credibility dimensions (i.e., trustworthiness and expertise) based on this survey of the literature.

Measures of Operator's Trustworthiness

The trustworthiness of a website can be assessed based on the trustworthiness of its operator. Several of the previous studies have identified sub-dimensions of trustworthiness by asking participants to rate the importance or appropriateness of related adjectives: neutral, balanced, unbiased, even-handed, fair, ethical, believable, consistent, well-respected, trusted, honest, and sincere (Cheung & Lee, 2006; Hong, 2006a; Johnson & Kaye, 2000, 2009; Liu & Huang, 2005; Westerwick, 2013). In this subsection, measures used in the literature that are related to the operator's trustworthiness are reviewed within four categories: (1) commercial implication, (2) perceived integrity, (3) transparency, and (4) decency.

One of the frequently mentioned measures in the literature that can be grouped in the category of an operator's trustworthiness is about a website's "commercial implication," checking whether it is a commercial or non-commercial site. In particular, it examines the website's URL—whether it ends with .com or .gov, .org, or .edu; ads on the website; whether it has pop-up windows with ads; whether it requires paid subscription to gain access (Fogg et al., 2001). Using these measures, Choi (2013) found that people tend to perceive non-commercial

sites as more credible than commercial ones for health information because they do not provide information to make a profit for themselves. When people see ads on health-related websites, they perceive the websites as trying to sell something, rather than providing the public with useful information.

The operator's trustworthiness also matters in online shopping sites. Cheung and Lee (2006) measured "perceived integrity," which was a significant factor for the trustworthiness of Internet merchants, based on users' ratings on whether the vendors charged the same price for Internet shoppers. Jansen and Resnick (2006) focused on the effect of sponsored links (vs. non-sponsored links) on Web searching behavior in the context of online shopping. This study showed that when using a Web searching engine for e-commerce searching, participants were more likely to view the non-sponsored links first and evaluate them as more relevant than sponsored links. On search results pages on Web searching engines (e.g., Google and Yahoo!), sponsored links appear because a company, organization, or individual purchased the key words, while non-sponsored (i.e., organic search) links show up based on their proprietary matching algorithms. Therefore, searchers' perceived credibility of the given links, either sponsored or non-sponsored, can play an important role in their online information seeking behaviors.

On SNSs and user-generated content sites, where authors' identity information is not always available, nor their expertise is necessarily assured, author trustworthiness and expertise could be assessed based on the records/logs of their past contributions and behaviors (Stvilia et al, 2008). For instance, the trustworthiness of a Wikipedia user who had been observed behaving maliciously in the past (e.g., inserting false content in an article) and whose edits had been reversed often could be evaluated lower. Thus, whether or not the author opens their profile to the public can be used as a useful credibility marker/cue. In particular, users may look for

author's online profile, the background information for an online identity, such as a LinkedIn profile, Twitter stream, or personal website or blog, to evaluate (or presume) the author's trustworthiness (Jessen & Jørgensen, 2012). Rieh, Jeon, Yang, and Lampe's (2014) study focused on the credibility of bloggers also showed that "transparency," in terms of a blogger's identity (e.g., the background information of the blogger and the main purposes of running the blog) and open-modification process (e.g., an announcement regarding correcting inaccurate information, rather than deleting it), was considered an important cue/marker that signals the credibility of the blog. Similarly, Francke and Sundin (2012) mention that Wikipedia, which allows people to participate in content production, is considered open and independent (i.e., transparent), therefore, more credible.

On social Q&A sites, the answerer's (i.e., author's) "intention" or "decency" can be an important criterion for askers to judge trustworthiness of the answerer (Jeon & Rieh, 2014). For instance, when an answerer is perceived as facetious in answering a certain question, trying to make a joke, his or her answer tends to be judged as less credible by people.

Measures of Operator's Expertise

An operator's expertise is the perceived knowledge, skill, and experience of the operator. Sub-dimensions of expertise that are related to an operator are: name recognition, reputation, fame, authoritativeness, and competence (Cheung & Lee, 2006; Fogg et al., 2003; Liu & Huang, 2005; Westerwick, 2013; Zhang, 2014). In this subsection, we review various measures that are used in the literature to examine the operator's expertise within three categories: (1) perceived reputation, (2) search engine ranking, and (3) history of author's activity.

Operator's expertise can be measured by checking whether or not the site lists author credentials for each article (Fogg et al., 2001). For scholarly information, in particular, the

author's affiliation information, qualification and credentials, and publications in printed journals are employed by people to evaluate the author's expertise—i.e., "reputation" (Hargittai, Fullerton, Menchen-Trevino, & Thomas, 2010; Liu, 2004; Liu & Huang, 2005). In other contexts, such as seeking entertainment information, the positive reputation still plays an important role in forming the authority of the site (Huvila, 2013).

In addition, "search engine rankings" can play a significant role in judging source credibility (Hargittai et al., 2010; Huvila, 2013; Pan et al., 2007; Westerwick, 2013). Westerwick (2013) showed that Google top-ranking affected information credibility through the significant impact on perceived sponsor (i.e., operator) credibility. Other scholars also report the result that people tend to trust a website when it was suggested in the first result by a search engine (Hargittai et al., 2010; Huvila, 2013; Pan et al., 2007). These findings may be interpreted that users' trust in search engines can influence their credibility perceptions of the search results.

"Historical data of member activities" in peer-production systems such as Wikipedia have been used for predicting the quality of information and/or identifying expertise and interests of a member (Adamic, Zhang, Bakshy, & Ackerman, 2008; Cosley, Frankowski, Terveen, & Riedl, 2007; Stvilia, Twidale, Smith, & Gasser, 2005). In a recent study Jeon and Rieh (2014) reported that an answerer's involvement in the given topic (e.g., top contributor badge) tended to be considered a positive marker/cue in credibility assessment of the answer in a social Q&A site, as the answerer was assumed to have at least some knowledge to answer the topic.

Measures for Content's Trustworthiness

The trustworthiness of the content mainly concerns whether the content of a given online document (e.g., webpage, blog post, or article) is perceived by users as fair, unbiased, and truthful. Measures used in the literature that are related to content's trustworthiness can be

grouped into four categories: (1) neutral/unbiased information, (2) aggregated opinion, (3) consistency in content provision, and (4) currency/recency.

Fogg et al. (2001) mention that people tend to perceive content as trustworthy when it contains links to outside materials and sources, especially links to its competitors' sites. Also, when a policy on the content is available on a website (i.e., "consistent in content provision"), the content from the site is perceived to be trustworthy, providing consistent information (Princeton Survey Research Associates, 2002).

In terms of health-related topics, users tend to perceive a website as most credible when it provides both pros and cons on the given topic or issue (e.g., medication, side effects, etc.) because the site is viewed as attempting to provide "neutral/unbiased information" regarding the given topic (Choi, 2013). Neutrality also seems to be an important marker/cue to judge the trustworthiness of user-generated contents, such as Wikipedia articles, social Q&A sites, blogs, online discussion forums, etc. In Metzger's (2010) study, the proportion of negative to positive reviews on feedback systems or reputation systems was an important cue/marker that they paid attention to when making credibility evaluations. Giudice (2010) also showed that mixed stances of user feedback on an issue (i.e., both positive and negative) influenced perceptions of Web credibility. In the study (Giudice, 2010), a Web page with positive or mixed user feedback was perceived as more credible than a Web page with negative feedback only; however, there was no statistically significant difference in credibility ratings between positive and mixed feedback. Therefore, interestingly, even counterclaims and rebuttals seem to be considered useful cues/markers for judging the credibility in user-generated content. These findings may be understood that the content having at least some negative reviews is perceived by users as more balanced, and therefore, more trustworthy.

Also, “aggregated opinion” seems to play an important role in forming the perceived trustworthiness of the content (Fernquist & Chi, 2013; Flanagin & Metzger, 2013; Jessen & Jørgensen, 2012; Kim, 2010; Yi, Stvilia, & Mon, 2012). Yi et al. (2012) reported that the participants considered health information to be more trustworthy when the same information was found on multiple websites (i.e., “content voting”). In social Q&A sites, the ‘Best Answer’ rating is an important credibility marker/cue, as it is viewed as the social validation by the community including the questioner (Kim, 2010).

