Making Sense of Credibility on the Web: Models for Evaluating Online Information and Recommendations for Future Research

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This article summarizes much of what is known from the communication and information literacy fields about the skills that Internet users need to assess the credibility of online information. The article reviews current recommendations for credibility assessment, empirical research on how users determine the credibility of Internet information, and describes several cognitive models of online information evaluation. Based on the literature review and critique of existing models of credibility assessment, recommendations for future online credibility education and practice are provided to assist users in locating reliable information online. The article concludes by offering ideas for research and theory development on this topic in an effort to advance knowledge in the area of credibility assessment of Internet-based information.

Introduction

In just the last two decades, the Internet has become integrated into our lives as an important, if not indispensable, tool for information and communication (Fallows, 2005). The plethora of information available online, coupled with heavy reliance on the Internet by information seekers raise issues of the credibility or quality of information found online. Credibility in this context refers to the *believability* of some information and/or its source (Hovland, Janis, & Kelley, 1953). A long history of research finds that credibility is a multifaceted concept with two primary dimensions: expertise and trustworthiness. Secondary factors affect credibility perceptions as well, including source attractiveness and dynamism, for example (O'Keefe, 2002). It also is understood that the credibility of a source or message is a receiver-based judgment which involves both objective judgments of information quality or accuracy as well as subjective perceptions of the source's trustworthiness, expertise, and attractiveness (Freeman & Spyridakis, 2004).

Recent concerns about credibility stem from the fact that Internet and digitization technologies both lower the cost of and increase access to information production and dissemination. The result is that more information from more sources is available and more easily accessible now than ever before. In the past, substantial costs of information production and dissemination on a mass scale limited the number of sources to only those with enough authority and capital to justify and sell an information product. In the digital environment, however, nearly anyone can be an author, as authority is no longer a prerequisite for content provision on the Internet. This obviously raises issues of credibility, a problem that is exacerbated by the fact that many Web sites operate without much oversight or editorial review. Unlike most traditional (i.e., print) publishing, information posted on the Web may not be subject to filtering through professional gatekeepers, and it often lacks traditional authority indicators such as author identity or established reputation. Additionally, there are no universal standards for posting information online, and digital information may be easily altered, plagiarized, misrepresented, or created anonymously under false pretenses (Fritch & Cromwell, 2001, 2002; Johnson & Kaye, 2000; Metzger, Flanagin, Eyal, Lemus, & McCann, 2003; Rieh, 2002).

Burbules (1998) further suggested that because information is presented in a similar format online (i.e., Web sites), a kind of "leveling effect" is created that puts all information on the same level of accessibility, and thus all authors on the same level of credibility in the minds of Internet users. Studies of Web-based health information substantiate fears regarding the credibility of Internet-based information by concluding that the quality of online health information varies dramatically, with much of the information being inaccurate and incomplete (Eysenbach, Powell, Kuss, & Sa, 2002; Kunst, Groot, Latthe, Latthe, & Kahn, 2002; Morahan-Martin & Anderson, 2000; Rice & Katz, 2001; Seidman, 2006).

The culmination of all this is that the Internet has made the need to critically evaluate information more important than ever before while also shifting the burden of credibility assessment and quality control from professional gatekeepers onto individual information seekers. Developing the skills to evaluate Web-based information, then, is crucial for Internet users; however, there is evidence that many people are unprepared for this responsibility and may have trouble determining how to assess the credibility of online information (Amsbary & Powell, 2003; Meola, 2004; Metzger, Flanagin, Eyal, et al., 2003; Scholz-Crane, 1998).

The aims of this article are to critically review current efforts to help Internet users acquire the skills needed to find credible information online and to evaluate existing theoretical models and user-based strategies of credibility assessment. The article proceeds by describing the common "checklist" approach to credibility assessment, which is then compared with other (e.g., cognitive and contextual) models of credibility, as well as empirical studies of users' evaluations of Internet information. Findings of this review are then leveraged to (a) suggest more effective strategies for educators and practitioners in helping information consumers discern credibility, (b) evaluate possible tools and social applications that could be developed to assist users in locating credible information online (e.g., seal programs, rating systems, vetted databases, digital signatures, and collaborative filtering), and (c) propose a research agenda for future work in this area, including a new "dual processing" model of credibility assessment.

Critical Evaluation Skills: Training Users to Evaluate Online Information

Shortly after the problem of establishing credibility in the online environment was recognized, efforts to educate and train users were under way. Many of these efforts were couched within the "digital literacy" movement and lead by such groups as the American Library Association, the National Institute for Literacy (Kapoun, 1998; Rosen, 1998; Smith, 1997), and various healthcare agencies and consumer groups (Freeman & Spyridakis, 2004). A common aim of these groups was to assist Internet users in developing the skills needed to critically evaluate online information.

A key starting point for the digital literacy movement was the understanding that the skills needed to determine the quality or credibility of online information are largely the same as those for evaluating information found in other channels of communication (Alexander & Tate, 1999; Brandt, 1996; Fritch & Cromwell, 2001). Based on that, the literature identifies five criteria that users should employ in their assessments of the credibility of Internet-based information: accuracy, authority, objectivity, currency, and coverage or scope (see Alexander & Tate, 1999; Brandt, 1996;

Fritch & Cromwell, 2001; Kapoun, 1998; Meola, 2004; Scholz-Crane, 1998; Smith, 1997).[1]

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

Checklist Approaches

Training programs based on these evaluative criteria typically develop checklists to guide users through the credibility evaluation process. Specifically, users are taught to ask and answer a list of questions designed to cover each criterion. For example, for currency, users are to check for a date stamp indicating when the information was originally uploaded or last changed (i.e., "Does the site provide information about when the information was last posted or updated?"). Under accuracy, they are to check if the author provides contact information (i.e., "Does the Web site list contact information such as a phone number or address?"). One problem with this kind of "checklist" approach is that it is rather time consuming and labor intensive for individual Internet users to perform for each site they visit (Meola, 2004).

Indeed, studies have found that users are seldom diligent in checking the accuracy of the information they obtain online (Flanagin & Metzger, 2000; Scholz-Crane, 1998). In a series of studies, Metzger and Flanagin examined the degree to which Internet consumers use each of the recommended criteria (i.e., accuracy, authority, objectivity, currency, and coverage) to gauge the credibility of the information they

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[1]Most digital literacy efforts focus on users' assessments of the credibility of Web pages, and so this discussion is accordingly limited to this form of online information; however, note that there are many other types of Internet-based information that have serious credibility implications, such as blogs, wikis, social networking sites, chat groups, and e-mail. Each of these forms of communication is somewhat unique and carries with it specific credibility concerns. That said, the general principles of critical evaluation should be applicable, albeit to different degrees, across all types of network-based information.

TABLE 1.   Frequency of verification behaviors across each sample and overall.

	Dataset (M)					
Year data collected:	1999	1999	2000	2001	2001	
Population sampled:	students	nonstudents	students	students	nonstudents	Overall
N =	718	323	485	300	274	M
Check to see if the information is current.	3.18	3.21	2.68	3.16	3.66	3.18
Consider whether the views represented are facts or opinions.	2.88	2.95	3.02	3.10	3.61	3.11
Check to see that the information is complete and comprehensive.	3.04	2.91	2.90	3.09	3.26	3.04
Seek out other sources to validate the information.	2.57	2.82	2.85	2.79	3.38	2.88
Consider the author's goals/objectives for posting information.	2.65	2.69	2.39	3.03	3.15	2.78
Check to see who the author of the Web site is.	2.25	2.51	1.85	2.43	3.02	2.41
Look for an official "stamp of approval" or a recommendation from someone you know.	2.20	2.45	N/A	2.43	2.96	2.51
Check to see whether the contact information for that person or organization is provided on the site.	2.09	2.31	2.10	2.27	2.91	2.34
Verify the author's qualifications or credentials.	1.97	2.25	1.78	2.09	2.61	2.14

Note. 1 = never, 2 = rarely, 3 = occasionally, 4 = often, 5 = all the time.

