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.

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[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).
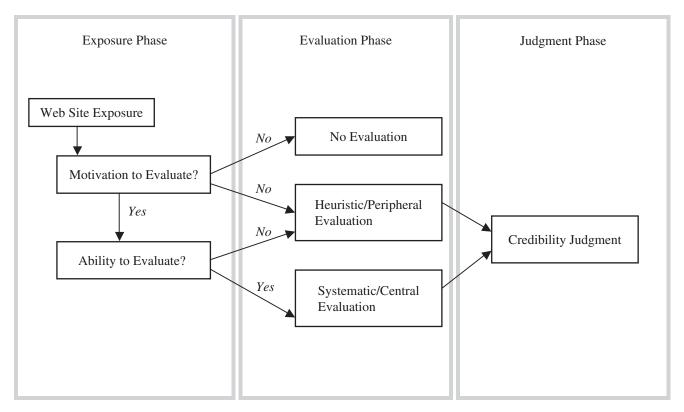
FIG. 1.   Elements of a dual processing model of Web site credibility assessment.

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.

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.

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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.

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.

Developing a unifying framework of credibility assessment: Construct, heuristics, and interaction in context

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Abstract

This article presents a unifying framework of credibility assessment in which credibility is characterized across a variety of media and resources with respect to diverse information seeking goals and tasks. The initial data were collected through information-activity diaries over a 10-day period from 24 undergraduate students at three different colleges. Based on 245 information seeking activities from the diaries, the authors conducted individual interviews with participants and analyzed the transcripts using a grounded theory analysis. Three distinct levels of credibility judgments emerged: construct, heuristics, and interaction. The construct level pertains to how a person constructs, conceptualizes, or defines credibility. The heuristics level involves general rules of thumb used to make judgments of credibility applicable to a variety of situations. Finally, the interaction level refers to credibility judgments based on content, peripheral source cues, and peripheral information object cues. In addition, context emerged as the social, relational and dynamic frames surrounding the information seeker and providing boundaries of credibility judgments. The implications of the framework in terms of its theoretical contribution to credibility research and practices are discussed.
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Keywords: Information credibility; Credibility assessment; Information seeking behavior

1. Introduction

Every day people encounter more information than they can possibly use. Friends, colleagues, books, newspapers, television, and Web sites are just a few of the resources and media contributing to the flow of information. But all information is not necessarily of equal value. In many cases, certain information appears to be better, or more trustworthy, than other information. The challenge that most people then face is to judge which information is more credible. The concept of credibility has received considerable attention since the late 1990s when the Internet began providing a new information interaction environment that allowed users to seek for information and communicate with others in ways never before possible. As a consequence,

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researchers and practitioners in diverse fields including information science, marketing, management information systems, communication studies, human–computer interaction (HCI), and psychology have examined credibility assessment from a variety of different perspectives (Rieh & Danielson, 2007).

Many studies of credibility tend, however, to investigate credibility by relying on definitions, approaches, and presuppositions that are field-specific (Flanagin & Metzger, 2007). In information science, credibility has been understood as one of the criteria of relevance judgment used when making the decision to accept or reject retrieved information (Rieh & Danielson, 2007). Communication researchers have, on the other hand, been examining credibility as a research agenda distinguishing message credibility, source credibility, and media credibility (Metzger, Flanagin, Eyal, Lemus, & McCann, 2003). Management information systems (MIS) researchers have examined credibility issues in expert systems and decision support systems by querying people as to whether they believe the advice these systems provide. Consumer behavior researchers have addressed how consumers distinguish subjective and objective claims in e-commerce Web sites.

Consequently, previous studies of credibility have provided insights in relation to particular media such as the Web (e.g., Fogg et al., 2003; Huerta, 2003; Rieh, 2002), particular types of information such as political information (Johnson & Kaye, 1998, 2000), news information (Sundar, 1999), and scholarly information (Liu, 2004) as well as particular settings such as schools (Fidel et al., 1999). This approach is potentially problematic in that people may carry over strategies and criteria used for one type of information (e.g., political information) to another type of information (e.g., scholarly information) and vice versa. People also may rely on multiple types of media or resources in the course of a single information seeking episode. What is called for, then, is a framework that identifies common aspects of credibility assessment regardless of media, type of information, and environment of information use.

This paper proposes a unifying framework of credibility assessment in which credibility is characterized across various types of information resources and diverse information tasks including work- and school-related problems and personal interests. Importantly, this paper differentiates the terms credibility assessment and credibility judgment. Credibility assessment is herein seen as an iterative process involving one or more credibility judgments. As an information seeker encounters information, a series of judgments are made about the credibility of that information. These judgments are based on various factors to be discussed in greater depth in the following sections. Taken together, those judgments comprise the credibility assessment which feeds into the decision to accept or reject information.

This article begins with definitions of credibility and existing theoretical frameworks of credibility assessment which help to motivate the need for new research to develop a credibility assessment framework with respect to people's information seeking behaviors in which multiple information resources are used. The methods of data collection and analysis used in the present study are then presented. Results are discussed in the form of an emerging unifying framework that is grounded in empirical findings. Finally, implications and contributions of the framework are discussed with respect to the previous literature on credibility.

2. Review of related literature

2.1. Definition of credibility

Credibility has been defined as believability, trust, reliability, accuracy, fairness, objectivity, and dozens of other concepts and combination thereof (Self, 1996). It also has been defined in terms of characteristics of persuasive sources, characteristics of the message structure and content, and perceptions of media (Metzger et al., 2003). Some studies focus on the characteristics that make sources or information worthy of being believed, while others examine the characteristics that make sources or information likely to be believed (Flanagin & Metzger, 2007).

Despite the fact that communication researchers have been interested in source credibility since the 1950s, there is as yet no clear definition of credibility. The overarching view across definitions is believability. Credible people are believable people, and credible information is believable information (Tseng & Fogg, 1999). Most credibility researchers agree that there are at least two key dimensions of credibility: trustworthiness and expertise (Hovland, Janis, & Kelley, 1953), both of which contribute to the concept of credibility. Trustworthiness is a key factor in credibility assessment. A person is trustworthy for being honest, careful in choice

of words, and disinclined to deceive (Wilson, 1983). Information is trustworthy when it appears to be reliable, unbiased, and fair. Expertise is "the perceived knowledge, skill, and experience of the source" (Fogg, 2003a, p. 124). Expertise is also an important factor because it is closely related to user perceptions of the ability of a source to provide information both accurate and valid. When people find that sources have expertise, they are likely to judge that information to be trustworthy. Assessment of sources' expertise come in multiple ways: people might have prior first-hand experience with a source; they might have heard about a source from other people; they might know that a source has a good reputation; and they might recognize expertise when a source has credentials, among others (Rieh, 2002). People's credibility judgments are subjective and implicit because they need to recognize expertise to conclude that the information is trustworthy.