Flanagin and Metzger (2013) showed that the volume of ratings provided by other users on a movie rating site was positively associated with perceived credibility, meaning that the ratings information was perceived as more credible when the volume of ratings was higher. Notably, people tended to perceive the ratings from general users (as opposed to experts) as even more credible than the ratings from experts when the volume of ratings was high, while the opposite was true at a low volume of ratings. Thus, opinions on a certain topic or issue from a large number of people can be considered a credibility marker/cue that triggers the perceived trustworthiness of the content, rather than the perceived expertise, as the aggregated social opinion is assumed to be honest and not easily manipulated by a few.

In the literature, “currency” (or recency) has been considered one of the important message-related features that may influence the perception of information credibility (Bernstam, Shelton, Walji, & Meric-Bernstam, 2004; Hargittai et al., 2010; Sundar, Knobloch-Westerwick, & Hastall, 2007). For online news, in particular, currency can be an important criterion to judge its trustworthiness because the validity of news information is time sensitive. Sundar et al. (2007) measured the number of minutes since the news story broke, named *upload recency*, to see whether or not currency affects the perceived credibility of the news lead itself. The authors

found that upload recency had a significant impact on the perceived message credibility when the news item was from a low-credibility-source. More specifically, the moderately recent news item (uploaded 11 or 12 hours ago) was considered less credible than the most recent news (uploaded a few minutes ago) and the least recent news (uploaded 45 or 48 hours ago); however, upload recency did not influence the perceived message credibility when the news was from a high-credibility-source.

Measures for Content's Expertise

The content's expertise, which is based on the evaluation of whether or not the content of a website follows the norms, conventions, and expectations of a particular occupation, community of practice, and/or culture plays an instrumental role in Web credibility assessment (Eastin, 2001; Fogg et al., 2001; Hong, 2006a; Liu, 2004; Savolainen, 2011; Sundar et al., 2007; Zhang, 2014). Measures regarding the content's expertise that are used in the literature can be grouped into three categories: (1) provision of evidence, (2) intrinsic quality, and (3) reinforcement of content expertise.

When a website has articles that list citations and references—i.e., "provision of evidence"—people tend to perceive the site more credible (Fogg et al., 2001). People seem to view citations and references as scientific supports/evidence for the arguments made in the articles, assuming that these markers/cues guarantee the accuracy and completeness of the content. In their empirical study, Sundar et al. (2007) examined whether the number of related articles would have a significant impact on perceived credibility of online news leads. The authors found that a news lead from a low-credibility-source was perceived as more credible when it included a larger number of related articles. However, there was no significant relationship between the number of related articles and the perceived credibility of a news lead

when it came from a high-credibility-source. In other words, in a case where the source's credibility is not guaranteed, people tend to give higher credibility to the argument being supported by a larger number of citations and references.

Fogg et al. (2001) showed that "intrinsic quality" related cues such as typographical errors or the lack of comprehensives or completeness (e.g., having less than 5 pages) made the participants rate the website as less credible. These content cues tend to have a negative effect on the perceived expertise of a website. Such content cues are applicable for user-created content or knowledge, such as Wikipedia articles and Yahoo! Answers. Rowley and Johnson (2013) reported that the structure/style/quality of writing and grammar/proofreading were some of the indicators that might influence the perceived credibility of Wikipedia articles. In addition, it was found that the length of the article was an important cue signaling the quality of the article (Stvilia et al., 2007; Yaari, Baruchson-Arbib, & Bar-Ilan, 2011). In Yahoo! Answers, the length of reply and the number of competing answers (i.e., number of other answers the questioner has to choose from) were significant factors for predicting the 'Best Answer' (Adamic et al., 2008; Agichtein, Castillo, Donato, Gionis, & Mishne, 2008).

There is a unique type of information behavior on the Web that influences the credibility of user-generated content. St. Jean, Rieh, Yang, and Kim (2011) paid attention to the fact that people have a chance to reinforce the credibility of their content even after they post it online. The authors found that many content contributors posted additional information—i.e., "reinforcement of content expertise"—including supplementary images, and/or provided feedback to their audience, and these interactions with the audience provided the content contributors with an additional chance to promote their knowledge and expertise to the audience in the social sites. Their findings are in line with Savolainen's (2012) finding that people tend to

perceive answers in social Q&A sites as more credible when the content provides further evidence and/or competing answer candidates.

Measures for Design's Trustworthiness

As mentioned above, Fogg's (2003a) Web credibility framework defines the *design* aspect of Web credibility with four sub-categories: information design (the structure of information on each page and throughout the site); technical design (technical functionalities); aesthetic design (layouts, graphics, and colors of the site); and interaction design (usability). Based on the framework, design 'trustworthiness' can be determined by whether or not the website's performance is stable and consistent; whether or not it 'looks' trustworthy, etc. This subsection examines measures used in the literature that are related to a design's trustworthiness according to the (1) real-world feel and (2) stability of the website.

An early study on Web credibility assessment (Fogg et al., 2003) reported that the most frequently mentioned criteria for evaluating the credibility of a website were design look and information design/structure. The result tells us that visual aspects of a website, such as pleasing graphics, higher quality look and feel, and professional appearance, may have significant impacts on users' perceptions of credibility of Web-based resources. In particular, scholars have examined the effects of trustworthiness of a website's design in terms of "real-world feel," such as whether or not the site lists the operator's physical address, contact number, and email address (Fogg et al., 2001; Fogg et al., 2003), and whether or not it includes a picture of the operator—e.g., organization's members, authors of certain articles (Fogg et al., 2001; Liu, 2004; Liu & Huang, 2005). In particular, posting a profile picture may have a positive effect on users' perceived credibility of user-generated content, as well. Jeon and Rieh (2014) reported that some participants noticed answers' profile pictures in Yahoo! Answers, considering them being more

involved in the site. When people feel that there are actual people behind the website, they may perceive the website as more trustworthy.

Moreover, technical design also has a significant impact on perceived trustworthiness of a website. In particular, users seem to be sensitive to the "stability" of a website, such as how often the site is down, or whether or not links from all pages work properly (Fogg et al., 2001). Previous studies using these measures showed that people considered the websites that are often unexpectedly unavailable or have broken links less credibility because these are perceived as less consistent and reliable—i.e., less trustworthy (Choi, 2013; Fogg et al., 2001; Fogg et al., 2003; Liu, 2004; Liu & Huang, 2005).

Measures for Design's Expertise

Web resources involve various design-related features, such as the structure of information, search functions, aesthetics design, and usability (Fogg, 2003a). Even though these design-related features are not particularly about content or its source(s), which have been traditionally considered as the main objects of credibility assessments, several scholars have shown that design may have a significant effect on the overall perception of Web credibility (Fogg et al., 2001; Robins & Holmes, 2008; Wathen & Burkell, 2002). In particular, a website's credibility can be communicated by the quality of its design (i.e., design's expertise) in terms of aesthetics based on first impressions of surface traits and usability based on first-hand experience (Fogg, 2003a). Measures regarding a design's expertise identified in the literature are grouped into two categories: (1) visual aesthetics, and (2) appropriateness of design.

Robins and Holmes (2008) found that people tended to judge the content with a higher aesthetic treatment as having higher credibility than the same content with a lower aesthetic treatment—i.e., impact of "visual aesthetics" on Web credibility assessment. Also, based on

Wathen and Burkell's (2002) model for Web credibility assessment, people begin the process of assessing Web credibility with making immediate judgments about the surface characteristics of the website, which is directly related to the structural features of websites. Surface characteristics mentioned in this research include site appearance (e.g., color, graphics, no errors, etc.), usability (e.g., navigability, menus, download speed, etc.), and organization of information (e.g., layers, ease of access, and choice of detail level). Rieh et al. (2014) also mentioned that visual aesthetics can play an instrumental role in signaling credibility of blogs (e.g., changing the background of a blog and including pictures). In particular, the "appropriateness of design," being in harmony with the type of content and tone of writing, was suggested as an important aspect of a 'credible' blog, as blogs are a type of user-generated content sites where bloggers and audience are closely engaged, interacting with each other regarding their common concerns and interests.