Please see the following citations for detailed information about the sample and questionnaire items (Flanagin & Metzger, 2000, 2007; Metzger, Flanagin, & Zwarun, 2003).

found online. Survey data were collected across 3 years (1999–2001) from five different samples. (Three samples consisted of college students, and two samples were of general adult Internet users; $n = 274–718$). Respondents were asked to indicate how often they performed nine behaviors when visiting Web sites. Specifically, they were asked how often they check if the information is up-to-date (i.e., currency), to consider whether the views represented on a site are facts or opinions (i.e., objectivity), to consider the author's goals/objectives for posting the information (i.e., objectivity), to check that the information is complete and comprehensive (i.e., coverage), to seek other sources to validate the information on a site (i.e., accuracy), to check the author of the Web site (i.e., authority), to verify the author's qualifications or credentials (i.e., authority), to check whether the contact information for the author or organization is provided on the site (i.e., authority), and to look for an official "stamp of approval" or a recommendation from someone they know (i.e., authority).

Data analysis revealed striking similarity in both the frequency and nature of respondents' evaluation behaviors across all samples (see Table 1). Overall, respondents in every study reported performing each of the nine evaluation behaviors only "rarely" to "occasionally." Users evaluated Web sites' currency, comprehensiveness, and objectivity most often (although still only occasionally) whereas checking the author's identity, qualifications, and contact information were evaluated least often by respondents across the samples. Looking for other sources or recommendations and considering the goals of the author of the information fell in the middle. In general, Internet users scored highest on the actions that are easiest to perform and that only require their opinion (e.g., considering whether a site's information is current and complete), and lowest on the recommendations that are more time consuming and that require effort to perform (e.g., verifying the qualifications or credentials of the author), even if the effort is fairly minimal (i.e., checking if contact information is provided). These data are interesting in many ways, but the most worrisome finding is that the strategy least practiced (i.e., verifying an author's qualifications) is perhaps the most important for establishing credibility.[2]

Another study using different research methodology similarly found that Internet users do not vigorously apply the five criteria in their judgments of information quality (Scholz-Crane, 1998). In this study, 21 college students evaluated two Web sites. Participants were asked to write in an essay format "how they would evaluate the quality of each site including specific criteria used to assess this quality" (p. 55). Content analyses revealed that of the five criteria, most students used only two in their evaluations of information quality: scope (e.g., the site provides detailed information) and accuracy (e.g., the site contained statistics, cited sources, and was clearly written and well organized). Only 6 students assessed objectivity by considering whether there was evidence of bias on the sites, and fewer considered authority (by looking at the author identity or site sponsor) or contact information. In many cases, students used a single criterion in their final decision about the quality of the

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[2] Across all datasets, evaluation behavior was positively related to experience online. At first glance, this bodes well for the future: As people gain experience, they will be more likely to evaluate online information; however, there is some evidence that people with greater experience exaggerate their critical evaluation behavior on self-report measures (see Flanagin & Metzger, 2007). In addition, education seems to be a factor, as people with more education report evaluating online information more often than do those with less education. This speaks to the need for digital literacy efforts to target at-risk groups, including younger and less educated populations.

Web sites. A clear conclusion from the various Metzger and Flanagin studies and from the Scholz-Crane (1998) data is that few users are rigorously evaluating the quality of the information they obtain via the Internet (also see Eysenbach & Kohler, 2002; Wilder, 2005).

Additional Models of Web Information Evaluation

The checklist approach to credibility assessment is the most popular among educators, although other models have been proposed. For example, Fritch and Cromwell (2001, 2002) presented a model for ascribing cognitive authority to Internet information. Cognitive authority is a term they used to incorporate both the notions of credibility and quality; it is what people evaluate "to know what credence and impact to impart to any specific body of information" (2002, p. 243). Fritch and Cromwell (2001) proposed an iterative model whereby assessments of authority and credibility are made by the information seeker at the levels of author, document, institution, and affiliations, which then are integrated into a global judgment of online information credibility. In this model, verifying the author and/or institutional identity of a Web site through reputation or stated qualifications, considering the factual accuracy of the Web document and its presentation and format, and examining both overt and covert affiliations of the Web site are recommended strategies that, when combined, contribute to an overall impression of its cognitive authority.[3] This model is similar to the previously described "checklist" model in that it provides a "to do" list for Internet users, but differs from that model in that it places more emphasis on the technological tools available to users for making these assessments. For example, to help establish author identity and site affiliations, Fritch and Cromwell (2003) recommend using tools such as Whois, Traceroute, and NSlookup/Dig. These technologies can assist users in finding the identity of the owner of a particular Web site and can reveal affiliations between organizations or Web sites that are not immediately apparent.

Walthen and Burkell (2002) also proposed an iterative model for how users judge the credibility of online information based on a review of literature in psychology and communication. They posited that credibility assessment takes place in three stages. First, users form an impression of the overall site credibility by examining its surface characteristics including, for example, its appearance and presentation (e.g., colors, graphics, typographical errors), usability and interface design (e.g., navigability), and organization of information. Next, the information or site content is evaluated for its credibility by looking at characteristics of the source (e.g., expertise, trustworthiness, credentials) and message (e.g., currency, accuracy, relevance to the user). The third stage of their model involves factoring in the user's cognitive state at the time of evaluation. In other words, assessments of the message presentation and content will differ depending on the users' need for information, need for cognition, and prior knowledge of the topic, and these will interact with other situational and individual-level factors (e.g., time available for information retrieval and processing).

This model resembles Fritch and Cromwell's (2001) model for ascribing cognitive authority in that it suggests there are different levels of credibility assessment that are combined to form a final judgment (also see Rieh, 2002). Another similarity to the checklist model is that it provides evaluative criteria that users are supposed to consider in their credibility assessments. The model differs from the others, however, in that it incorporates aspects of the information receiver as being important to the evaluation process, highlighting the fact that credibility judgments are situational and dependent on individual-level factors. Indeed, information scientists have long understood that both a user's informational needs and context are fundamental to information evaluation and use.

Factors Important to Users of Web-Based Information

One problem with the foregoing models of credibility evaluation is that none has been tested using actual Internet users as they seek information online. Another problem, related to the first, is that these models have not been directly connected to studies examining what factors people *really do* use to determine credibility online. Researchers have suggested myriad factors that may play into credibility assessments (see Table 2), but only a few studies have examined what criteria people actually employ. The studies that do so are reviewed next (see also Morahan-Martin, 2004).

In a study involving 21 participants, Eysenbach and Kohler (2002) examined how consumers appraise the quality of online health information. The research was conducted in three stages, beginning with focus groups to identify the criteria participants say they use in deciding whether Internet health information is credible. The second stage involved observing a subsample of the focus-group participants as they sought health information online that they "felt confident about." The third stage consisted of the researchers interviewing them about their searches to understand participants' decision-making processes and criteria for selecting particular Web sites. Interestingly, what focus-group participants said they looked for in assessing credibility was not what the researchers found they actually looked at during the observational portion of the study. An analysis of the focus-group discussions revealed that participants' main criteria for assigning credibility rested on whether the source was an official authority, whether the page cited scientific references, whether the site was professionally designed and easy

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[3]Seidman (2006) offered a model of third-party health Web site evaluation that involves experts vetting and rating sites along structural and performance criteria. Structural criteria include whether a health site: (a) explains the process by which content was generated and selected for inclusion; (b) provides author identity, affiliations, credentials, and contact information; (c) uses peer review and supports claims with evidence; and (d) regularly dates and updates content. Performance criteria include measures of the comprehensiveness and accuracy of the information provided on the site against known evidence-based practice guidelines and expert medical opinion.