Credibility differs from cognitive authority and information quality, while being closely related to these two concepts. Cognitive authorities are those people who actually exert influence on other people's thoughts by being recognized as proper (Wilson, 1983). According to Wilson, an authority's influence is thought proper because "he is thought credible, worthy of belief" (p. 15). Cognitive authorities are clearly among those who are considered to be credible sources. A person may be recognized as credible in an area even if not exerting influence on other people's thoughts. In Wilson's words, "Those we think credible constitute the potential pool of cognitive authorities on which we might draw" (Wilson, p. 16). Wilson claims that people do not attribute cognitive authority exclusively to individuals. Cognitive authority can be found in books, instruments, organizations, and institutions.

Information quality refers to people's subjective judgment of *goodness and usefulness of information* in certain information use settings with respect to their own expectations of information or in regard to other information available. Information quality is composed of five facets: usefulness, goodness, accuracy, currency, and importance (Rieh, 2002). These facets of information quality are not necessarily always consistent. Information may be accurate but not useful, useful but not important, important but no longer current, current but inaccurate, and so forth. In such cases, one of the questions people ask themselves would be whether they can believe what the information says or, if not, whether they can at least take it seriously (Wilson, 1983). Thus, credibility is a *chief aspect of information quality*.

2.2. Existing theoretical frameworks of credibility assessment

Several existing theoretical frameworks inform the understanding of credibility assessment. Fogg's (2003b) Prominence-Interpretation Theory grew out of a series of research projects on Web credibility conducted for four years at the Stanford Web Credibility Research Lab. This theory posits that two things need to happen for people to make a credibility assessment: the user notices something (prominence), and the user makes a judgment about what she/he notices (interpretation). Prominence is "the likelihood that a Web site element will be noticed or perceived" (p. 722). If the element is not noticed, it will have no impact on how the user assesses the credibility of the site. Fogg claims that at least five factors affect prominence: involvement (motivation and ability to scrutinize Web site content), topic of the Web site, task of the user, experience of the user, and individual differences of users. Interpretation, the second component of the theory, is "a person's judgment about an element under examination" (p. 723), or the evaluation of a Web site element in terms of being good or bad. According to Fogg's theory, various factors affect interpretation: user assumptions (culture, past experiences, heuristics, etc.), user skill/knowledge (level of competency in the site's subject matter), and context (user environment, user expectations, situational norms, etc.). This process of prominence and interpretation takes place more than once when a person evaluates a Web site because new aspects of the site are continually noticed and interpreted in the process of making overall assessments of credibility.

Rieh's (2002) model also looks at credibility assessment as an iterative process. While Fogg's (2003b) theory describes the credibility assessment process from the point when a user notices something in a Web site to the point when the user makes a judgment, Rieh's model begins earlier at the point at which a user makes a predictive judgment about which Web site will contain credible information and follows through to include evaluative judgments by which the user expresses preferences for information encountered. Rieh states that the kinds of factors influencing predictive judgments of information quality and cognitive authority differ from those that influence evaluative judgments. Her empirical study findings indicate that users tend to rely on their

previous knowledge in terms of systems (system functions and structures) or topic area for making predictive judgments while their evaluative judgments are based on the characteristics of information objects (content, type of information object, and presentation). The characteristics of sources are consistently important criteria for both predictive judgments and evaluative judgments, according to Rieh's study.

Wathen and Burkell (2002) present a model of credibility assessment in which a staged process is laid out in the context of health information searching on the Web. They propose that a user's first task is to rate the credibility of the medium based on surface characteristics such as appearance/presentation, usability/ interface design, and organization of information. The second task for the user is rating the source and the message. The evaluation of a source is often made in terms of its expertise/competence, trustworthiness, credentials, and so forth. The message is evaluated in terms of content, relevance, currency, accuracy, and tailoring. The third aspect of process involves the interaction of presentation and content with the user's cognitive state. Wathen and Burkell's model is also iterative given that the user makes judgments of the initial surface of Web sites and source cues via interactions with Web sites. Their model, however, has not been tested empirically.

Sundar (2007) presents four of what he calls "affordances" in digital media capable of cueing cognitive heuristics pertinent to credibility assessments: Modality (M), Agency (A), Interactivity (I), and Navigability (N). His MAIN model argues that these four technical affordances help to explain the perceived credibility of digital media and their offerings beyond what is explained by content characteristics. According to Sundar, the affordances have the power to amplify or diminish content effects on credibility because they can play the role of a moderator in a variety of psychological ways. Sundar further suggests that a deeper understanding of the role of heuristics in the credibility assessment process will clear up apparent contradictions in the credibility literature. While heuristics are not infallible and do not guarantee success, they likely appeal to many individuals who might cope with the deluge of information. Further discussion of the importance of heuristics in conceptualizing credibility assessment is found in Petty and Cacioppo's Elaboration Likelihood Model (ELM) to be discussed below.

2.3. Elaboration Likelihood Model (ELM)

The Elaboration Likelihood Model (ELM) provides a fairly general framework for understanding the basic process underlying persuasive communication, and as such it has often been adopted by credibility researchers to characterize credibility assessment processes and elements (e.g., Eastin, Yang, & Nathanson, 2006; Sundar, 2007; Wathen & Burkell, 2002). The ELM explains attitudinal changes in individuals as they encounter messages and the sources of those messages (Petty & Cacioppo, 1981, 1986). The two key constructs capable of affecting the amount and direction of attitude change are argument/message quality and peripheral cues. In the ELM, arguments are viewed "as bits of information contained in a communication that are relevant to a person's subjective determination of the true merits of an advocated position" (p. 133). Thus, one way to influence attitude in a persuasive message is to strengthen the quality of the arguments. Another way to influence attitude is to use a simple cue even in the absence of arguments. Peripheral cues can pertain to either source or message. An example of a peripheral source cue is the reputation of the source (highly respected author, etc.), while an example of a peripheral message cue would be the length of the message or the number of points made in the argument. The distinction Petty and Cacioppo make between content and peripheral cues may have important implications for credibility research given that "peripheral route" and "central route" characterize where people tend to put their effort and attention in evaluating information credibility when using digital media (Sundar, 2007).

Petty and Cacioppo (1981, 1986) also identify two types of message processing in which individuals engage when encountering messages: systematic and heuristic. Systematic processing is effortful and involves analyzing a message based on content cues. In many instances, however, individuals lack either the motivation or the ability to engage in systematic processing. At those times they resort to heuristic processing, basing their judgments of a message not on its content but on peripheral cues from the message and/or the source. Heuristics are practical rules or guidelines that aid in problem solving, decision making, and discovery (Newell, Shaw, & Simon, 1960), and as such tend to reduce mental effort (Petty & Cacioppo, 1986; Sundar, 2007).