One interesting finding regarding the impact of design features on Web credibility is that quality design and site organization tend to be considered as a basic requirement (or even prerequisite) that a website must have (Choi, 2013). In other words, a high level of website design may or may not increase the overall credibility of a health-related website, while poor surface credibility significantly decreased the overall credibility of a website. Participants in Choi's (2013) study highlighted that the 'prettiness' of a website (i.e., aesthetic design) was not important when they judged the credibility of a website providing health-related information, while the website would be seen as less professional if it had typographical errors. Westerwick (2013) also showed that credibility perceptions could not be enhanced by more appealing website design when the site had lower source credibility; instead, higher source credibility increased users' ratings of the website's design appeal.

Table 2

Measures for Web Credibility Assessment

	Trustworthiness	*Expertise*
Operator	Commercial implication: ▪ URL ends with .com ▪ Ads on the site ▪ Pop-up windows with ads ▪ Paid subscription required Perceived integrity: ▪ Same condition for both on- and off-line shopping products ▪ Sponsored links (vs. non-sponsored links) Perceived transparency: ▪ Accessibility of author's online profile (e.g., LinkedIn Profile, Twitter stream, personal website or blog, etc.) ▪ Announcement (notice) on correcting inaccurate information (not deleting it) Perceived decency: ▪ Whether the author is serious or facetious in information provision.	Perceived reputation: ▪ Author credentials ▪ Affiliation information ▪ Author's publications in printed journals Search engine ranking: ▪ Google top-ranking History of author's activity (in social Q&A sites): ▪ Number of answers ▪ Number of best answers ▪ Top contributor badges
Content	Neutral/unbiased information: ▪ Links to outside materials and sources ▪ Links to its competitors' sites ▪ Mixed stances of user feedback on an issue (both pros and cons are provided) ▪ Proportion of positive and negative comments on user-generated contents Aggregated opinion/social validation: ▪ Duplication (i.e., certain information is found on multiple websites.) ▪ Social annotations and rating from other people ▪ 'Best Answer' rating (e.g., 'Best Answer' in Yahoo! Answers and 'Likes' in Facebook) Consistency in content provision: ▪ Posting policy on content Currency/Recency: ▪ Upload recency (number of minutes since a message was posted)	Provision of evidence: ▪ Provision of citations and references ▪ Number of related articles Intrinsic quality: ▪ Typographical errors ▪ Size of the site (e.g., how many pages does it have?) ▪ Length of the content (e.g., length of the Wikipedia article; length of the answer in Yahoo! Answers) ▪ Number of competing answers (in social Q&A sites) Reinforcement of content expertise: ▪ Additional information posted by the author (e.g., replies, comments, or supplemental images and videos, etc. in social Q&A sites)

	Trustworthiness	*Expertise*
Design	Real-world feel: ▪ Operator's contact information (e.g., physical address, contact number, email address, etc.) ▪ Picture of operator Stability of the website: ▪ The site is rarely down. ▪ All links in the site are working (number of broken links).	Visual aesthetics: ▪ Professionally designed (e.g., color, graphics, etc.) Appropriateness of design: ▪ Well-matched with content (topic) ▪ Well-matched with tone of writing

User Characteristics and Credibility Perception on the Web

The process of assessing information credibility relies on users' perceptions, which may be affected by different user characteristics. These include (1) demographic characteristics (Robertson-Lang, Major, & Hemming, 2011; Zulman, Kirch, Zheng, & An, 2011); (2) user involvement (Arazy & Kopak, 2011; Fogg, 2003b; Lucassen, Muilwijk, Noordzij, & Schraagen, 2013; Metzger, 2007); and (3) technology proficiency (Ahmad, Komlodi, Wang, & Hercegfi, 2010; Kim, 2012; Lucassen et al., 2013; Zulman et al., 2011). Therefore, to gain better understanding of users' assessment of the credibility of online resources, and the effects of various demographic, cultural, and physiological variables on information behaviors, researchers have devised studies of populations defined by those variables. This section reviews those factors as they have been discussed in the credibility literature.

Demographics

"Age" seems to be one of the important factors that influence Web credibility assessment. Older adults, who have relatively less experience with the Web than younger generations, tend to have more concerns or doubts about the credibility of health-related

resources on the Web (Zulman et al., 2011). It may be because their expectations about how a system should work are based on how previous versions (i.e., non-electronic) were structured (Fisk, Rogers, Charness, Czaja, & Sharit, 2009). Therefore, they may assume that the credibility of online information is relatively lower than that of printed information because they are more familiar with printed information that is produced and disseminated through a stricter process that requires enough authority and capital to justify and sell information product (Fritch & Cromwell, 2001; Metzger, 2007).

However, the fact that older adults have more concerns with credibility issues does not necessarily mean that they are able to seek out indicators of credibility when exploring a website. In their study, Robertson-Lang et al. (2011) found that 93% of older adults believed that the websites they chose were credible, but only 29% of them actually checked the source of the sites to make sure they were credible; some participants automatically trusted online health information simply because they are on the Web.

Furthermore, there have been studies examining age differences in trust from the perspectives of neural activity, which may underlie older adults' vulnerability to fraud. In Castle et al.'s (2012) study, older adults rated untrustworthy faces as significantly more trustworthy and approachable than younger adults did. Also, older adults show lesser activation in the anterior insula (AI), a region believed to contribute to decision-making by instantiating subjective feeling states, when making explicit judgments of trustworthiness and when perceiving untrustworthy faces. The authors argue that reduced AI activation seen in older adults may be a neural indicator of a weaker warning signal than is present in younger adults. Thus, the results may be implicated that older adults may have a lower visceral warning signal in response to cues of

untrustworthiness, which could make deciding whom to trust difficult, and may make them fall victim to online fraud at a higher rate than other age groups.

"Gender" is another demographic factor that influences credibility perception on the Web. Johnson and Kaye (1998) mentioned that gender was the only variable that was significantly associated with perceptions of credibility of all four types of sources (e.g., online newspapers, online news magazines, online candidate literature, and online issue sources) among the demographic variables under investigation, such as age, education, and income. In particular, female participants in the study viewed the Web as more credible than males did. Fogg et al. (2001) also found that male participants rated credibility markers/cues more negatively than females did. However, gender does not necessarily have a consistent effect on perceptions of Web resources (i.e., men are more critical than women). For instance, Flanagin and Metzger (2003) reported opposite findings that males rated the given websites as more credible (i.e., more positive) than females did. Furthermore, Johnson and Kaye (2000) found that gender did not play a significant role in assessing Web credibility. Due to the inconsistent findings, which imply interaction effects of gender on credibility perceptions on the Web, some studies controlled gender in their data analysis (Hong, 2006a; Johnson & Kaye, 2009; Metzger, Flanagin, & Zwarun, 2003).

User Involvement

Several models for Web credibility assessment view user involvement (e.g., motivation and ability), as a decisive factor that has an impact on the overall process of Web credibility assessment (Fogg, 2003b; Lucassen et al., 2013; Lucassen & Schraagen, 2011; Metzger, 2007). When people have high "motivation" to evaluate Web credibility, they are more likely to look into the content-related features of the Web resource, such as the arguments presented and/or

source of the information. However, when they have low motivation, people tend to evaluate Web credibility based on more superficial features of the Web resource, such as design, color schemes, and functionalities of the websites, etc. (Fogg, 2003b; Metzger, 2007).

Furthermore, when people have the "ability" to evaluate the Web resource, in addition to motivation, people take a more rigorous and systematic strategy to credibility assessment. However, if a user does not have motivation, no credibility assessment will happen; in case the user does not have the ability, yet has the motivation to evaluate, the user would rely on the surface characteristics (i.e., peripheral cues) or heuristics to judge the credibility of the information (see Metzger, 2007, p. 2088). Thus, user motivation and ability are crucial factors that determine the extent to which users will critically evaluate the Web resource.

"Familiarity" on a given topic is known as a contributing factor that influences Web credibility assessment, as well (Arazy & Kopak, 2011; Chesney, 2006; Lucassen et al., 2013). More specifically, Lucassen et al. (2013) found that people who were familiar with a given topic tended to pay more attention to the semantic features of the information (i.e., central cues), while people who were not familiar with the topic focused more on surface features of the information (i.e., peripheral cues). Arazy and Kopak (2011) too highlighted that assessing the accuracy of the content required knowledge of relevant facts (i.e., semantic features), while assessing the presentation of the Wikipedia article (i.e., surface features) did not require such expertise. Thus, a user's level of familiarity regarding the subject matter may affect the user's interpretation of the Web resource under examination.