TABLE 2.   Suggested factors that influence credibility assessments of online information.

Presence of date stamp showing information is current
Source citations
Citations to scientific data or references
Author identification
Author qualifications and credentials
Presence of contact information
Absence of advertising
Presence of privacy and security policies
Certifications or seals from trusted third parties
Professional, attractive, and consistent page design, including graphics, logos, color schemes, etc.
Easy navigation, well-organized site
Sponsorship by of external links to reputable organizations
Notification/presence of editorial review process or board
Absence of typographical errors and broken links
Professional-quality and clear writing
Download speed
Message relevance, tailoring
Interactive features (e.g., search capabilities, confirmation messages, quick customer-service responses)
Past experience with source/organization (reputation)
Domain name and URL (suffix)
Ability to verify claims elsewhere (e.g., external links)
Comprehensiveness of information provided
Ranking in search engine output
Paid access to information
Plausibility of arguments

Source: Alexander & Tate, 1999; Eysenbach & Kohler, 2002; Fogg et al., 2003; Freeman & Sprydakis, 2004; Metzger et al., 2003; Rieh & Belkin, 1998; Rieh, 2002; Walthen & Burkell, 2002.

Note. Of course, not all factors will apply to every Web site. Site type (e.g., a commercial vs. an individual's Web site), and receiver factors (e.g., purpose and motivation for information search, Internet experience and prior knowledge) also will make a difference in which factors are applicable and which factors are used during the evaluation (Flanagin & Metzger, 2000; Fogg et al., 2003). In addition, some factors are more or less helpful at evaluating credibility at different "levels" (e.g., at the level of the Web site as a whole or at the level of messages residing on Web sites). To illustrate, factors having to do with site design and navigation will be more relevant to judgments of site credibility whereas factors such as argument plausibility and author credentials will likely be more important in evaluations of the credibility of messages on Web sites.

to use, and whether it was written in language that they could understand. Despite placing emphasis on the identity of the source and quality of the data presented on a Web site, the observational portion of the study revealed that while most participants used sites they were unfamiliar with, none looked at information about the source or how data on the sites were compiled. Perhaps most distressing, the post-search interviews revealed that "few participants took notice and later remembered from which websites they retrieved information or who stood behind the sites" (p. 576).

Eysenbach and Kohler's (2002) findings overlap somewhat with those of a study of online health-information seekers conducted by the Pew Internet and American Life project (S. Fox & Rainie, 2002). Using surveys and focus groups, this study found that overt commercialism, trusted third-party endorsements, site-design elements, as well as users' ability to determine the source and currency of the information posted on health-related Web sites were the most important criteria for assessing the credibility of online health information.

Rieh (2002) examined people evaluating the quality of information as they performed a variety of search tasks. Using think-aloud and interviewing procedures, she followed 15 academics as they searched for information online regarding four topics: academic research, health, travel, and product (ecommerce) information. Each participant was instructed to find information on Web sites that they considered to be of high quality. Rieh found that in making evaluations, participants' judgments were based on two basic criteria: the characteristics of the information "objects" that they found online and the characteristics of the source of online information. The characteristics of the information objects that participants were concerned about included the type of information object (e.g., journal article vs. chat forum), its content (i.e., how detailed, comprehensive, and technical the information provided is), its presentation (i.e., graphics), and its structure (i.e., how well organized the information is). Source characteristics that participants looked to were reputation and type of source (e.g., commercial vs. noncommercial source, .com vs. .edu, etc.).

A problem with studies such as those just reviewed is that they tend to rely on small, atypical user populations performing somewhat specialized search tasks. As a result, it may be difficult to generalize findings to other users. By contrast,

Fogg et al. (2003) conducted a large-scale study of a variety of user populations. In an online experiment, 2,648 people evaluated the credibility of several real Web sites that ranged in their informational content (e.g., news sites, ecommerce sites, nonprofit sites, health sites, travel sites, etc.). Fogg et al. analyzed user comments "to find out what features of a Web site get noticed when people evaluate credibility" (p. 1). Not surprisingly, results varied by the type of Web site evaluated (e.g., ecommerce sites vs. news sites, etc.), and most respondents mentioned many features. Summarizing the findings, people seemed to consider four broad categories of elements. The first was *site presentation*. This included visual design elements such as the graphics and readability of the site as well as the site's navigability and functionality (e.g., broken links, presence of a search feature). Interestingly, site design/presentational elements were the most frequently used criterion, with 46% of the comments including this feature. A second consideration related to the *information* on the page, including its organization, breadth/depth, accuracy, bias, usefulness, and the tone and clarity of writing. Third, the site operator's or source's *motives* were a factor. This includes selling intent, presence of advertising, clear identification of the site sponsor, and treatment of customers. Finally, the source's *reputation* played into users' credibility judgments, including name recognition, their past experience with the site, presence of seals of approval, or affiliations with reputable organizations.

To summarize, the results of the Fogg et al. (2003) study are similar to those of Rieh (2002) and Eysenbach and Kohler (2002) in that features of both the information itself (e.g., its organization, level of detail, etc.) and the source (e.g., commercial intent) matter in Internet users' credibility assessments. Results also reflect Scholz-Crane's (1998) finding described earlier that not all five of the critical evaluation skills criteria are used. Indeed, the data from Fogg et al.'s study show that people only used four of the five criteria: authority (e.g., through source reputation), accuracy of information, comprehensiveness of information, and objectivity (e.g., in evaluations of information bias and source motive). Together, this collection of studies indicates that people do not seem to take the currency of the information they find online into account when making credibility judgments. This is somewhat surprising, given that many Web pages indicate when the information was last updated at the bottom of the page.[4] In addition and perhaps most interesting, the review of research reveals that people rely most heavily on a criterion that is not among the five critical evaluation skills recommended to judge credibility. That is, design/ presentational elements appear to be the primary factor in users' credibility and information-quality assessments. The

implications of this finding are ominous in that they suggest Internet users may be easily duped by slick Web design. Taken together, these studies speak to a need to think beyond the checklist model to get people to critically evaluate the information they find online.

A Contextual Approach to Credibility Assessment

A very different approach to the checklist model and other models offering evaluative criteria lists is Meola's (2004) contextual model of Web site evaluation. Meola critiqued the idea of using checklists to evaluate online information because he believes they are unwieldy for users to perform (e.g., one checklist requires Internet users to answer over 112 questions per Web site viewed), and thus are an unrealistic approach to teaching critical evaluation. The aforementioned research (e.g., Flanagin & Metzger, 2000; Scholz-Crane, 1998) showing people's reluctance to exert much effort to verify online information supports his view. He also challenged the notion that all online information needs to be verified to the same degree by noting that more Web-based information these days is professionally vetted. In fact, he made a useful and important distinction between the "free Web" and the "fee-based Web" when it comes to credibility assessment. Although much of what is available on the free Web may not be subjected to peer or editorial review, the situation is very different for the fee-based Web, which includes professionally vetted subscription databases, prestigious journals, or national newspapers offering full-text access to their contents.

In contrast to the checklist model with its emphasis on evaluating the internal characteristics of Web sites (e.g., identifying the author, checking when the information was last updated, etc.), the contextual model focuses on information external to a particular site. By using external information to establish credibility, Meola (2004) contended that online information "is located within its wider social context, facilitating reasoned judgments of information quality" (p. 338). Meola's approach recommends three techniques to determine the quality of online information. The first technique is (a) *promoting peer- and editorially reviewed resources* that are available online. Information intermediaries (e.g., teachers, librarians, experts, etc.) should inform Internet users of high-quality, vetted resources that are searchable through universities, schools, public libraries, by subscribing to national newspapers online, or through other (largely fee-based) portals. This is similar to when doctors recommend Web sites to patients as a sort of "information prescription" (Rice & Katz, 2006). Meola noted that the time currently taken by teaching Internet users a checklist of questions is better spent teaching people what high-quality resources are available and how to use them.