3. Methodology

The goal of this study was to better understand how people make credibility assessments in a wide variety of everyday life information seeking contexts. To accomplish this goal, undergraduate students were selected as potential participants under the assumption that their lives would involve a wide variety of information seeking activities across work, school, and personal pursuits.

3.1. Participants

A purposive sampling approach to recruit participants was used, ensuring that a variety of undergraduate students representing different sizes of colleges, academic majors, and genders were included. Recruiting was continued up to the point of theoretical saturation (i.e., when participants began repeating the same themes and the authors ceased learning anything new). Twenty-six undergraduate students were recruited from three different institutions in the US Midwestern state. The three institutions included a large research university, a medium-sized state university, and a community college. Two participants dropped out of the study before they could be interviewed, and their data are not reported here. So, in total, 24 students participated in the study. Initially, only first year students were recruited on the belief that they would likely be encountering a variety of novel information tasks in their new learning and living environments. At the research university, the sampling was limited to first year students; this limiting, however, proved extremely difficult at the other two institutions as recruitment for the study occurred primarily during the summer months when fewer first year students were on campus. Therefore, recruitment was extended to include undergraduate students at all levels.

Although the average age of the participants was 21.8 years, 11 participants were 18-year old. Half of the participants were in the first year of their undergraduate education. There were only three non-traditional students, including a 29-year old, a 31-year old, and a 43-year old. Fourteen were female, and ten were male. The participants' majors included engineering, dance, film, psychology, business, nursing, education, and pre-medicine, among others.

A pre-interview questionnaire was administered to gather background information on the participants. On average, participants said they used the Internet 3.6 hours each day and their institution's online library catalog system about 0.75 hour each week. Twenty-one participants (87.5%) reported they used email multiple times daily and went on the Internet for personal interests four or more times each week. Twenty participants (83.3%) also responded that they used the Internet for school research approximately four to seven days per week.

3.2. Data collection

Diaries have proven useful to researchers given that the method enables the collection of a wealth of detailed, actual information behaviors in specific contexts (Toms & Duff, 2002). Furthermore, diaries make it possible to capture various kinds of information activities such as topics in task, resources used, time spent on task, and outcome of search activity while they are still fresh in the mind of the participant and are useful for triggering memories of those details during a subsequent in-depth interview (Rieh, 2004). Thus, participants are not left to rely entirely on their memories to recall their information needs and activities, making diaries a useful means of capturing the salient aspects of real information seeking activities for discussion during later interviews (Cool & Belkin, 2002).

Participants were asked to record one information seeking activity per day for 10 days. The general instructions given to the participants were to: "Think about situations today in which you needed to find information. Choose the one that was most important to you; then answer the following questions, providing as much detail as you can." They were encouraged to include activities that involved the range of information sources (human, Web site, book, newspaper, etc.), because the intent was not to limit the investigation to any one system, source or medium. The diaries were kept online via a password-protected Web page. Participants answered a series of 11 specific questions about the activity to ensure important details were captured. The questions posed in the diary form included the topic of information seeking activity, goals of information

seeking, familiarity with the topic, resources used, information seeking process, information use plans, and their next steps. No question directly related to credibility was included in the diaries. This is because questions about credibility in the diary may have changed the participants' behaviors and attitudes by having them focus on credibility issues during the process of information seeking.

Once the activities from the entire 10 days had been recorded, an in-depth interview was conducted. The researcher prepared two hard copies of the participant's diary and gave one to the participant so that both the researcher and the participant could read the entries in the diary during the interview. The interview was initiated by asking the participant to recount each activity, providing additional details about the topic, the resources used, and the step-by-step information seeking process. The participant was then queried about issues of credibility, including whether or not credibility was a concern and how it was judged. The participant was also asked to provide reasons for the judgments of credibility that they made. Additional questions in the interview included the participant's perceived levels of difficulty and confidence along with comments on the general seeking experience. The interviews were not, however, strictly limited to the 10 activities contained in the diaries: when appropriate, participants were asked to discuss comparable or contrasting activities with respect to their judgments of credibility generally.

3.3. Data analysis

The interviews ranged in length from 1 to 1.5 hours. The audiotapes of these interviews were transcribed and then analyzed using the grounded theory approach (Glaser & Strauss, 1967). The two authors conducted an initial content analysis separately on the same transcripts. The encodings of three transcripts resulted in the first draft of the coding scheme. Through discussions and explanations of how and why each code was applied, the coding scheme was revised. The three transcripts were finally recoded using the revised coding scheme, and the major themes emerged from the content analysis.

Two Library and Information Services masters students in the School of Information at the University of Michigan served as coders. They and the authors held weekly meetings from June to August 2006. The authors presented the coders with the coding scheme along with operational definitions and examples. Each coder was responsible for analyzing the transcripts of the twelve interviews, and in the first three weeks they coded two transcripts each week as well as brought questions and "uncodable" quotes to the meeting for the purposes of revising the coding scheme. Through the iteration of coding scheme revisions over several weeks, the coding scheme was finalized and the themes emerged more clearly. The coders entered their encodings using NVivo 2.0, qualitative data analysis software. The meetings of the group of four were continued until all the encodings were completed in order to resolve any differences in encodings between the two coders. The common themes and categories emerged in the grounded theory analyses were then broken down into seven major categories and 25 sub-categories as shown in Table 1.

This article focuses on the development of a unifying framework of credibility assessment. Thus, the three levels—construct, heuristics, and interaction—and the context of credibility judgments that emerged from the data analysis will be discussed in detail in the following chapters of this article. References can be made to

Table 1
Coding categories of data analysis

Major categories	Sub categories
Goal	Personal information need, academic achievement, entertainment, problem solving, and routines
Task	Subject searching, question answering, fact retrieval, known item searching, and advice/recommendations/opinions
Medium/Resource	Human resources, online, print, and mass media
Strategies	Starting point, use of multiple resources, and information seeking based on convenience and cost
Levels of credibility judgments	Construct, heuristics, and interaction
Context	Related to the selection of resources, applicability of judgments
Credibility judgment process	Prediction, evaluation, follow-up judgments (verification/re-evaluation/clarification/refusal)

other works by the authors (Rieh & Hilligoss, 2007; Rieh, Hilligoss, & Yang, 2007) for other themes such as goals, tasks, media/resources, credibility judgment process, and information seeking strategies.