Technology Proficiency

Users' information "literacy levels" play a significant role in acknowledging the structural and message features, which influence credibility perceptions and evaluations of

websites (Ahmad et al., 2010; Lucassen et al., 2013; Zulman et al., 2011). Using Julien and Barker's (2009) definition of information literacy, "the set of skills required to identify information sources, access information, evaluate it, and use it effectively, efficiently, and ethically" (p. 12), expert users who have higher information literacy tend to use not only the structural features of websites (e.g., links, policy, affiliation, sponsor, domain names, advertisements, and aesthetics), but also the message features (e.g., information timeliness, information language, information organization, information citation, information consistency, testimonials, author, and author-expertise) to verify the credibility of the websites. However, novice users having lower information literacy mainly rely on visual appearance and structural features of websites.

Scholars in the field of communication have used the term, "media reliance," which mainly examined the relative influence of reliance on different media types on credibility perceptions (Johnson & Kaye, 2009; Johnson, Kaye, Bichard, & Wong, 2007; Kiousis, 2001). These studies focused on the relationship between users' media reliance (or media use) and the perceived credibility of the media under investigation. Overall, reliance has been found to be one of the influential factors for credibility perception both in traditional media, such as television, radio, and newspaper, and in the Web sources (e.g., websites in general, blogs, SNSs, etc.). For instance, Flanagin and Metzger (2000) reported that more experienced users tended to consider the Internet more credible than those who had less experience with the Internet. In blogs, in particular, reliance was the strongest predictor of blog credibility even after controlling for demographics and Internet use (Johnson & Kaye, 2004; Johnson & Kaye, 2009; Johnson et al., 2007): experienced Internet users considered blogs more credible than those having less experience with blogs (i.e., general Internet users) because the experienced users were familiar

with the purpose of blogs or the style of writing. These findings seem to indicate that the more users rely on a certain source, the more likely they are to judge the information from the source as credible. Table 3 below lists the factors having an impact on Web credibility assessment in three categories: demographics, involvement, and technology proficiency.

Table 3

Variability of Credibility Perception on the Web

	Definition	*Variables*
Demographics	User's demographic backgrounds that influence Web credibility assessment	▪ Age ▪ Gender ▪ Education
Involvement	The degree to which users know and care about specific topics under examination	▪ Motivation ▪ Ability ▪ Domain expertise
Technology proficiency	The degree to which users are familiar and comfortable with the technology (Internet) to identify, access, evaluate, and use information resources	▪ Information literacy ▪ Media reliance

Models and Frameworks

Several theoretical frameworks have been proposed to explain Web credibility assessment taking various attributes of online resources into consideration, in terms of source (i.e., source), message (i.e., content), and structure (i.e., design), as well as the dynamic nature of the 'process' of assessing the information credibility. This section reviews six theoretical frameworks pertinent to Web credibility assessment: (1) Wathen and Burkell's (2002) *Model for How Users Judge the Credibility of Online Information*, (2) Fogg's (2003b) *Prominence-*

Interpretation Theory (P-I Theory), (3) Metzger's (2007) *Dual Processing Model of Website Credibility Assessment*, (4) Hilligoss and Rieh's (2008) *Unifying Framework of Credibility Assessment*, (5) Sundar's (2008) *MAIN Model*, and (6) Lucassen et al.'s (2013) *Revised 3S-Model*. In particular, the common and unique features of the theoretical frameworks are recapitulated in Table 4 below.

Fogg's Prominence-Interpretation Theory (P-I Theory)

Prominence-Interpretation Theory (P-I Theory), proposed by Fogg (2003b), posits that two things happen when people assess credibility: a person notices something (prominence) and makes a judgment about it (interpretation). The fundamental idea of this theory is that people would evaluate the parts of the website they have noticed based on their involvement, motivation, ability, etc.

The first concept of the theory, *prominence*, is defined as "the likelihood that a website element will be noticed or perceived" (Fogg, 2003b, p. 722). The author mentions that before a website element can affect a user's credibility assessment of the site, the user must first notice the element. In other words, if certain website elements are not noticed by users, information in the website cannot have an impact on credibility assessment of the site. He identifies five factors that affect the prominence phase: involvement of the user, content, task, experience, and individual differences.

The second concept of the P-I Theory is *interpretation*. Fogg (2003b) defines the concept as "a person's judgment about an element under examination" (p. 723). In the interpretation phase, the user evaluates website elements as good or bad. For example, a user may interpret a broken link on a website either as an indicator the operator does not care for the site or the site was not carefully created in the first place. In either case, the broken link will contribute to a

lower credibility perception of the site. Fogg mentions that at least three factors affect interpretation: user's assumptions (e.g., culture, past experiences, and heuristics), skill/knowledge of a user (e.g., a user's level of competency in the site's subject matter), and context (e.g., the user's environment, expectations, and situational norms).

Wathen & Burkell's Model for How Users Judge the Credibility of On-line Information

Wathen and Burkell (2002) view the credibility assessment of online resources as an iterative process. Particularly, they conceptualize the process of Web credibility assessment with two distinct levels (or phases): evaluation of surface credibility and evaluation of message credibility. According to the model, people begin the process by making immediate judgments about the surface characteristics of the site, such as appearance (e.g., color, graphics, lack of error, etc.), usability (e.g., navigability, menus, download speed, etc.), and organization of information (e.g., layers, ease of access, and choice of detail level). The factors identified in this model are in line with the surface credibility markers suggested by Tseng and Fogg (1999). As mentioned above, people consider the professional appearance of a website an important cue for judging its overall credibility.

In the second level of the model, people evaluate the credibility of the message delivered by the website in terms of source and message. The authors identify expertise, competence, trustworthiness, and credentials as factors that influence source credibility. Also, they identify content, accuracy, currency, and relevance to the user's need as factors that influence message credibility.

Hilligoss and Rieh's Unifying Framework of Credibility Assessment

Hilligoss and Rieh (2008) suggested a unifying framework of credibility assessment in an attempt to consider diverse information seeking goals, tasks, and contexts in everyday life. They

identified three distinct levels of credibility judgments: construct, heuristic, and interaction. In the framework, *construct* is the highest and the most abstract level, as it is concerned with how people define (or perceive) the concept of credibility. Hilligoss and Rieh suggest five constructs of credibility – trustfulness, believability, trustworthiness, objectivity, and reliability – and highlight that people may conceptualize credibility in different ways depending on the situation they are facing and the types of information encountered.

The second level of the framework is the *heuristic* level. Heuristics involve general rules of thumb that are utilized in cases where people are unwilling or unable to evaluate the content of the message because of time, motivation, and ability. Hilligoss and Rieh categorize heuristics for credibility assessment into four types: media-related heuristics (e.g., book, peer-reviewed journal articles, Web, etc.), source-related heuristics (e.g., familiar vs. unfamiliar sources, primary vs. secondary sources), endorsement-based heuristics (e.g., recommendation by knowledgeable and trusted individuals), and aesthetics-based heuristics (e.g., design in websites).

The third level of Hilligoss and Rieh's framework is *interaction*. The authors define interactions as "specific attributes associated with particular information objects and sources for credibility judgments" (p. 1473). This level differs from the previous level (i.e., heuristics), in that credibility judgments in this level are based on specific source or content cues that are unique to a specific context. Three types of interactions are identified: interactions with content cues, peripheral source cues, and peripheral information object cues. *Content cues* are directly related to evaluating the credibility of the message itself. *Peripheral source cues* are source-related features that can affect the credibility assessment of information, such as affiliation, reputation, author's education background, type of institution, etc. *Peripheral information object cues* are about the appearance or presentation of the information object, such as advertisements

or language used in the website, etc. Hilligoss and Rieh mention that the three levels of credibility assessment are interlinked, affecting each other in both directions from the abstract level (i.e., construct) to the specific level (i.e., interaction), rather than functioning exclusively.