The second technique is *comparing* information found on a Web site to other Web sites and/or to offline sources such as, for example, newspapers or magazines, peer-reviewed journal articles, or books. This is a more practical strategy for the "free Web" and, as Meola wrote: "Comparing Web

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[4]It also is surprising because it contradicts Metzger and Flanagin's consistent pattern of finding that checking if the information is current is the strategy used most often across their five samples. The discrepancy in results could be due to the methods used by different researchers (e.g., self-report vs. direct observation), which underscores this article's ultimate conclusion that the study of online credibility must be conducted using a variety of research techniques.

sites to each other and to reviewed sources provides an understanding of the depth of information available, reveals the controversial areas of a topic that need special attention, and gives . . . a feel for the different kinds of information available across formats" (p. 341). The final technique is *corroboration*. Similar to comparison, corroboration involves seeking more than one source to verify information on a given topic. Internet users may assess the accuracy and reliability of information through corroboration as a convergence of facts and/or opinions from a variety of sources is (or is not) found. In the end, Meola argued that the contextual approach to online information evaluation is more practical than are the checklist approaches, and thus will be more likely to be used by online information seekers.

Implications and Recommendations

The foregoing review leads to a number of conclusions and recommendations about Internet credibility and the user. In particular, it suggests new strategies for practice and/or for curriculum development, and new technological and social approaches to helping users assess the credibility of the information they find on the Internet. It also suggests several directions for future research and opportunities for theory development on user assessments of the credibility of online information.

Educational and Practical Efforts

Although the checklist approach to critical evaluation is the most popular among educators, it is perhaps not the most practical or effective for the reasons described earlier. The research has clearly indicated that the best strategy for educating Internet users will be one that is easy to use and/or is transparent to them. Indeed, a closer connection between research findings on credibility assessment using actual online information seekers and curriculum development is long overdue. That means if educators continue to teach checklists for Web evaluation, they need to keep them short. In addition, the models of credibility assessment reviewed earlier suggest that the best strategy for practice is perhaps to teach a hybrid approach to credibility assessment that is based on individual Internet users' motivation and purpose for seeking information online. In other words, a variety of approaches to credibility assessment could be taught to fit the specific search task or situation at hand. Users could be taught to use the checklist and contextual models of credibility assessment in situations where they feel motivated to obtain high-quality, credible information such as when the negative consequences of obtaining incomplete or inaccurate information are high. For less motivated users or search situations, users could be taught some simple heuristics to consider, such as checking for source or sponsorship information. Of course, learning when to apply which approach would then need to become part of the educational effort. The advantage of this kind of "sliding scale" approach to teaching critical evaluation skills is that it is more focused and less

effortful for users to perform in the majority of their searches, and thus is more realistic for educators to expect of users.

Another conclusion from the review is that digital literacy efforts might be more effective if they are targeted at certain user populations who are particularly vulnerable for receiving low-quality information online or those whose needs for credible information are very high. Young students using Web-based information to learn or medical patients seeking information about their treatment options are examples. Information about credible sites and how to access high-quality databases residing on either the "free" or "fee" Web would be particularly valuable to these user groups and could be tailored by topic or area (e.g., medical, news, academic, etc.).

Working through schools and libraries is one very useful way to disseminate this kind of information to target user populations, but what about other ways of reaching users? Digital literacy efforts need to be extended outside the classroom and library reference desk. While literally dozens of online guides to Web site evaluation currently exist, a comprehensive Web site developed to serve as a resource for users to understand Internet credibility and how to assess it would be more useful.[5] The site could have many levels of information and instruction regarding online credibility assessment, and users could go as deeply into the site as they wished depending on their motivation and interest in online credibility. In addition to general information about online credibility, the site could include specialized tips and instructions for seekers of particular kinds of information, such as ways to determine the credibility of medical and health information, commercial information, political information, and so on. Note that this type of effort would only succeed to the degree that it was well publicized and linked to several popular "point-of-entry" Web sites, which includes major portal sites that people typically use to launch their online information searches (e.g., popular search engines, medical information clearinghouse sites, government sites, etc.).

Social and Technological Means of Online Credibility Assessment

One interpretation of the research reviewed in this article is that credibility assessments should *not* be up to users because they are unlikely to exert the effort it takes to verify the credibility of Internet-based information.

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[5]Examples of online Web site evaluation pages include *The Good, the Bad, and the Ugly, or Why It's a Good Idea to Evaluate Web Sources* produced by New Mexico State University (http://lib.nmsu.edu/instruction/eval.html), Kathy Schrock's *Guide for Educators* (http://school.discovery.com/schrockguide/eval.html), the Illinois Mathematics and Science Academy's 21st Century Information Fluency Project (http://21cif.imsa.edu/), among many, many others. The Credibility Commons, a joint project currently under development by the University of Washington's Information School and the Information Institute at Syracuse University, is an example of a credibility "clearinghouse" (http://credibilitycommons.org/) which will eventually offer a range of credibility tools and information to the public.

This suggests that energy may be better spent developing tools or systems that are designed to assess credibility *for* users, and then training users how to use those tools and systems. Several possibilities exist, some of which are described next (for a description of these and other possibilities, along with a discussion of the problems and challenges associated with each, see Fritch, 2003).

Credibility seal programs modeled after the TRUSTe or BBB online seal programs could be set up to assist Internet users in locating Web sites whose content has been approved by a trusted outside authority. A credibility seal program would capitalize on the fact that many people assess credibility based on somewhat-quick visual inspections of Web sites (Fogg et al., 2003). Such a "trustmarking" program would require the development of a code of conduct that sites carrying the seal would be required to adhere to (e.g., seal-bearing sites must provide authorship and update information). The HONcode program developed by the NGO Health on the Net Foundation is an example of a credibility seal program within the medical/health field (Fritch, 2003). According to its mission statement, the HONcode aims to "hold Web site developers to basic ethical standards in the presentation of information" and "help make sure readers always know the source and the purpose of the data they are reading" (see http://www.hon.ch/HONcode/). TRUSTe and HONcode provide viable models for credibility seal programs that could be extended beyond ecommerce and online health information.

Credibility rating systems could be instituted to help establish the credibility of Web-based information. Such systems could be controlled by an institution (e.g., the American Library Association) or could be based on a peer-rating system (a discussion of collaborative filtering via social networks appears later in this article). In any case, rating systems could be created that would allow Web sites to be assessed systematically along several quality standards (e.g., authority, currency, objectivity, disclosure, etc.). Peer-based credibility rating systems could be developed using interactive software that allows Web users to answer a series of questions about sites they visit and then assigns a rating based on aggregating users' responses.[6] The ratings would be stored in a database and would be accessible to Internet users at a central location, or the ratings could be required by

government regulators to be displayed on all sites or integrated into all Web browsers. An application could be developed and downloaded that would post a small icon with a site rating, using the central rating database, which would not require the user to go get a rating for each site visited. Alternatively, a ratings system could be developed by having a panel of experts rate various sites. Due to the incredible volume of sites that would need to be evaluated, this may be easier to do within specific types of online content domains, such as health information (e.g., Seidman, 2006). The ratings systems described here are specific to assessing credibility. Social networking approaches more generally (e.g., reviews of books or magazines on Amazon.com, eBay feedback ratings, or MySpace friend links) can provide credibility cues as well, although they are not aimed to provide credibility ratings, per se. Social networking approaches to credibility assessment will be discussed later as collaborative filtering and peer review.