4. A unifying framework of credibility assessment

A unifying framework of credibility assessment was developed as a result of data analysis. Three distinct levels of credibility judgments emerged: construct, heuristics, and interaction. The construct level pertains to how a person constructs, conceptualizes, or defines credibility. It is the most abstract level and as such involves broad notions of credibility that influence the person's judgments. The heuristics level involves general rules of thumb used to make judgments of credibility. This level is fairly general, being broad enough to apply to a variety of situations rather than specific to any particular situation. The interaction level refers to credibility judgments based on specific source or content cues. A summary of the three levels is presented in Table 2.

The three levels of credibility judgments above do not necessarily operate independently. In fact, as presented in Fig. 1, any or all of the levels interlink. This framework implies that each level affects the other levels in both directions from abstract to specific levels and vice versa. For instance, if a person constructs credibility in terms of reliability, that construct may influence the kind of heuristics that can help in identifying a resource likely to be reliable (e.g., official Web site). Heuristics may influence the ways in which a person assesses credibility by drawing attention to certain characteristics when interacting with the information resource. Sometimes a person makes a credibility judgment based on certain cues from a source of information and finds later that the judgment may contradict the original heuristic. In such cases, the current heuristic can be extended by adding a new general rule of thumb. On the other hand, once a person repeatedly relies on the same kind of cues relative to information objects within a single information seeking episode or across multiple information seeking episodes, the use of such cues can be established as personal heuristics. If a person's heuristics prove consistent over time, the heuristics may become the person's construct of credibility.

As Fig. 1 shows, context also emerged as an important factor influencing all three levels by playing a central role in the process of making a credibility judgment. The context is the social, relational, and dynamic frame of reference surrounding the person's information seeking process. In general, it creates boundaries around the information seeking activity or the credibility judgment itself. The context of credibility judgments can either guide the selection of resources or limit the applicability of such judgments.

Table 2
Three levels of credibility assessment

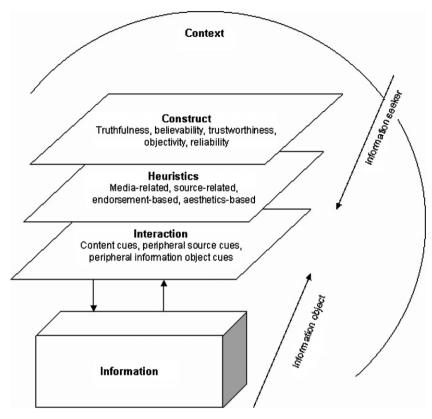| Level	Definition	Types	Influence
Construct	Conceptualizations of credibility	• Truthfulness • Believability • Trustworthiness • Objectivity • Reliability	Provides a particular point of view for judging credibility
Heuristics	General rules of thumb that are broadly applicable to a variety of situations	• Media-related • Source-related • Endorsement-based • Aesthetics-based	Provides useful ways of finding information conveniently and making credibility judgment quickly
Interaction	Specific attributes associated with particular information objects and sources for credibility judgments	• Content cues • Peripheral source cues • Peripheral information object cues	Provides specific information source or object characteristics on which to base a judgment

Fig. 1. A unifying framework of credibility assessment.

4.1. Construct level

The construct level is the highest in the framework because it concerns itself with how a person conceptualizes and defines credibility, providing a particular point of view for judging credibility in fundamental ways. The data analysis reveals that participants in this study conceptualize information credibility with respect to five different aspects: truthfulness, believability, trustworthiness, objectivity, and reliability. The distinct categories of a credibility construct indicate how a person defines credibility differently from other people at any given time.

There were a few cases in which judgments of credibility were made based on participants' estimations of the truthfulness of the information they encountered. "I guess what makes it credible would be: what type of information do they produce? Like, as long as they're producing the truth, and they're not altering it or providing false information, I would think of a source as credible" (P22 A11).[2] Other related definitions that participants used included accuracy, validity, correctness, and legitimacy.

Believability is another construct of credibility employed by several participants in this study. As one participant put it: "Credible is, like, believable" (P02 A11). In some cases participants applied this definition of credibility to the information itself, and in other cases they applied it to its sources. "...if somebody's not credible, then how can you believe in it?" (P13 A13).

Trustworthiness is the definition of credibility that participants mentioned most frequently. P16 said that "It comes down to being able to trust the source and trust the information" (P16 A12). As this quote demonstrates, the conceptualization of credibility as trustworthiness is one that can be applied to both information

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[2] Throughout, quotations from the data are followed by a reference to the participant (P) and the information seeking activity (A) in which the quote occurred.

and sources. In another example, when asked to talk about the credibility of an article on Wikipedia, one participant talked about the issue of trust by saying "But I do have a reason not to trust Wikipedia" (P19 A3). He went on to explain that "Because... anybody can edit any information on there... it's this thing where anybody can do anything to the information that's there. So, I just can't trust it because it could be modified" (P19 A3).

Another conceptualization of credibility that emerged during the interviews is objectivity. One participant defined credibility as "presenting [a] balance of facts and knowledge, showing different sides of the issues, not being biased, not being involved directly in what's going on is important" (P10 A2). This quote describes objective information ("showing different sides of the issues") and objective sources ("not being involved directly in what's going on").

Finally, several participants defined credibility in terms of reliability, a conceptualization of credibility closely linked with verifiability. One participant explained that "Being able to verify it with another source" makes for credible information (P18 A11). One interesting point that becomes apparent with this conceptualization of credibility is that it suggests certain strategies or behaviors for judging credibility. Participants who considered credibility as being about reliability felt they needed to seek out other sources of information or actually use the information in order to confirm its credibility.

Thus, it is evident that different people conceptualize credibility in different ways. This is not, however, to suggest that individuals have only one definition of credibility. In fact, the participants in this study often held multiple concepts of credibility. They applied certain constructs of credibility depending on the situation or type of information encountered, as shown in the following quote:

> ...I guess when I would trust information more than others kind of depends on how the Web site was set up. Like, for instance, the [amusement park] thing, I knew that was the Web site of the park, so I said, 'Okay, this is valid information,' or I assumed it to be. I guess they could be lying. When they say this is the official Web site of this then I kind of take it as, 'Okay, this is correct information.' But I guess...if you were trying to find out about hypertension or something, I would trust it more if...it said 'doctor' at the bottom of the page; MD at this hospital, or this foundation; like, the American something something—I would trust it more. But probably the best place that I would believe information would probably be a doctor or some sort of clinic or medically trained person (P23 A11).

In this example the participant was concerned with whether or not the information told the truth (truthfulness) when discussing information related to an amusement park. When talking about health information, the participant constructed credibility in terms of trustworthiness.