Sundar's MAIN Model

Sundar (2008) pays attention to the technology effects on credibility assessments. In particular, as multiple sources are often interlinked in online information, source credibility, which has been conventionally regarded as the most important clue to judging the believability of information, may not play a clear role in the Web context. Therefore, information receivers have to consider message credibility as well as the credibility of the medium itself to assess the credibility of online information. In such an information environment where people have to take more things into consideration to find credible information, they get to face the information overload and the lack of uniformity in content quality. In this regard, he highlights the importance of roles of cognitive heuristics that people take advantage of to make judgments of credibility in the Web context. His MAIN model accommodates various heuristics pertaining to credibility assessments, categorized in four types of affordances in digital media, such as Modality (M), Agency (A), Interactivity (I), and Navigability (N).

Affordance is a particular capability possessed by the medium to facilitate a certain action, and the affordances exist in most digital media to some different degrees. The *modality* affordance is closely related to the structural aspects of the medium, rather than the content—e.g., "realism heuristic" that people tend to trust audiovisual modality because its content has a higher resemblance to the real world. The *agency* affordance-related heuristics are utilized to identify the source, which affect the perceived credibility of the information provided by the source—e.g., "machine heuristic" that people consider the objectivity of chosen news to be more credible if it

is recommended by a machine. The *interactivity* affordance involves both concepts such as interaction and activity, which are the characteristics usually lacking in most traditional media—e.g., "activity heuristic" that influences users' credibility judgments by the dynamism. The *navigability* affordance is about the interface features of digital media, such as organization of sites and hyperlinks—e.g., "browsing heuristic" that encourages users to take a look at the site by checking out the various links.

Metzger's Dual Processing Model of Credibility Assessment

Metzger's (2007) dual processing model takes user motivation and ability into account in theorizing the process of Web credibility assessment. This model adopts the main idea of the dual processing models, such as Petty and Cacioppo's (1981) Elaboration Likelihood Model of persuasion (ELM), that divide the process of information processing and assessment into two routes, (a) central and (b) peripheral routes, depending on the depth of the user's motivation and ability to scrutinize it. The dual-processing-perspective is a useful approach to understand Web credibility assessment as it is mainly based on user perceptions, which are formed (influenced) by various audience factors (i.e., user characteristics) such as demographic background, involvement (motivation and ability), topic familiarity, and information skills. In other words, since user perceptions are not necessarily the same for all types of users, nor for various situations, it is reasonable to specify the evaluation process by considering the dynamisms in Web credibility assessment. In the *exposure phase* of the model, a user's motivation and ability decide whether or not they will go to the next phase, the *evaluation phase*. When a user has motivation and ability to evaluate the information he or she is being exposed to, the user will take more rigorous and systematic strategies to credibility assessment (i.e., central route); however, if a user does not have the motivation, no credibility assessment will happen; in case

the user does not have the ability, yet has the motivation to evaluate, he or she will rely on the surface characteristics (i.e., peripheral cues) or heuristics to judge the credibility of the information (see Metzger, 2007, p. 2088).

Lucassen and Schraagen's Revised 3S-Model of Credibility Evaluation

Lucassen and Schraagen (2011) suggested the 3S-model, where 3S indicated the three information characteristics: semantic, surface, and source features. Lucassen et al. (2013) improved the initial version of the model by further examining the influences of the topic familiarity and information skills (i.e., information literacy). Defining topic familiarity (or domain expertise) as "having knowledge on the topic at hand" (Lucassen et al., 2013, pp. 256-257), people who have the higher level of knowledge on the topic tended to focus more on the semantic features (i.e., message of the information), while the novice users who were not familiar with the topic relied more on surface features (i.e., structural features). Furthermore, when defining information skills as "the skills required to identify information sources, access information, evaluate it, and use it effectively, efficiently, and ethically" (Julien & Barker, 2009, p. 12), users with better information skills more often attempted to evaluate information quality, while those with poorer information skills did not.

The Revised 3S-Model shares common ideas with the dual processing model by Metzger (2007), in that credibility assessment may vary depending on the levels of motivation and abilities. In particular, ability can be seen as the same concept as information skills mentioned in the Revised 3S-Model. Thus, involving the two models together, users go through the different routes by focusing on different types (i.e., semantic vs. surface) and levels (i.e., number of cues) of credibility cues embedded in the given information depending on the information skills (i.e., ability).

Common and Unique Features of Web Credibility Assessment Models

As reviewed above, each of the six theoretical frameworks has a different coverage and focal point on the Web credibility assessment. Overall, four main facets of the theoretical frameworks are identified: (1) context, (2) user characteristics, (3) information characteristics, and (4) process (see Table 4). This section analyzes the six theoretical frameworks along those four facets.

The first facet, *context,* categorizes whether the framework takes contextual factors into account. Depending on a certain contextual situation in which people are located, their credibility assessments may vary, in terms of selecting resources and judging the credibility. For instance, Hilligoss and Rieh (2008) find that college students try not to rely on information from the Web for their homework because their professor may consider the Internet as a less-credible source to reference for academic work. Even though college students are very familiar with searching and using online information in everyday life, they may change their information behavior of both selecting the pertinent source and judging its credibility in a certain context. Two of the six existing theoretical frameworks of credibility assessment clearly emphasizethe influence of contextual factors: P-I Theory (Fogg, 2003b) and Unifying Framework of Credibility Assessment (Hilligoss & Rieh, 2008).

The second facet examines whether the model considers the variability of Web credibility assessment in terms of the *user's characteristics*. Given that credibility assessment is mainly based on users' perception, it is important to take audience factors into account to better understand credibility assessment of online resources. In particular, the factors reviewed in the preceding section of the paper (i.e., User Characteristics and Credibility Perception on the Web), such as demographics, user involvement, and technology proficiency, are known for being

influential in Web credibility assessment. As shown in Table 4 below, most of the theoretical frameworks for Web credibility assessment reviewed in this paper include audience factors.

Operationalization categorizes how each model measures information credibility. As reviewed in the previous section, various credibility markers/cues have been identified in terms of source, message, and structural characteristics of Web resources (see Table 2 above). The third facet, operationalization, shows which type of credibility markers/cues (or measures) are employed and how they are labeled in each theoretical framework.

Lastly, *process* categorizes the theoretical frameworks by whether they combine and organize various factors to depict the process of Web credibility assessment. This is an important criterion to sort out the frameworks because the 'process-based' frameworks encompass the overall process of credibility assessment, while the 'judgment-based' frameworks focus on certain factors affecting users' perceived credibility of online information. Table 4 below is the comparison of the six theoretical frameworks of Web credibility assessment based on the four facets.

Table 4

Characterization of Six Existing Theoretical Frameworks of Web Credibility Assessment by Four Facets

Model	*Facet 1: Context*	*Facet 2: User characteristics*	*Facet 3: Operationalization*	*Facet 4: Process*
P-I Theory	▪ Context ▪ Task	▪ Involvement ▪ Experience ▪ Individual difference ▪ Assumption ▪ Skill/knowledge	▪ Content	▪ Prominence ▪ Interpretation

Model	*Facet 1: Context*	*Facet 2: User characteristics*	*Facet 3: Operationalization*	*Facet 4: Process*
Judgment Model	▪ Situation	▪ Previous knowledge ▪ Topic familiarity ▪ Willingness to believe and use the information	▪ Surface credibility ▪ Source credibility ▪ Message credibility	▪ Enter websites ▪ Evaluation of surface credibility ▪ Evaluation of message credibility ▪ Content evaluation
MAIN Model	N/A	N/A	▪ Modality cues ▪ Agency cues ▪ Interactivity cues ▪ Navigability cues	▪ Affordance ▪ Heuristics ▪ Quality ▪ Credibility judgment
Unifying Model	▪ Context ▪ Goal ▪ Task	▪ Information seeker: motivation & ability	▪ Media heuristics ▪ Source heuristics ▪ Endorsement heuristics ▪ Aesthetics heuristics	▪ Construct ▪ Heuristic ▪ Interaction
Dual Model	N/A	▪ Motivation to evaluate ▪ Ability to evaluate	▪ Heuristic evaluation ▪ Systematic evaluation	▪ Exposure phase ▪ Evaluation phase ▪ Judgment phase
Revised-3S Model	N/A	▪ Domain expertise ▪ Information skills ▪ Source expertise	▪ Semantic features ▪ Surface features ▪ Source features	N/A

Conclusion and Future Research Directions

This paper has reviewed theoretical and empirical studies on information credibility with particular questions of (1) how scholars have conceptualized credibility as a multi-dimensional concept; (2) how credibility has been operationalized and measured in empirical studies, especially in the Web context; (3) what are the important user characteristics that contribute to the variability of Web credibility assessment; and (4) how the process of Web credibility assessment has been theorized.