Directories, databases, or search engines that carry or display online content that has been preapproved or filtered for credibility could be developed. Many such proprietary databases already exist in the form of Lexis-Nexis, JSTOR, ERIC, and the like. For the so-called "free Web," it is possible that nonprofit groups or education associations could develop and implement searchable databases or directories of information from high-quality sources, based on some agreed-upon and publicized criteria. Examples are the Librarian's Index to the Internet (www.lii.org), which provides a list of librarian-vetted Web sites on various topics, and government-run health information portals such as Medline Plus (see http://medlineplus.gov/ for an analysis of commercial vs. government online health databases, also see Rice, Peterson, & Christine, 2001). Google itself presents an interesting case in this regard because one of the reasons for its immense popularity and influence is precisely because it has a sort of built-in credibility metric: the number of inward links from other sites with a large number of inward links. Regardless of who develops or sponsors these databases, it is critical that they are easily searchable. High-quality databases such as those found on the "fee Web" and in libraries should be as easy to search as popular search engines such as Google.[7] Reducing the effort involved in using high-quality, professionally vetted databases will increase their usage, which could in turn drive down user access and subscription costs.

Combining the last two ideas (i.e., credibility ratings and vetted databases), some propose using *Platform for Internet Content Selection* (*PICS*) *labels* to establish the credibility of Internet information (Eysenbach & Diepgen, 1998: Fritch, 2003). The existing PICS developed by the

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[6]Fritch (2003) described two applications that could serve as prototypes for such a system. One application is the Information Quality (IQ) tool (http://hitiweb.mitretek.org/iq/) that was developed to support the Health Summit Working Group's criteria for assessing the quality of health information on the Internet. The IQ tool is essentially a pop-up window that prompts the user to answer credibility-related questions about a specific Web site that he or she is currently viewing. Based on answers to these questions, the IQ tool calculates a "quality" score for the Web site. The other application works similarly, although it is not interactive. It is the DISCERN questionnaire (http://www.discern.org.uk/), which prompts users to rate health-related Web sites by answering focused questions pertaining to the quality of information found on the sites. In either application, ratings data could be collected across individuals over time to produce aggregate ratings.

[7]Interestingly, Google itself is beta testing an incarnation of the idea of providing searchable, vetted databases. Google Scholar (http://scholar. google.com) searches a specialized database that indexes articles from academic sources including academic publishers, professional societies and associations, universities, preprint repositories, and scholarly articles posted on the Internet.

World Wide Web consortium could be configured to filter and select information that meets certain credibility standards. PICS enables Web site operators to label their content, and allows users to control the content they receive based on those labels. If Web site operators (or others) included information in the labels about the nature and quality of information provided on the site, Internet users could use the labels to select information that meets their minimum criteria for credibility while also filtering out information falling below that minimum. More plausibly, third parties could rate or preapprove content along some credibility metric and use the PICS platform to create electronic labels for Web sites that reflect their evaluations. The labels then could be used by end users to filter information. The MedPICS Certification and Rating of Trustworthy Health Information on the Net (medCERTAIN) project is an example of such a system (Eysenbach, 2000; Eysenbach & Diepgen, 1998). The MedPICS system would work by labeling health-related information according to core standards of quality developed by medical societies, associations, and relevant others, and then entering that information into one or more medical-label databases that would be searchable by consumers.

More recently, Google has begun developing an algorithm that will rank and display search results on its all-news site, Google News (http://news.google.com/), according to the credibility of the news source. Currently, results are ranked according to criteria such as relevance to search term and date to determine which stories appear first, but the new algorithm would use such credibility-related factors as the news source's number of years in business, staff size, number of bureaus the news source operates, circulation information, average story length, volume of network traffic to its site, and other criteria to rank stories (Baertlein, 2005; B. Fox, 2005).

Digital signatures could be used to assure the authorship of online information, which is a key aspect of credibility. Fritch and Cromwell (2002) explain that digital signatures are "a cryptographic method that allows a sender to append a small data block, called a "signature," that allows the recipient to prove, to some quantifiably high certainty, two things: first, that message contents have not been altered in transit, and second, that the message sender is really who he/she claims to be" (p. 252). Authenticating the identity of the author is an important first step in assessing the credibility of online information, and is particularly important for Internet transactions involving sensitive information such as one's financial or personal data. Ultimately, however, digital signatures still require the recipient of some information to evaluate the quality of the information provided by the author (Fritch & Cromwell, 2002). This approach also is problematic for Web sites that are coauthored by more than one source, corporate authored, or provide no author information, as is increasingly the case. Indeed, any approach to credibility assessment that relies on author identity may be impractical as source information becomes more complex and difficult to pinpoint online.

Of course, many and even most of these solutions may be infeasible due to their high cost, low profitability, reliance on voluntary compliance, and tremendous implementation effort. In the end, Internet users may be left with no choice but to rely on themselves. If that is the case, then extending existing models of *collaborative filtering* and *peer review* of Web-based information, such as those found on epinions.com, BizRate, eBay, Amazon, or even in social networking sites such as MySpace or Facebook, might be a more practical way for users to discern whether some information they find online is credible. Peer review allows Internet users to provide feedback about the products, information, or source of some information offered on Web sites. It allows users to pool their intellectual and experiential resources when evaluating the trustworthiness, reliability, or quality of a Web site or information residing on a site, making credibility assessment a collective rather than an individual task. Hence, the name "collaborative" filtering (e.g., Resnick, Iacovou, Suchak, Bergstrom, & Riedl, 1994).

User review and feedback systems, which also are known as recommender or reputation systems, were initially developed in the realm of ecommerce but now exist within several other Web content domains (e.g., online recipe sites such as epicurious.com use these systems). Indeed, at least 26% of adult Web users in the United States reported having rated a product, service, or person online (Rainie & Hitlin, 2004). Of course, peer-review systems are susceptible to biased, uninformed, or inaccurate reviews, as was demonstrated by revelations that Amazon.com book authors were promoting their own work by submitting anonymous reviews. The site Slashdot.org provides an interesting model of user review that tries to overcome the problem of bias in peer review. Slashdot is a large Internet forum in which users summarize information they find on other Web sites, link to those sites, and provide a place for readers to comment on the information. Contributors and their contributions are then rated by Slashdot users in a very elaborate and sophisticated system that helps to ensure fairness and impartiality. Slashdot's system of peer review covers a huge range of Web content and offers a provocative model that could be used to develop systems of peer review to assist Internet users in assessing the credibility of a wide variety of online information.

A Research Agenda

The review of literature presented earlier also clearly indicates that there is much more work to be done to formulate effective strategies for building Internet users' skills to critically evaluate online information. A research agenda for the issue of Internet credibility must include studies of information evaluation using a greater variety of research methods, on a greater variety of Internet users, performing a greater variety of search tasks than has been done to date. The body of findings from this research agenda should be used to develop and shape practical guidelines for Internet users, creating a strong linkage between research and practice. As part of this, the research agenda also must include evaluative

studies of the usability and effectiveness of any practical guidelines developed to help Internet users discern credible information online.

An area of immediate concern for scholars studying Internet credibility is the need for more research on what users actually do to assess credibility. This is true not simply because there are very few studies to date that have examined large populations of Internet users, but also because there is evidence that those studies may already be out of date. Specifically, existing research has found that more experienced Internet users may act differently than do less experienced users when it comes to credibility assessment (Freeman & Spyridakis, 2004; Johnson & Kaye, 2000, 2002; Flanagin & Metzger, 2007). This suggests that as users gain experience with this relatively young medium, perceptions of the credibility of information found online, as well as the ways in which users make their credibility assessments, may change. For example, Flanagin and Metzger (2007) found that although more experienced Web users *said* they evaluated information online more than did less experienced users in the study, they *actually* evaluated information less.