4.2. Heuristics level

The heuristics level is comprised of general rules of thumb used to make decisions regarding credibility. These rules of thumb are fairly general, broad enough to apply to a variety of situations rather than being specific to any particular situation. Participants often explained their information seeking behaviors as doing what was "convenient" and "quick." The use of heuristics supports their objective of finding information quickly and conveniently. In many cases, heuristics allow individuals to almost instantly jump to a judgment of credibility without much substantial engagement with the information or source itself. As noted by Petty and Cacioppo (1981, 1986), systematic processing of the content of a message is time consuming and cognitively demanding, and in some cases individuals lack the motivation or ability to systematically process (or evaluate) the content of a message (or information object). In these cases individuals may engage in heuristic processing because they are either unwilling or unable to spend the time or effort required for systematic processing. The data herein revealed four categories of heuristics: media-related, source-related, endorsement-based, and aesthetics-based.

4.2.1. Media-related heuristics

Many of the heuristics that individuals hold pertain to specific media. Here, the term media is used broadly to refer to any media, format, or channel through which information is conveyed. In some instances, heuristics about different media are used to compare and contrast the relative credibility of those media. These general

rules of thumb can exert various kinds of influence on the credibility assessment process, affecting such deci-
sions as to where to look for information as well as the scrutiny or skepticism with which one can approach
information found in a given media format.

Participants in the study expressed general heuristics about books, peer-reviewed journal articles, the
Web, blogs, and libraries. Books and scholarly journal articles were consistently perceived as credible media,
particularly in comparison with the Internet as shown in the comment that "People can just make up sites
and stuff online, but with a book you have to go through publishing companies and getting that whole book
[publishing] process. It just goes through so many procedures to make sure that it's credible, but the Inter-
net, it's so easy [to post there]" (P02 A10). Knowledge of the peer-review process also lies behind the posi-
tive heuristics of scholarly journal articles. One student said, "I know it's really hard to become published,
so, I'm assuming that it's credible" (P06 A8). Similarly, another participant explained that "With a peer
reviewed article, I know that the person saying it is supposed to know something about the topic.... I know
that other people who are supposed to know something of the topic agreed with them or at least consider
what they're saying a reliable possibility" (P01 A12). Thus, a general, if not detailed, understanding of the
peer-review publishing process lay behind the confidence participants expressed in the credibility of books
and scholarly journals.

Many participants are well aware of the notion that "...anybody can write anything on the Web" (P20 A7)
and so tend to evaluate more carefully the information on the Web. Teaching in schools seems to play a part in
the participants' heuristics about the Web as indicated in the statement that "...in high school I pretty much
learned that everything you read [on the Web] is not true, and you can't trust everything that you read" (P22
A6). The concerns about the Web-based information did not, however, prevent the participants from using the
information found on the Web. Rather, the heuristics about specific media will at times increase or decrease
concerns about credibility, which can influence the scrutiny an individual uses in evaluation.

Some participants differentiated between types of Web sites, comparing and contrasting blogs to other Web
sites. Participants who spoke of blogs perceived them as opinion-based and thus lacking credibility. As one
participant put it, "I would say a blog would have a lot less credibility than a professional Web site; a lot
of times they don't have first hand information" (P09 A5). That same participant elaborated to the effect that
"[On] a blog, someone could say anything they want and just keep going. There's no journalistic integrity
required or anything, because there's no repercussions" (P09 A5). Other participants noted that blogs can
be useful as "spring boards," providing new ideas and leads for information seeking. One participant
explained "So, I might use the information I found in a forum or a blog to point me in a direction to find
out if something is true, but I wouldn't take that information as credible" (P10 A5). Thus, while people
may perceive certain media or specific media formats to be non-credible, they still may have good reason
for using those media.

4.2.2. Source-related heuristics

Analysis of the data revealed the participants employ heuristics about sources of information in two ways:
familiar vs. unfamiliar sources and primary vs. secondary sources.

In terms of familiarity, the most common heuristics mentioned by the participants is that familiar, known
sources are more credible than unfamiliar ones. One participant reported that "If it's from a trusted source...
I would probably trust [it] more than, you know, when you ask someone random for directions; you don't
really know if what they are saying is right" (P05 A11). Use of the word "random" is notable. Another par-
ticipant spoke about random Web sites (P01 A11), while yet another participant referred to random organi-
zations or random companies (P15 A2). In these cases, the heuristic is that unknown or random sources of
information are less likely to be credible than known ones.

The second source-related heuristics is related to the dichotomy of primary vs. secondary sources. In gen-
eral, participants perceived primary sources as being credible, with the "official site" being perceived as most
credible. One participant stated that "I would say information is more credible, more trustworthy ... if the
source is sort of the official source...regarding what you're looking for" (P08 A12). Another participant's
characterization of the heuristics of secondary sources held that "...if it's like a second[ary] source, like, a
paper someone has written online or a blog or an article even, then I kind of second guess whether it's a true
Web site, whether that information is valid. So it depends on the site I'm on" (P03 A11).

4.2.3. Endorsement-based heuristics

A third kind of source-related heuristics involves endorsements. Here, participants perceived a particular information object or source to be credible because it has been endorsed, recommended, or otherwise upheld by knowledgeable and trusted individuals. Those individuals might be known (friends, family, colleagues, etc.), or not known (e.g., experts in a particular field). Endorsements may also come in the form of citations, one participant explaining that "If [the book] had been cited in other history papers, then I know that people find it reliable" (P07 A8).

Organizations are also seen as givers of endorsements. Some participants felt that if the Web site of a trusted organization provided a link to another Web site, then that trusted organization was effectively endorsing the other Web site. One participant explained that "...if it's something that [the University] will send a link to, or a Web site I have used sends a link to, I trust that more. It's more credible to me because if they're associated with it, then they've done their checks" (P12 A12).

The findings demonstrate that some participants perceive popularity as a form of endorsement, following the general rule of thumb that information sources and objects widely used are are more likely to be credible. One participant talked about his trust in several Web sites that review information technologies, calling them "reputable" and "respected in the industry." When asked to explain how he knew these Web sites were well respected, he replied that "...the fact that they're so popular, it's not like a perfect indicator, but it usually indicates they have some reputability" (P09 A5). The perception of popularity as a measure of credibility is not, however, restricted to Web sites. Another participant explaining why he might trust a moving company more if it were popular said "I think my general conclusion is that [if] everyone's using them..., then they must be a good company and a trusted company" (P15 A2). Another participant talked about the theory of global warming and how his own opinion about that theory had changed over time as he encountered "more and more and more" scientific articles supporting the theory. He said he now believed the theory because of "The overwhelming difference in proportion and amount [of scientists on the two sides]. It was like one hundred to one, really" (P16 A11). Nonetheless, he acknowledged that "The majority doesn't always mean it's correct" (P16 A11).