The notion of credibility has been mainly examined in terms of source credibility in the context of interpersonal communication. Many scholars have identified various underlying dimensions of credibility, which were mainly focused on the characteristics of a speaker that influence the listener's perception of credibility. In particular, trustworthiness and expertise have been identified as key dimensions of credibility, along with goodwill, dynamism, objectivity, and personal attraction. As mentioned above, people tend to perceive certain information (or a message) as credible when it originates from credible sources.

In the Web context, various credibility markers/cues have been identified in terms of operator, content, and design. Many scholars note that Web credibility assessment may not be fully addressed by the traditional measures used in the interpersonal communication context as Web credibility assessment involves the unique features of Web-based platforms, such as the structural features of websites (e.g., domain names, navigation tools, hyperlinks to other resources, etc.), self/peer-production mechanisms (e.g., Wikis, blogs, social Q&A sites, etc.), easiness of sharing and reproducing information, etc. (Flanagin & Metzger, 2008; Hong, 2006b; Jessen & Jørgensen, 2012). Table 2 above summarizes the key dimensions of credibility and associated measures for Web credibility assessment.

Furthermore, audience factors, such as demographic backgrounds, user involvement, information skills, etc., make Web credibility assessment variable. Several models have been proposed to theorize the process of Web credibility assessment by taking these factors into consideration. However, each model has a somewhat different perspective or angle on Web credibility assessment. Models for Web credibility assessment may share common aspects but still have unique features, depending on the focal point of each model. Additional variance in the models has been introduced by the needs of different contexts of credibility operationalizations.

As new technologies and new types of information systems emerge on the Web, leading to new types of credibility behaviors, heuristics and cues, there will be an ongoing need for new information credibility research. Following are some potential future research directions and trends regarding Web credibility assessment.

Conceptualization – Studying the Relationship between Information Credibility and Information Quality

One important future research agenda would be to make a clearer relationship between the concepts of information credibility and quality, which are closely related. In the literature, many of the criteria for message credibility overlap with those for information quality. These include: accuracy, currency, reliability, relevance, etc. Looking at the information quality literature, scholars tend to consider credibility as a dimension of quality—a set of characteristics, which allows indirect (vs. direct) evaluation or prediction of information quality. That is, when users do not have sufficient knowledge to judge the quality of the given information and/or those who are not deeply involved with the given task, they may rely on the markers/cues and heuristics of information credibility, rather than directly evaluate the information quality.

Information foraging theory (Pirolli & Card, 1999) may be a good theoretical lens to understand the relationship between information credibility and information quality. The indirect evaluation of information quality by credibility markers/cues may be understood as following "information scents" (Pirolli, 1997) or "residues" (Furnas, 1997), which are imperfect representations of the information quality based on proximal cues, such as source credentials, hyperlinks in a Website, etc. Using the analogy, credibility markers/cues may exude either a positive, negative, or even neutral 'scent' in sense-making around the quality of the information.

Operationalization of Web Credibility in Various Contents

Future research will continue studying human information behaviors regarding how people judge information credibility in various contexts. In particular, as new types of websites and information systems emerge continuously, the design of information scents or residues (Furnas, 1997; Pirolli, 1997) to support heuristic evaluation of information credibility by users will still remain a very active area of research in the future.

As mentioned above, Web credibility assessment is different from and more complex than credibility assessment in interpersonal communication due to the dynamic nature of the Web, its technologies, and document genres. Recent studies on Web credibility started paying attention to user-generated content, such as posts on SNSs, blogs, including micro-blogs (e.g., Twitter), and questions and answers in social Q&A sites. Since the user-generated content often lacks cues/markers for source credibility, it can be a challenge for users to evaluate whether the given information (i.e., user-generated content) is credible or not. Therefore, future research on Web credibility assessment will need to study the unique features of the user-generated contents and related information behaviors on those sites. Appropriate measures need to be identified to capture those user behaviors and enable Web credibility assessment in specific contexts.

There have been studies examining age differences in trust from the perspectives of neural activity, which may underlie older adults' vulnerability to fraud. Most of the previous studies, however, have been either based on or focusing on younger generations' perceptions, such as college students or high school students. Others have been conducted with the general population, consisting of a wide range of age groups. Even though some studies have dealt with older adults' credibility assessment of online health information, they tended to focus on the factors responsible for older adults' distrust of online information, rather than looking into the

underlying dimensions and structures of their perceptions of Web credibility. In light of the expected increase in the population of older adults who use the Internet, future research on information credibility needs to pay more attention on older users as an important research population, aiming at developing a model of older adults' Web credibility assessment. The model could be utilized for designing older adult-friendly information credibility cues and information technology literacy programs.

References

Adamic, L. A., Zhang, J., Bakshy, E., & Ackerman, M. S. (2008). Knowledge sharing and Yahoo Answers: Everyone knows something. *Proceedings of the 17th International Conference on World Wide Web*, 665-674. doi:10.1145/1367497.1367587

Agichtein, E., Castillo, C., Donato, D., Gionis, A., & Mishne, G. (2008). Finding high-quality content in social media. *Proceedings of the 2008 International Conference on Web Search and Data Mining*, 183-194. doi:10.1145/1341531.1341557

Ahmad, R., Komlodi, A., Wang, J., & Hercegfi, K. (2010). The impact of user experience levels on web credibility judgments. *Proceedings of the American Society for Information Science and Technology, 47*(1), 1-4. doi:10.1002/meet.14504701180

Arazy, O., & Kopak, R. (2011). On the measurability of information quality. *Journal of the American Society for Information Science and Technology, 62*(1), 89-99. doi:10.1002/asi.21447

Berlo, D. K., Lemert, J. B., & Mertz, R. J. (1969). Dimensions for evaluating the acceptability of message sources. *Public Opinion Quarterly, 33*(4), 563-576. doi:10.1086/267745

Bernstam, E. V., Shelton, D. M., Walji, M., & Meric-Bernstam, F. (2004). Instruments to assess the quality of health information on the World Wide Web: What can our patients actually use? *International Journal of Medical Informatics, 74*, 13-19. doi:10.1016/j.ijmedinf.2004.10.001

Burnette, J. L. (2007). Operationalization. In R. F. Baumeister, & K. D. Vohs, (Eds.), *Encyclopedia of Social Psychology.* (pp. 636-637). Thousand Oaks, CA: Sage Publications.

Castle, E., Eisenberger, N. I., Seeman, T. E., Moons, W. G., Boggero, I. A., Grinblatt, M. S., & Taylor, S. E. (2012). Neural and behavioral bases of age differences in perceptions of trust. *Proceedings of the National Academy of Sciences*. doi:10.1073/pnas.1218518109

Chesney, T. (2006). An empirical examination of Wikipedia's credibility. *First Monday, 11*(11).

Cheung, C. M. K., & Lee, M. K. O. (2006). Understanding consumer trust in Internet shopping: A multidisciplinary approach. *Journal of the American Society for Information Science and Technology, 57*(4), 479-492. doi:10.1002/asi.20312

Choi, W. (2013). What makes online health information credible for older adults?: An exploratory study. *CHI '13 Extended Abstracts on Human Factors in Computing Systems*, 2671-2676. doi:10.1145/2468356.2479491

Chung, C. J., Nam, Y., & Stefanone, M. A. (2012). Exploring online news credibility: The relative influence of traditional and technological factors. *Journal of Computer-Mediated Communication, 17*(2), 171-186. doi:10.1111/j.1083-6101.2011.01565.x

Cosley, D., Frankowski, D., Terveen, L., & Riedl, J. (2007). SuggestBot: Using intelligent task routing to help people find work in wikipedia. *Proceedings of the 12th International Conference on Intelligent User Interfaces*, 32-41. doi:10.1145/1216295.1216309

Credibility. (n.d.). In *American Heritage Dictionary of the English Language.* Retrieved from http://www.ahdictionary.com/word/search.html?q=credibility&submit.x=51&submit.y=23

Eastin, M. S. (2001). Credibility assessments of online health information: The effects of source expertise and knowledge of content. *Journal of Computer-Mediated Communication, 6*(4). Retrieved from http://onlinelibrary.wiley.com/doi/10.1111/j.1083-6101.2001.tb00126.x/full

Fernquist, J., & Chi, E. H. (2013). Perception and understanding of social annotations in web search. *Proceedings of the 22nd International Conference on World Wide Web*, 403-412.