This discrepancy in self-reported versus actual evaluation behavior raises an important point with regard to the study of credibility online: The method of study may, by itself, influence the results obtained (also see Eysenbach & Kohler, 2002). Credibility research has the potential for response bias problems, as people know they "should" critically analyze the information they obtain online, yet rarely have the time or energy to do so. Given this situation, researchers must look to other methods besides survey questionnaires to understand actual online behavior. Research methods for future online credibility research should be as anthropological, naturalistic, and unobtrusive as possible.

Perhaps the most pressing item on the agenda for online credibility research is the need to study the role of user *motivation* in the credibility-assessment process. There is much evidence that user motivation, stemming in part from the information search task, moderates the degree to which users will critically evaluate online information. Surprisingly, however, user motivation is missing from most existing models of credibility assessment. The basis for this recommendation is the observation that not all Web sites need vigorous examination (Fritch & Cromwell, 2001, 2002; Meola, 2004), and research finding that different evaluative processes are used for different search tasks (Fogg et al., 2003; Rieh, 2002). As Fritch and Cromwell (2002) wrote:

> Sometimes the significance of the information under scrutiny does not warrant extensive research and analysis, while in other instances extensive research and analysis may be crucial; it ultimately depends upon the purposes and intent of the user(s) of the information." (p. 251)

This further suggests that credibility assessment should not be conceptualized as a single evaluative process. Instead, different users may use different processes at different times to evaluate the credibility of online information.

Dual processing models of information processing and assessment may be a helpful guide in formulating a model of credibility assessment that takes motivation into account. Dual processing models are proposed to operate in many areas of social and cognitive psychology, and have been successful in explaining a wide array of social judgments including, for example, persuasion, impression formation, person perception, and decision making (Chaiken & Trope, 1999). Examples of some well-known dual process theories involving information assessment include the Elaboration Likelihood Model, the Heuristic-Systematic Model, and controlled versus automatic processing models (Chaiken, 1980; Petty & Cacioppo, 1981; Shiffrin & Schneider, 1977), although there are others (for a review, see Chaiken & Trope, 1999).[8]

What the various dual processing models have in common is an emphasis on the role that motivation and cognitive ability play in guiding information assessment and decision making. In brief, these models theorize that people will process and/or scrutinize messages in more or less depth depending upon the receiver's motivation and ability to do so. In other words, when people are motivated due to personal or situational factors such as having a high need for accurate information or having a personal stake in understanding some issue, they are likely to pay more attention to a message, think about the arguments presented, and exert more cognitive resources to process and evaluate the information and its source. By contrast, when motivation and/or ability are low, these models predict that information will be processed or evaluated based on more superficial and less thoughtful criteria. In these situations, decisions will be made on more heuristic judgments of the message or its source (e.g., attractiveness) rather than on message quality. Ability to process a message hinges on many factors (e.g., sufficient time, prior knowledge of the topic, message comprehensibility, etc.).

A Dual Processing Model of Credibility Assessment

Dual processing models provide a good basis for developing a new model of Web credibility assessment that prioritizes user motivation and ability and accounts for the situational nature of credibility assessment (i.e., that it will not be important for all Internet users at all times). Like most dual processing models, the model proposed in Figure 1 assumes that motivation and ability are keys to whether and to what degree users will critically evaluate Web information. In this context, motivation stems from the consequentiality of receiving low-quality, unreliable, or inaccurate information online. Ability may be linked to users' knowledge about how to evaluate online information, which could involve teaching users the critical evaluation skills employed by the checklist or contextual models of credibility, for example.

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[8]Indeed, several researchers have discussed the Elaboration Likelihood Model with regard to online credibility processes (see Fogg et al., 2003; Freeman & Spyridakis, 2004; Walthen & Burkell, 2002).
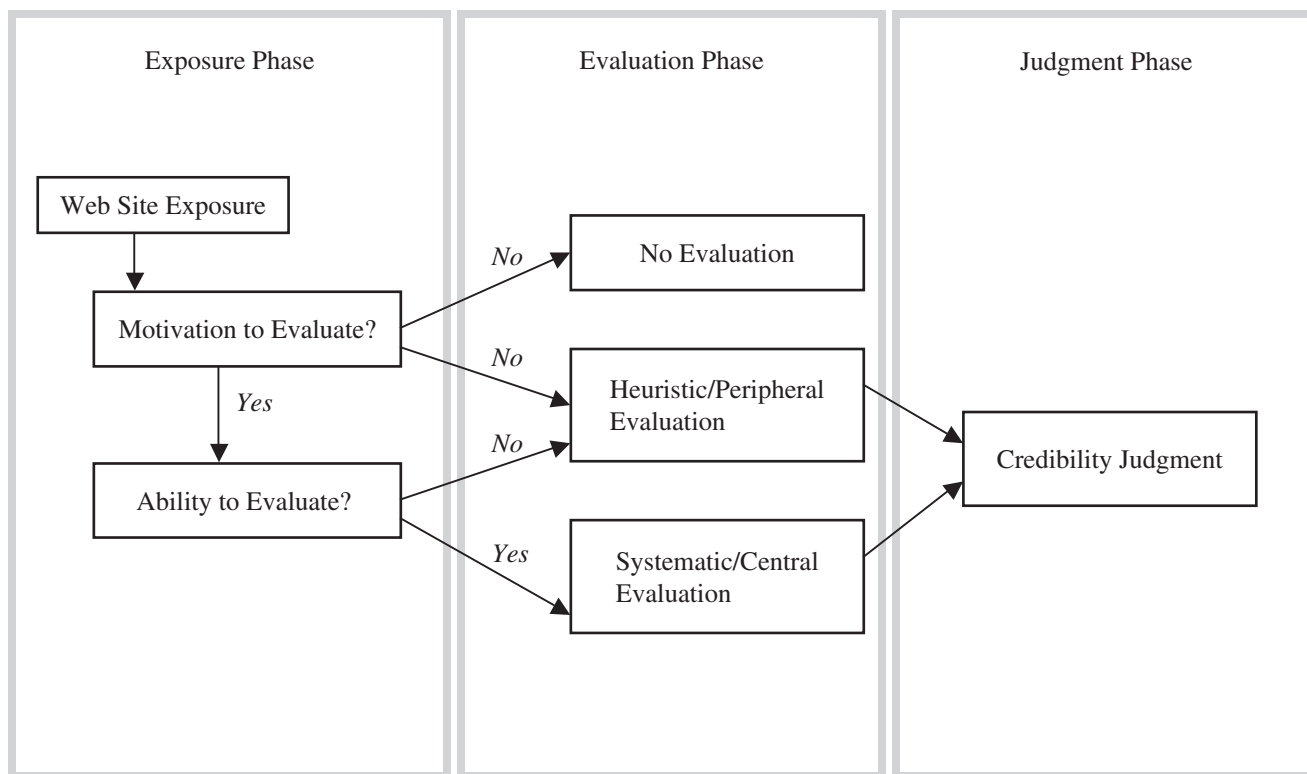
FIG. 1.   Elements of a dual processing model of Web site credibility assessment.

Simply put, the degree to which online messages will be scrutinized for their credibility depends on individual users' ability to evaluate the message and their initial motivation or purpose for seeking the information, which involve their awareness of and salience of the consequentiality of the information.