4.2.4. Aesthetics-based heuristics

A number of participants used heuristics that connected credibility and aesthetic design in Web sites. As one participant expressed it, "I also judge Web sites based on the quality of their layout. It's kind of snobbish, but if something looks like it's been put together by a five year old on his first GeoCities page, like, lots of blinky things and whatever, then I usually think the Web site's probably crap, because they haven't put a whole lot of effort into it" (P18 A8). One participant offered that "I guess a professional design of a Web site, like a nice and clean layout kind of—generally, if someone puts that much time into designing the Web site, they put more time into what they're saying. It's not always true, but it's kind of a good rule of thumb" (P09 A10).

4.3. Interaction level

The third and final level of influence is the interaction level, in which specific attributes associated with particular information objects and sources enter into an individual's judgment of credibility. In contrast to heuristics, which are broad and widely applicable, interaction level judgments are unique to a specific information object or source that participants encounter. The data analysis reveals that the interaction level involves three types of interactions: those with content cues, those with source peripheral cues, and those with information object peripheral cues.

4.3.1. Interactions with content cues

Content refers to the message itself, that is, the substantive information being conveyed. Interactions with content are arguably the most cognitively demanding of the three kinds of interactions (Petty & Cacioppo, 1986). This study finds that the use of personal knowledge to evaluate information is the primary method by which people interact with content from a credibility assessment perspective. P20, researching a particular Islamic scholar for a school assignment, conducted a Google search and found an article about him on

Wikipedia. Since she already knew something about the scholar, she was able to recognize several errors in the content provided on the Wikipedia site. The following quote explains her interactions with the content with respect to her prior knowledge:

> It's usually like, for example, on that one site that I went to on Wikipedia for that one article that I knew wasn't credible. I knew it wasn't credible because of some of the small mistakes in there. And others were pretty big mistakes that directly contradicted what I knew about the person who I was looking up. And so in that sense I knew it wasn't credible (P20 A11).

When the participants lacked the knowledge required for judging the credibility of information, they took other strategies for making credibility judgments based on content cues. For instance, participants looked for multiple sources with concurring information in order to verify content. One participant, researching the effectiveness of evidence-based substance abuse prevention programs, explored numerous scholarly articles. He explained why he felt that a particular article he found was credible: "All of the information follows suit with what others studies have said. It kind of falls in line with that" (P16 A7). Similarly, another participant was looking for the date for a particular upcoming community event. She conducted a search on Google, clicking on several of the links in the results set even though the first one she tried provided the date. She explained her reason for doing this as "Just reassurance—because I don't know which one is like—some sites on the Internet are not credible. So I wanted to make sure that it was the right information, and by giving the same date a couple of times, I believed it" (P22 A6).

4.3.2. Interactions with peripheral source cues

Any cue pertaining to a source that was used in a judgment of the credibility of information was deemed a peripheral source cue. In this study, individuals, groups, organizations, and any other social aggregate were considered sources. Source peripheral cues included affiliation, reputation, author's educational background, type of institution, and so forth.

Many participants explained their confidence in the credibility of information they received from friends, family, and other acquaintances. For example, one participant trusted her roommate for help on a sociology assignment because she knew the roommate was also taking the class and "doing pretty well" (P05 A1). Another participant trusted his friend for advice on ice skating because he knew "she has been skating many years—10 years" (P07 A2). Still another participant accepted input from his track coach about how best to treat an injury because he knew the coach "has been running marathon for nearly thirty years" (P15 A3). A different participant knew she could ask her boyfriend for information on just about any topic and have confidence that he would be knowledgeable because "he's always doing research on everything" (P06 A4). These are just a few examples of how knowledge about the habits, behaviors and talents of another person can influence a person's credibility judgment.

Past experience with sources sometimes quite significantly influenced a participant's subsequent judgments. Several participants explained their selection of Web sites by pointing to positive prior experiences with those Web sites. One participant was looking for information about an upcoming performance by a musical band. He checked two Web sites, both of which he had used previously, and found the information he needed. When asked whether he felt the information might have been not credible, he replied, "Not really. Both the sites I've been to many times before and completely trust...so I didn't have any issues like that" (P04 A2). Previous experiences can also boost a person's confidence in an e-commerce Web site. One participant explained why she used Amazon.com saying, "I've used them in the past. I've ordered things from them. I haven't had any bad experiences with ordering things or pre-ordering items" (P12 A8). First-hand knowledge can also make people doubt the credibility of information sources. One participant asked his friend for information about an upcoming football game but then decided to double check the information with another, more knowledgeable friend. In explaining why he was hesitant to trust the first friend he said "...he has a history of just sort of saying whatever when I ask him these trivial questions, because it's not a big issue. He doesn't really consider it a big issue, so he'll just say whatever" (P08 A10).

In addition to their personal experiences, people may also be influenced by the experiences of others when making credibility judgments. One participant trusted a book she called "The Gardener's Bible," explaining "I do remember hearing from other people a long time back that they'd used it and found it helpful. And so I

thought that's probably a good bet'' (P20 A3). A different participant talked about an activity in which she needed more information about a female musical artist. She explained why she turned to and believed the information she found on a particular Web site by citing her stepfather's experience with that Web site:

> My step-dad actually had a band, and they had a CD on there, and [the Web site] asked [the band] to write the biography of it because they [the Web site] are kind of small, and it's a lot cheaper way to do it. So, I figured it was probably, if not [the musical artist] who wrote it, someone like her manager or someone who was familiar with her (P14 A4).

As these examples illustrate, knowledge of a source, whether first or second-hand, influenced credibility judgments as participants interacted with sources.

4.3.3. Interactions with peripheral information object cues

The third kind of interaction involves peripheral cues derived from the information object. Most commonly these cues pertain to the appearance or presentation of the information. Considerations of presentation tend to involve the external, aesthetic aspects of the information object, or the emotional effect of interaction with the object. As noted above, many participants used aesthetics-based heuristics to judge information credibility. When applying such heuristics to a specific information object, such as examining how well a particular Web site is designed, an individual uses information object peripheral cues to judge credibility on the interaction level. One participant's effort to contrast Google and Yahoo! is illustrative:

> Google seems to be more legitimate simply because there's no advertisement and all they have is the search [box] on their Web site. If you go to Google.com it says "Google," the search box, and then you can search . . .different things. Yahoo! has all this stuff: news, weather, advertisements, links to movies and stuff. So, Google appears to be more credible because it doesn't have any of the other stuff. It has that appearance that we are here to find information—to help you search whatever information, while Yahoo! seems to be more kind of for entertainment or different kinds of things (P10 A5).

In addition to cues pertaining to the appearance or presentation of information, participants also considered cues derived from the language used. Referring to articles he had read on zdnet.com, cnet.com, and slashdot.com, one participant said, "I think they're well written in general, so I guess that leads it to be more reputable" (P9 A4). In another example, P10 looked online for a listing of Martin Luther's Ninety-five Theses. He explained why he trusted the listing he found. "Well, I mean it was the old English. The wording was kind of complex unnecessarily. It sounded like something from that period" (P10 A9).