Fisk, A. D., Rogers, W. A., Charness, N., Czaja, S. J., & Sharit, J. (2009). *Designing for older adults: Principles and creative human factors approaches* (2 ed.). Boca Raton, FL: CRC Press.

Flanagin, A. J., & Metzger, M. J. (2000). Perceptions of Internet information credibility. *Journalism & Mass Communication Quarterly, 77*(3), 515-540. doi:10.1177/107769900007700304

Flanagin, A. J., & Metzger, M. J. (2003). The perceived credibility of personal Web page information as influenced by the sex of the source. *Computers in Human Behavior, 19*(6), 683-701. doi:10.1016/S0747-5632(03)00021-9

Flanagin, A. J., & Metzger, M. J. (2008). Digital media and youth: Unparalleled opportunity and unprecedented responsibility. In M. J. Metzger, & A. J. Flanagin (Eds.), *Digital media, youth, and credibility* (pp. 5-27). Cambridge, MA: The MIT Press.

Flanagin, A. J., & Metzger, M. J. (2013). Trusting expert-versus user-generated ratings online: The role of information volume, valence, and consumer characteristics. *Computers in Human Behavior, 29*(4), 1626-1634. doi:10.1016/j.chb.2013.02.001

Fogg, B. J. (2003a). *Persuasive technology: Using computers to change what we think and do*. San Francisco, CA: Morgan Kaufmann Publishers.

Fogg, B. J. (2003b). Prominence-interpretation theory. *CHI '03 Extended Abstracts on Human Factors in Computing Systems*, 722-723. doi:10.1145/765891.765951

Fogg, B. J., Marshall, J., Laraki, O., Osipovich, A., Varma, C., Fang, N., . . . Treinen, M. (2001). What makes Web sites credible?: A report on a large quantitative study. *Proceedings of*

the SIGCHI Conference on Human Factors in Computing Systems, 61-68. doi:10.1145/365024.365037

Fogg, B. J., Soohoo, C., Danielson, D. R., Marable, L., Stanford, J., & Tauber, E. R. (2003). How do users evaluate the credibility of Web sites?: A study with over 2,500 participants. *Proceedings of the 2003 Conference on Designing for User Experiences*, 1-15. doi:10.1145/997078.997097

Francke, H., & Sundin, O. (2012). Negotiating the role of sources: Educators' conceptions of credibility in participatory media. *Library & Information Science Research, 34*(3), 169-175. doi:10.1016/j.lisr.2011.12.004

Fritch, J. W., & Cromwell, R. L. (2001). Evaluating Internet resources: Identity, affiliation, and cognitive authority in a networked world. *Journal of the American Society for Information Science and Technology, 52*, 499-507. doi:10.1002/asi.1081.abs

Furnas, G. W. (1997). Effective view navigation. *Proceedings of the ACM SIGCHI Conference on Human Factors in Computing Systems*, 367-374. doi:10.1145/258549.258800

Gaziano, C., & McGrath, K. (1986). Measuring the concept of credibility. *Journalism Quarterly, 63*(3), 451-462.

Giffin, K. (1967). The contribution of studies of source credibility to a theory of interpersonal trust in the communication process. *Psychological Bulletin, 68*(2), 104-120. doi:10.1037/h0024833

Giudice, K. D. (2010). Crowdsourcing credibility: The impact of audience feedback on Web page credibility. *Proceedings of the American Society for Information Science and Technology, 47*(1), 1-9. doi:10.1002/meet.14504701099

Hargittai, E., Fullerton, L., Menchen-Trevino, E., & Thomas, K. Y. (2010). Trust online: Young adults' evaluation of web content. *International Journal of Communication, 4*, 468-494.

Hilligoss, B., & Rieh, S. Y. (2008). Developing a unifying framework of credibility assessment: Construct, heuristics, and interaction in context. *Information Processing & Management, 44*, 1467-1484. doi:10.1016/j.ipm.2007.10.001

Hong, T. (2006a). Contributing factors to the use of health-related websites. *Journal of Health Communication, 11*, 149-165. doi:10.1080/10810730500526679

Hong, T. (2006b). The influence of structural and message features on Web site credibility. *Journal of the American Society for Information Science and Technology, 57*, 114-127. doi:10.1002/asi.20258

Hovland, C. I., Janis, I. L., & Kelley, H. H. (1953). *Communication and persuasion: Psychological studies of opinion change*. New Haven, CT: Yale University Press.

Huvila, I. (2013). In Web search we trust?: Articulation of the cognitive authorities of Web searching. *Information Research, 18*(1).

Jansen, B. J., & Resnick, M. (2006). An examination of searcher's perceptions of nonsponsored and sponsored links during ecommerce Web searching. *Journal of the American Society for Information Science and Technology, 57*(14), 1949-1961. doi:10.1002/asi.20425

Jeon, G. Y., & Rieh, S. Y. (2014). Answers from the crowd: How credible are strangers in social Q&A? *iConference 2014 Proceedings*, 663-668. doi:10.9776/14309

Jessen, J., & Jørgensen, A. H. (2012). Aggregated trustworthiness: Redefining online credibility through social validation. *First Monday, 17*. Retrieved from http://journals.uic.edu/ojs/index.php/fm/article/view/3731/3132

Johnson, T. J., & Kaye, B. K. (1998). Cruising is believing?: Comparing internet and traditional sources on media credibility measures. *Journalism & Mass Communication Quarterly, 75*, 325-340. doi:10.1177/107769909807500208

Johnson, T. J., & Kaye, B. K. (2000). Using is believing: The influence of reliance on the credibility of online political information among politically interested Internet users. *Journalism & Mass Communication Quarterly, 77*(4), 865-879.

Johnson, T. J., & Kaye, B. K. (2004). Wag the Blog: How Reliance on Traditional Media and the Internet Influence Credibility Perceptions of Weblogs Among Blog Users. *Journalism & Mass Communication Quarterly, 81*(3), 622-642. doi:10.1177/107769900408100310

Johnson, T. J., & Kaye, B. K. (2009). In blog we trust? Deciphering credibility of components of the internet among politically interested internet users. *Computers in Human Behavior, 25*(1), 175-182.

Johnson, T. J., Kaye, B. K., Bichard, S. L., & Wong, W. J. (2007). Every Blog Has Its Day: Politically-interested Internet Users' Perceptions of Blog Credibility. *Journal of Computer-Mediated Communication, 13*(1), 100-122. doi:10.1111/j.1083-6101.2007.00388.x

Julien, H., & Barker, S. (2009). How high-school students find and evaluate scientific information: A basis for information literacy skills development. *Library & Information Science Research, 31*(1), 12-17. doi:10.1016/j.lisr.2008.10.008

Kim, D. (2012). Interacting is believing? Examining bottom-Up credibility of blogs among politically interested Internet users. *Journal of Computer-Mediated Communication, 17*(4), 422-435. doi:10.1111/j.1083-6101.2012.01583.x

Kim, S. (2010). Questioners' credibility judgments of answers in a social question and answer site. *Information Research, 15*(2). Retrieved from http://informationr.net/ir/15-2/paper432.html

Kiousis, S. (2001). Public trust or mistrust?: Perceptions of media credibility in the information age. *Mass Communication and Society, 4*(4), 381-403. doi:10.1207/s15327825mcs0404_4

Liu, Z. M. (2004). Perceptions of credibility of scholarly information on the web. *Information Processing & Management, 40*(6), 1027-1038. doi:10.1016/S0306-4573(03)00064-5