In dual processing theory terms, Chen and Chaiken (1999) stated that perceivers' "accuracy goals" may vary depending on the situation such that people are more or less motivated to reach accurate judgments across different contexts. Applied to the online environment, while Internet users are active in searching for information online, their accuracy goals may vary from search to search. Furthermore, Internet information seeking may be more or less "casual" or "purposeful" depending on the situation. While we can assume that some Web browsing is highly motivated by a person's need to find accurate information, a good deal of users' online information-seeking behavior is not so purposeful. For example, a person may go online for casual-entertainment purposes, begin a search on one topic but be lead to other information via hyperlinks, or be confronted with information he or she did not intend to find when opening a new page. Despite being less purposeful, there is no reason to assume that users in these scenarios would not be concerned with the credibility of the information they find online. By the same token, one might assume that they may be *less* concerned about credibility, and thus are less willing to exert maximum cognitive resources toward credibility assessment.

A dual processing model of credibility is not only able to predict *when* users will or will not make the effort to critically evaluate online information but also is useful in understanding *how* credibility assessments are made (i.e., what processes are involved in those assessments). A dual processing model of credibility assessment would propose that users look to different aspects of Web-based information to assess its credibility depending on their motivation for seeking information. Users who are less motivated to find high-quality, credible information (e.g., a person biding some time online by looking up information on a favorite sports team or music band) may not assess credibility at all or do so by simply considering such simple characteristics or heuristics as a Web page's design and graphics. On the other hand, highly motivated users will likely take a more rigorous, systematic approach to credibility assessment. Examples might include a medical patient recently diagnosed with a serious disease, a student preparing a research paper, or a business owner analyzing the market. In these cases, users are more likely to go beyond the surface characteristics of a Web site to examine the information content, its author or source, and other factors in determining its credibility (for similar arguments, see Fogg et al., 2003; Walthen & Burkell, 2002).

One way to think about this in light of the previous discussion is that the proposed dual processing model can predict when users are likely to use a relatively more effortful credibility assessment procedure (e.g., the checklist approach) versus when they are likely to use an approach that

is potentially less time-consuming (e.g., the contextual approach) or perhaps even a very simple heuristic approach (e.g., simply looking at the site's graphic design) to determine the credibility of some online information. Another way that this new model of credibility assessment is useful is that it can help to understand when people might evaluate different types of credibility. Several scholars have suggested that users assess various types or "levels" of credibility in their judgments of information quality and trustworthiness (Fritch & Cromwell, 2001; Metzger, Flanagin, Eyal, et al., 2003).[9] Fogg (2003), for example, discussed four types of credibility that Internet users assess: presumed, surface, reputed, and earned. The dual processing model of credibility assessment could help to predict when users are likely to simply look at the surface credibility of a site (e.g., simple design or layout) and stop there versus when they are likely to make the effort to consider other types of credibility as well, which might include seeking third-party endorsements or recommendations (i.e., reputed credibility) or checking the site's domain name suffix and internal/external links (i.e., presumed credibility), for example.

Some preliminary evidence points to the applicability of a dual processing model of credibility assessment. According to dual processing tenets outlined earlier, motivation and ability should be key factors in users' credibility assessment efforts. Flanagin and Metzger (2000) found that credibility assessment varied by information type, such that participants reported exerting significantly more effort to verify the credibility of reference information (defined as factual, non-news information such as self-help, health-related, or "how-to" information) than they did for entertainment information. To the extent that it is reasonable to assume Internet users will be more concerned about obtaining accurate reference as compared to entertainment information, this finding suggests that motivation indeed impacts credibility assessment behavior. Other studies have provided evidence that user ability also plays a role in credibility assessment. For example, some research has found that Internet experience and Internet self-efficacy are positively related to users' efforts to verify the credibility of information they find online (Flanagin & Metzger, 2000; Hong, 2006). Finally, other research has shown that users possessing different levels of motivation and ability pay attention to different criteria when judging the credibility of Web sites. Specifically, this work found that nonexperts and those who judge information on a Web page to be less personally salient tend to use simple heuristics such as visual appeal in assessing credibility more than do experts and people for whom information is personally salient and consequential. By contrast, experts and those who find online information to be salient were more concerned about the quality of the site's information and source credentials when making credibility judgments (Flanagin & Metzger, 2007; Stanford, Tauber, Fogg, & Marable, 2002). While provocative, more research is clearly needed to fully understand the processes involved in Internet users' credibility determinations under different conditions, and therefore the skills users need to make those determinations.

Conclusion

This article summarizes much of what is known about the skills Internet users need to assess the credibility of online information. In addition, it describes and evaluates several models of online information evaluation and reviews the empirical research on how users themselves go about the process of determining the credibility of Internet information. Based on this, the article offers a number of recommendations for online credibility research, theory, and practice, and proposes alternative strategies to assist users in locating credible information on the Internet. Several overarching conclusions emerge from the review, including the fact that Internet users as a group are not willing to exert a great deal of effort in assessing the credibility of the information they find online, and that they place a premium on professional site design in their credibility appraisals.

Perhaps the most important conclusion from the review is that any effort to teach Web evaluation must be realistic in its expectations of users by recognizing that motivation is a key ingredient in users' willingness to undertake extensive effort to verify the credibility of information they find online. Educators could leverage this point by including information about the negative consequences of misinformation online, as a means to motivate users to critically evaluate information. Indeed, this is a fundamental theoretical tenet in other types of educational campaigns (see Rice & Atkin, 2001). As Fritch (2003) wrote:

> We all recognise [sic] that some information is not important enough to require careful evaluation, but each individual must determine when this is true. And when necessary, users need the evaluative skills to make a proper determination about which information is trustworthy, on the Internet and in other venues. This is part of what it means to become a literate citizen in an information-rich, networked world. (p. 327)

In sum, the Internet has not so much changed what skills are needed to evaluate the credibility of information as it has changed the need for people to know when and how to exercise those skills.

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[9]For example, users may form judgments about the credibility of a Web site as a whole, the credibility of some information presented on a Web page, the credibility of the Web/Internet medium itself, the credibility of a particular e-mail message or blog, and so on. Metzger, Flanagin, Eyal, et al. (2003) presented a comprehensive discussion of this issue.

References

Alexander, J.E., & Tate, M.A. (1999). Web wisdom: How to evaluate and create information quality on the Web. Hillsdale, NJ: Erlbaum.

Amsbary, J.H., & Powell, L. (2003). Factors influencing evaluations of web site information. Psychological Reports, 93(1), 191–198.

Baertlein, L. (2005, May 6). Google trying to patent news ranking by quality. Retrieved July 24, 2007, from http://findarticles.com/p/articles/mi_zdext/is_200505/ai_n13636886

Brandt, D.S. (1996). Evaluating information on the Internet. Computers in Libraries, 16, 44–46.

Burbules, N.C. (1998). Rhetorics of the Web: Hyperreading and critical literacy. In I. Snyder (Ed.), Page to screen: Taking literacy into the electronic era (pp. 102–122). London: Routledge.

Chaiken, S. (1980). Heuristic versus systematic processing and the use of source versus message cues in persuasion. Journal of Personality and Social Psychology, 39, 752–766.

Chaiken, S., & Trope, Y. (1999). Dual-process theories in social psychology. New York: Guilford Press.

Chen, S., & Chaiken, S. (1999). The heuristic-systematic model in its broader context. In S. Chaiken & Y. Trope (Eds.), Dual-process theories in social psychology (pp. 73–96). New York: Guilford Press.

Eysenbach, G. (2000). Consumer health informatics. British Medical Journal, 320, 1713–1716.

Eysenbach, G., & Diepgen, T.L. (1998). Towards quality management of medical information on the internet: Evaluation, labeling, and filtering of information. British Medical Journal, 317, 1496–1500.

Eysenbach, G., & Kohler, C. (2002, March 9). How do consumers search for and appraise health information on the world wide web? Qualitative study using focus groups, usability tests, and in-depth interviews. British Medical Journal, 324, 573–577.

Eysenbach, G., Powell, J., Kuss, O., & Sa, E.-R. (2002). Empirical studies assessing the quality of health information for consumers on the World Wide Web: A systematic review. Journal of the American Medical Association, 287(20), 2691–2700.