Information object peripheral cues can also evoke affective responses that may influence credibility judgments. In talking about why he judged a particular Web site about Albert Einstein to be credible, one participant said there was a "scientific mood to the Web site. It's hard to describe" (P8 A5). Others talked about information "seeming" or "feeling" correct or credible but were often unable to elaborate. Such judgments, based on interactions with information objects, are shaped by peripheral cues pertaining to those objects.

4.4. Context of credibility judgments

The data analysis reveals that contextual factors can intervene and influence credibility judgments by constraining selection of resources for a particular information seeking activity. For instance, P08 talked about a paper he was writing for a class assignment. While he was comfortable using the Web and felt that the Web provided many resources of high quality and credibility, he noted that he was reluctant to use many Web resources out of fear that they would be perceived by his professor as non-credible simply because they were Web-based. He elaborated by stating that "If it's something that I could find an actual book on, I like that too, because just using the Internet—I'm pretty nervous about just using the Internet—just because professors usually don't like that, and it's good to include some actual books" (P08 A3). In this example, the participant followed a strategy for selecting resources that was based not entirely on his own judgment of what constituted credible information but partly as well on the school context to accommodate a professor's judgment criteria.

Participants sometimes accepted certain resources as credible primarily by relying on the context in which they encountered the resources. For example, one participant explained her confidence in the textbook she was

using for one of her classes with "…the same guy who wrote the textbook wrote my test. So, I would trust it" (P05 A8). In this example one particular resource, the textbook, was intricately intertwined with the context out of which her information need had arisen. A similar example was found with a participant who turned to the professor to clarify the class assignment. She said "… I knew I could trust my professor to give me the correct information because it was his problem I was working on" (P01 A12). Again, selection of resources and judgments of credibility were guided by the context in which the information need emerged.

Another finding from the data analysis is that contextual factors also enter into judgments of credibility by bounding or otherwise limiting the applicability of those judgments. Several instances were found in which contextual factors both led the participants to make certain credibility judgments and prevented them from confidently extending those judgments to other contexts. These cases were most frequently noted when participants made credibility judgments in the context of their classes. Several participants talked about the credibility of the information they received from their class instructors, acknowledging that while the information might not be credible in the world outside the class, it was credible within. As one student expressed it, "It's reliable in the context of the class. It may or may not be reliable in the real world" (P01 A12). Another said, "I would assume it's credible, but I also know it's completely credible within the class because the class is designed around it. So, even if it's false, it's true within the bounds of the classroom" (P09 A3).

Context not only bounds credibility judgments of information received from instructors but also bounds judgments of other sources as well. For instance, one participant commented on the information found in her course textbook. "Well, it isn't necessarily that the book would be right. It's that everything was taken from the book that would be on the exam. So, if the book wasn't right, like, technically, then, it was irrelevant. It'd be irrelevant to my goal [of passing the test]" (P06 A5). Comments like these indicate that credibility is not always viewed as absolute but rather may be seen as relative given its relationship to certain contexts of information seeking and use.

4.5. Interplay among construct, heuristics, interaction, and context

As mentioned briefly at the beginning of Section 4, the multiple levels and contextual factors are interlinked in credibility assessment. This section provides examples from the data which illustrate how multiple levels and contextual factors can shape and influence credibility judgments.

One of the common credibility judgment strategies that the participants took was to apply their own heuristics of credibility assessment to a certain information seeking activity. In many cases, it proved to be useful. In one example, a participant who was planning to move from the United States to Australia wanted to find out whether or not she would be able to work legally in Australia. When beginning her search for this information, she thought of the Australian embassy and looked for its Web site. She explained the reasoning behind her actions this way: "…it's sort of the official source, I guess, of information for people who are immigrating to Australia. I turned to it as a credible source, I guess, because it's the official line" (P24 A5). Embedded in her explanation is the very common heuristic that official sources are credible sources. Ultimately, her heuristic proved useful because she found the information she needed on the embassy's Web site. In this example, the participant used heuristics in the process of information seeking to help her identify a resource that was likely to be credible. As she interacted with that resource, nothing about it contradicted that prediction of credibility derived from the heuristic. Along this same line, another participant explained why he trusted information he found in the textbook for his Spanish class: "I didn't have any reason not to trust it" (P10 A1). Thus, as long as the participants do not encounter any cues on the interaction level that contradict or challenge their heuristics, they appeared to be fairly confident in their credibility judgments based solely on heuristics.

Heuristics are sometimes formed around the roles that a source plays in the world. Librarian is one such role which several participants perceived as a credible source of information. One participant's search for fiction at her college library illustrates how this heuristic played out in relation to the interaction level. Not knowing whether or not the library collection included popular fiction or how to find it if it did, the participant decided to seek help from the librarian. The participant explained: "Because she [librarian] works here so I figured she knew how the system worked and where to find it. I didn't think she would direct me in the wrong

area to find something'' (P12 A1). This example indicates that nothing about the interaction with the librarian contradicted the heuristic, so the participant was able to keep her confidence in the librarian's credibility.

While heuristics are useful, they have their limits. When factors from other levels intervened, participants deviated from heuristics. For example, one participant expressed heuristics that educational and non-profit Web sites are more credible than commercial ones. As he put it, .coms ''might not be as reliable as the other types, like .edu and .orgs...'' (P11 A4). While this general rule of thumb might have been useful in guiding him in previous information seeking activities, he made an exception in the case of searching for information about bi-polar disorder for a paper he was writing. He turned to WebMD, a commercial health information Web site saying, ''...when you're doing a research paper, try to stay away from the.coms because [they] might not be as valid, but I just also assumed that WebMD would be pretty reliable'' (P11 A4). In this example, interactions with peripheral source cues on a commercial Web site influenced the participant to go against the heuristic and to judge the WebMD site credible.

Another example from this study indicated how context could prompt participants to make exceptions to the heuristics. As mentioned earlier, many participants ascribed credibility to textbooks assigned by professors. This heuristic was applied directly in two different activities of one participant as she discussed the textbooks for her anthropology and astronomy classes. However, the context surrounding her art history class, made her less trustful of the textbook:

> [In] my art history class, my professor disagrees with the text book quite a bit, and there was this one theory about art after the Black Death, like, saying how it changed. And that's, like, our textbook went along with this certain theory of art history. I don't remember the name, but [the professor] was completely against it. She said, ''Don't read this. It's not right.'' So, for that class I know at least not to look at the book for everything. You have to go to lecture (P05 A9).