Liu, Z. M., & Huang, X. B. (2005). Evaluating the credibility of scholarly information on the web: A cross cultural study. *International Information & Library Review, 37*(2), 99-106. doi:10.1016/j.iilr.2005.05.004

Lucassen, T., Muilwijk, R., Noordzij, M. L., & Schraagen, J. M. (2013). Topic familiarity and information skills in online credibility evaluation. *Journal of the American Society for Information Science and Technology, 64*(2), 254-264. doi:10.1002/asi.22743

Lucassen, T., & Schraagen, J. M. (2011). Factual accuracy and trust in information: The role of expertise. *Journal of the American Society for Information Science and Technology, 62*(7), 1232-1242. doi:10.1002/Asi.21545

McCroskey, J. C., & Teven, J. J. (1999). Goodwill: A reexamination of the construct and its measurement. *Communications Monographs, 66*(1), 90-103. doi:10.1080/03637759909376464

Metzger, M. J. (2007). Making sense of credibility on the Web: Models for evaluating online information and recommendations for future research. *Journal of the American Society for Information Science and Technology, 58*(13), 2078-2091. doi:10.1002/asi.20672

Metzger, M. J., Flanagin, A. J., Eyal, K., Lemus, D. R., & McCann, R. M. (2003). Credibility for the 21st century: Integrating perspectives on source, message, and media credibility in the contemporary media environment. In P. J. Kalbfleisch (Ed.), *Communication yearbook* (Vol. 27, pp. 293-336). Mahwah, NJ: Lawrence Erlbaum Associates, Inc., Publishers.

Metzger, M. J., Flanagin, A. J., & Medders, R. B. (2010). Social and Heuristic Approaches to Credibility Evaluation Online. *Journal of Communication, 60*(3), 413-439. doi:10.1111/j.1460-2466.2010.01488.x

Metzger, M. J., Flanagin, A. J., & Zwarun, L. (2003). College student Web use, perceptions of information credibility, and verification behavior. *Computers & Education, 41*(3), 271-290. doi:10.1016/s0360-1315(03)00049-6

O'Keefe, D. J. (1990). *Persuasion : Theory and research*. Newbury Park, CA: Sage Publications.

Pan, B., Hembrooke, H., Joachims, T., Lorigo, L., Gay, G., & Granka, L. (2007). In Google we trust: Users' decisions on rank, position, and relevance. *Journal of Computer-Mediated Communication, 12*(3), 801-823. doi:10.1111/j.1083-6101.2007.00351.x

Petty, R. E., & Cacioppo, J. T. (1981). The elaboration likelihood model of persuasion. In L. Berkowitz (Ed.), *Advances in experimental social psychology* (pp. 123-205). New York, NY: Springer-Verlag.

Pirolli, P. (1997). Computational models of information scent-following in a very large browsable text collection. *Proceedings of the ACM SIGCHI Conference on Human Factors in Computing Systems*, 3-10. doi:10.1145/258549.258558

Pirolli, P., & Card, S. (1999). Information foraging. *Psychological Review, 106*(4), 643-675. doi:10.1037/0033-295X.106.4.643

Princeton Survey Research Associates. (2002). *A matter of trust: What users want from web sites*. Yonkers, NY: Consumer WebWatch. Retrieved from http://consumersunion.org/wp-content/uploads/2013/05/a-matter-of-trust.pdf

Rieh, S. Y. (2010). Credibility and cognitive authority of information. In M. Bates, & M. N. Maack, (Eds.), *Encyclopedia of Library and Information Sciences.* 3rd Ed. (pp. 1337-1344). New York: Taylor and Francis Group, LLC.

Rieh, S. Y., & Danielson, D. R. (2007). Credibility: A multidisciplinary framework. *Annual Review of Information Science and Technology, 41*(1), 307-364. doi:10.1002/aris.2007.1440410114

Rieh, S. Y., Jeon, G. Y., Yang, J. Y., & Lampe, C. (2014). Audience-aware credibility: From understanding audience to establishing credible blogs. *Proceedings of the Eight International AAAI Conference on Weblogs and Social Media (ICWSM 2014)*.

Robertson-Lang, L., Major, S., & Hemming, H. (2011). An exploration of search patterns and credibility issues among older adults seeking online health information. *Canadian Journal on Aging, 30*(4), 631-645. doi:10.1017/S071498081100050X

Robins, D., & Holmes, J. (2008). Aesthetics and credibility in web site design. *Information Processing & Management, 44*(1), 386-399.

Rowley, J., & Johnson, F. (2013). Understanding trust formation in digital information sources: The case of Wikipedia. *Journal of Information Science, 39*(4), 1-15. doi:10.1177/0165551513477820

Savolainen, R. (2011). Judging the quality and credibility of information in Internet discussion forums. *Journal of the American Society for Information Science and Technology, 62*(7), 1243-1256. doi:10.1002/asi.21546

Savolainen, R. (2012). The structure of argument patterns on a social Q&A site. *Journal of the American Society for Information Science and Technology, 63*(12), 2536-2548. doi:10.1002/asi.22722

St. Jean, B., Rieh, S. Y., Yang, J. Y., & Kim, Y.-M. (2011). How content contributors assess and establish credibility on the web. *Proceedings of the American Society for Information Science and Technology, 48*(1), 1-11. doi:10.1002/meet.2011.14504801163

Stvilia, B., Gasser, L., Twidale, M. B., & Smith, L. C. (2007). A framework for information quality assessment. *Journal of the American Society for Information Science and Technology, 58*(12), 1720-1733. doi:10.1002/asi.20652

Stvilia, B., Twidale, M. B., Smith, L. C., & Gasser, L. (2005). Assessing information quality of a community-based encyclopedia. *Proceedings of the International Conference on Information Quality (ICIQ)*, 442-454.

Sundar, S. S. (2008). The MAIN model: A heuristic approach to understanding technology effects on credibility. In M. J. Metzger, & A. J. Flanagin (Eds.), *Digital media, youth, and credibility* (pp. 73-100). Cambridge, MA: The MIT Press.

Sundar, S. S., Knobloch-Westerwick, S., & Hastall, M. R. (2007). News cues: Information scent and cognitive heuristics. *Journal of the American Society for Information Science and Technology, 58*(3), 366-378. doi:10.1002/asi.20511

Taraborelli, D. (2008). How the Web is changing the way we trust. *Current issues in computing and philosophy*, 194-204.

Tseng, S., & Fogg, B. J. (1999). Credibility and computing technology. *Communications of the ACM, 42*(5), 39-44. doi:10.1145/301353.301402

Wathen, C. N., & Burkell, J. (2002). Believe it or not: Factors influencing credibility on the Web. *Journal of the American Society for Information Science and Technology, 53*(2), 134-144. doi:10.1002/asi.10016

Westerwick, A. (2013). Effects of sponsorship, Web site design, and Google ranking on the credibility of online information. *Journal of Computer-Mediated Communication, 18*(2), 80-97. doi:10.1111/jcc4.12006

Whitehead Jr., J. L. (1968). Factors of source credibility. *Quarterly Journal of Speech, 54*(1), 59-63. doi:10.1080/00335636809382870

Wilson, P. (1983). *Second-hand knowledge: An inquiry into cognitive authority*. Westport, CT: Creenwood Press.

Yaari, E., Baruchson-Arbib, S., & Bar-Ilan, J. (2011). Information quality assessment of community generated content: A user study of Wikipedia. *Journal of Information Science,* 0165551511416065.

Yi, Y. J., Stvilia, B., & Mon, L. (2012). Cultural influences on seeking quality health information: An exploratory study of the Korean community. *Library & Information Science Research, 34*(1), 45-51. doi:10.1016/j.lisr.2011.06.001

Zhang, Y. (2014). Beyond quality and accessibility: Source selection in consumer health information searching. *Journal of the Association for Information Science and Technology, 65*(5), 911-927. doi:10.1002/asi.23023

Zulman, D. M., Kirch, M., Zheng, K., & An, L. C. (2011). Trust in the internet as a health resource among older adults: Analysis of data from a nationally representative survey. *Journal of Medical Internet Research, 13*(1). doi:10.2196/jmir.1552