Fallows, D. (2005). Search engine users: Internet searchers are confident, satisfied and trusting—But they are also unaware and naïve. Report for the Pew Internet and American Life Project. Retrieved January 25, 2005, from http://www.pewinternet.org/PPF/r/146/report_display.asp

Flanagin, A.J., & Metzger, M.J. (2000). Perceptions of Internet information credibility. Journalism & Mass Communication Quarterly, 77(3), 515–540.

Flanagin, A.J., & Metzger, M.J. (2007). The role of site features, user attributes, and information verification behaviors on the perceived credibility of Web-based information. New Media & Society, 9, 319–342.

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

Fogg, B.J., Soohoo, C., Danielson, D.R., Marable, L., Stanford, J., & Trauber, E.R. (2003). How do users evaluate the credibility of Web sites? A study with over 2,500 participants. Paper presented at the Proceedings of the Conference on Designing for User Experiences, San Francisco. Available at: http://portal.acm.org/citation.cfm?doid=997078.997097

Fox, B. (2005, April 30). Google searches for quality not quantity. New Scientist, 2497, 24. Retrieved May 12, 2005, from http://www.newscientist.com/article.ns?id=mg18624975.900

Fox, S., & Rainie, L. (2002, May 22). Vital decisions: How Internet users decide what information to trust when they or their loved ones are sick. Washington, DC: Pew Internet & American Life Project. Retrieved June 5, 2005, from http://www.pewinternet.org/pdfs/PIP_Vital_Decisions_May2002.pdf

Freeman, K.S., & Spyridakis, J.H. (2004). An examination of factors that affect the credibility of online health information. Technical Communication, 51(2), 239–263.

Fritch, J.W. (2003). Heuristics, tools, and systems for evaluating Internet information: Helping users assess a tangled Web. Online Information Review, 27(5), 321–327.

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(6), 499–507.

Fritch, J.W., & Cromwell, R.L. (2002). Delving deeper into evaluation: Exploring cognitive authority on the Internet. Reference Services Review, 30(3), 242–254.

Hong, T. (2006). The Internet and tobacco cessation: The roles of Internet self-efficacy and search task on the information-seeking process. Journal of Computer-Mediated Communication, 11(2), Article No. 8. Retrieved March 3, 2006, from http://jcmc.indiana.edu/vol11/issue2/hong.html

Hovland, C.I., Janis, I.L., & Kelley, J.J. (1953). Communication and persuasion. New Haven, CT: Yale University Press.

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, 865–879.

Johnson, T.J., & Kaye, B.K. (2002). Webelievability: A path model examining how convenience and reliance predict online credibility. Journalism & Mass Communication Quarterly, 79, 619–642.

Kapoun, J. (1998). Teaching undergrads WEB evaluation: A guide for library instruction. Retrieved July 24, 2007, from http://www.ualberta.ca/~dmiall/Brazil/Kapoun.html

Kunst, H., Groot, D., Latthe, P.M., Latthe, M., & Khan, K.S. (2002, March 9). Accuracy of information on apparently credible websites: Survey of five common health topics. British Medical Journal, 324, 581–582.

Meola, M. (2004). Chucking the checklist: A contextual approach to teaching undergraduates Web-site evaluation. Libraries and the Academy, 4(3), 331–344.

Metzger, M.J., Flanagin, A.J., Eyal, K., Lemus, D., & McCann, R. (2003). Bringing the concept of credibility into the 21st century: Integrating perspectives on source, message, and media credibility in the contemporary media environment. Communication Yearbook, 27, 293–335.

Metzger, M.J., Flanagin, A.J., & Zwarun, L. (2003). Student Internet use, perceptions of information credibility, and verification behavior. Computers & Education, 41, 271–290.

Morahan-Martin, J.M. (2004). How Internet users find, evaluate, and use online health information: A cross-cultural review. CyberPsychology & Behavior, 7(5), 497–510.

Morahan-Martin, J.M., & Anderson, C. (2000). Information and misinformation online: Recommendations for facilitating accurate mental health information retrieval and evaluation. CyberPsychology & Behavior, 3, 731–742.

O'Keefe, D.J. (2002). Persuasion: Theory and research (2nd ed.). Thousand Oaks, CA: Sage.

Petty, R.E., & Cacioppo, J.T. (1981). Attitudes and persuasion: Classic and contemporary approaches. Dubuque, IA: Brown.

Rainie, L., & Hitlin, P. (2004). The use of online reputation and rating systems. Available at: http://www.pewinternet.org/PPF/r/140/report_display.asp

Resnick, P, Iacovou, N., Suchak, M., Bergstrom, P., & Riedl, J. (1994). GroupLens: An open architecture for collaborative filtering of netnews. In Proceedings of ACM CSCW Conference on Computer Supported Cooperative Work, Sharing Information and Creating Meaning (pp. 175–186). ACM: Chapel Hill, NC.

Rice, R.E., & Atkin, C.K. (Eds.). (2001). Public communication campaigns (3rd ed.). Thousand Oaks, CA: Sage.

Rice, R.E., & Katz, J.E. (Eds.). (2001). The Internet and health communication: Experiences and expectations. Thousand Oaks, CA: Sage.

Rice, R.E., & Katz, J.E. (2006). Internet use in physician practice and patient interaction. In M. Mureror & R.E. Rice (Eds.), The Internet and health care: Theory, research and practice (pp. 149–176). Mahwah, NJ: Erlbaum.

Rice, R.E., Peterson, M., & Christine, R. (2001). A comparative features analysis of publicly accessible commercial and government health database Web sites. In R.E. Rice & J.E. Katz (Eds.), The Internet and health communication: Experiences and expectations (pp. 213–231). Thousand Oaks, CA: Sage.

Rieh, S.Y. (2002). Judgment of information quality and cognitive authority in the Web. Journal of the American Society for Information Science and Technology, 53(2), 145–161.

Rieh, S.Y., & Belkin, N.J. (1998). Understanding judgment of information quality and cognitive authority in the WWW. In C.M. Preston (Ed.), Proceedings of the 61st ASIS annual meeting (pp. 279–289). Silver Spring, MD: American Society for Information Science.

Rosen, D.J. (1998, February). Driver education for the information super-highway: How adult learners and practitioners use the Internet [Series title: Literacy Leader Fellowship Program Reports, 2(2)]. Washington, DC: National Institute for Literacy.

Scholz-Crane, A. (1998). Evaluating the future: A preliminary study of the process of how undergraduate students evaluate Web sources. Reference Services Review, 26(3/4), 53–60.

Seidman, J.J. (2006). The mysterious maze of the World Wide Web: How can we guide consumers to high-quality health information on the Internet? In M. Murero & R.E. Rice (Eds.), Internet and health care: Theory, research and practice (pp. 195–212). Mahwah, NJ: Erlbaum.

Shiffrin, R.M., & Schneider, W. (1977). Controlled and automatic human information processing: II. Perceptual learning, automatic attending, and a general theory. Psychological Review, 84, 127–190.

Smith, A.G. (1997). Testing the surf: Criteria for evaluating Internet information resources. Public-Access Computer Systems Review, 8. Retrieved July 24, 2007, from http://epress.lib.uh.edu/pr/v8/n3/smit8n3.html

Stanford, J., Tauber, E.R., Fogg, B.J., & Marable, L. (2002). Experts vs. online consumers: A comparative credibility study of health and finance Web sites. Consumer WebWatch Research Report. Retrieved March 3, 2006, from http://www.consumerwebwatch.org/dynamic/web-credibility-reports-experts-vs-online-abstract.cfm

Walthen, 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.

Wilder, S. (2005, January 7). Information literacy makes all the wrong assumptions. Chronicle of Higher Education, 51(18), B13.