This participant did not fully distrust the textbook; however she did not accept it without question as she did for her other courses. She said that she needed to attend the lectures to know what information in the textbook she should believe and what she should not. Furthermore, her caution stemmed not from any cues on the interaction level. That is, nothing about content, source, or book itself made her concerned about the credibility of information. Instead, the context in which the textbook was used influenced her credibility judgment.

5. Discussion

The purpose of this research is to develop a theoretical framework of credibility assessment in which people's credibility judgments are extended across multiple media for a variety of information seeking goals and tasks. Data from 24 in-depth interviews with college students seeking information through a variety of media and channels for work, school, and personal interests were collected and analyzed in order to develop a framework of credibility assessment. This framework involves the three levels of credibility judgments: construct, heuristics, and interactions, any or all of which may be involved in an attempt to assess the credibility of information encountered. Context emerged as an important factor that influences the three levels. This framework also indicates that these multiple levels interplay with each other in shaping a person's credibility judgments.

Previous credibility studies have tended to use the measures of credibility concept by presenting multiple terms with which to study participants when examining credibility issues. To evaluate the credibility of newspapers, TV news, and online news, researchers have used measures such as fairness, accuracy, factuality, truthfulness, believability, completeness, precision, objectivity, lack of bias, trustworthiness, objectivity, depth, informativeness (Bucy, 2003; Johnson & Kaye, 2000; Meyer, 1988; Newhagen & Nass, 1989; Salwen, 1987; Sundar, 1999). It is, however, unclear whether these measures are predictors of perceived credibility or are underlying dimensions of the credibility concept itself (Newhagen & Nass, 1989). Multiple constructs of credibility that characterize conceptualizations or definitions of credibility were identified: truthfulness, believability, trustworthiness, objectivity, and reliability. At least two interesting findings were noted. First, each person seeming to possess his/her strong sense of what credibility means. Second, a person may have multiple constructs of credibility, with the construct being closely related to the type of information to be evaluated. For instance, when the person evaluates news information, objectivity could be a more important construct than others. When evaluating information from primary sources, reliability may play an important role for

credibility constructs. With health information, for instance, the question of whether people can trust the source of information would be more important than any other constructs. The framework herein indicates that linking the constructs of credibility with types of information will be a useful direction for future research in credibility.

A few researchers (e.g., Flanagin & Metzger, 2000; Sundar, 2007), have paid attention to the heuristics of credibility assessment lying behind general credibility perceptions. The present study contributes to the literature of credibility by identifying the role that heuristics plays in credibility judgments. As general rules of thumb or principles for evaluating information, heuristics help people to judge information credibility somewhat intuitively while retaining some consistencies across different information seeking and use situations. For example, as people develop heuristics about certain digital media, they may not need to examine various characteristics of information objects or sources at the interaction level in order to evaluate the information they encounter. Similarly, if people hold heuristics about the aesthetic aspects of Web sites, they tend to apply these heuristics across various Web sites.

Most previous credibility research has focused on cues on the interaction level (e.g., Fogg et al., 2001, 2003; Hong, 2006; Rieh, 2002). The results of this study show that credibility judgments taking place when interacting with specific cues are affected by credibility judgments made on the other two levels. For instance, a person may have heuristics that the information issuing from commercial Web sites is not credible compared to that issuing from government or educational Web sites. However, when the content is read carefully, the person may trust the information from commercial sites as sounding credible. Once the person gains this experience, it would become a heuristic that may be used in future credibility assessments. The findings also imply that people's perceptions of context influence credibility judgments on the interaction level in fundamental ways that go beyond the appearance, source, and content of information.

This study's findings reveal that credibility is not viewed as an absolute attribute of information or sources. Rather, credibility is seen as relative to the social context in which information seeking is pursued and credibility judgments are made (Rieh & Hilligoss, 2007). Awareness of the boundaries of credibility assessment helps participants to determine their selection of resources by filtering out stimuli in the information seeking process. The contextual factors also influence credibility assessment by "bounding" or otherwise limiting the information use environments.

6. Conclusion

Given that this framework was developed from a qualitative study of 24 participants, the findings need to be discussed with caution. Nonetheless, the unifying framework provides a fruitful initial base with which to understand better the multiple-layered and complex nature of credibility assessment for future research on credibility. This article contributes to the understanding of credibility in three distinct ways.

First, credibility judgments can be understood by taking into consideration multiple levels from construct to heuristics and interaction that go beyond focusing on cues for assessment. The cues that people rely on to make credibility judgments have been the focus of much credibility research because these cues are easily observed by researchers and discussed by study participants. However, the framework herein suggests that credibility assessment needs to be understood beyond the level of interaction, by incorporating much broader perspectives given that people also make credibility judgments in their process of developing constructs, relying on heuristics, and considering contexts.

Secondly, this research has implications for methodology when investigating credibility. Credibility assessments are often made internally, and it might prove difficult for many people to articulate their cognitively processed judgments. The methodology used in this research took a naturalistic approach in which participants were asked to keep track of their information seeking activities in diaries. In the interviews, questions were primarily asked about information seeking resources selected and strategies taken. That is because credibility judgments are embedded in the information seeking process as people tend to judge the value of credibility implicitly when deciding where to find information and what to select.

Third, the framework herein demonstrates the importance of understanding credibility across multiple media and information resources. The findings indicate that participants relied on multiple types of media and resources within one information seeking episode. More importantly, they often preferred to make cred-

ibility judgments by comparing the information retrieved from different resources. Thus, rather than focusing on credibility issues on the Web, in online news, or in electronic scholarly journals, for example, credibility should be investigated by taking into consideration multiple kinds of information media and resources that people are likely to use for their information seeking processes.

Acknowledgements

References

Bucy, E. P. (2003). Media credibility reconsidered: Synergy effects between on-air and online news. *Journalism and Mass Communication Quarterly, 80*(2), 247–264.

Cool, C., & Belkin, N. J. (2002). A classification of interactions with information. In H. Bruce, R. Fidel, P. Ingwersen, & P. Vakkari (Eds.), *Emerging frameworks and methods: Proceedings of the fourth international conference of library and information science (CoLIS4)* (pp. 1–15). Greenwood Village, CO: Libraries Unlimited.

Eastin, M., Yang, M.-S., & Nathanson, A. I. (2006). Children of the Net: Am empirical exploration into the evaluation of internet content. *Journal of Broadcasting and Electronic Media, 50*(2), 211–230.

Fidel, R., Davies, R. K., Douglass, M. H., Holder, J. K., Hopkins, C. J., Kushner, E. J., et al. (1999). A visit to the information mall: Web searching behavior of high school students. *Journal of the American Society for Information Science, 50*(1), 24–37.

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

Flanagin, A. J., & Metzger, M. J. (2007). Digital media and youth: Unparalleled opportunity and unprecedented responsibility. In M. Metzger & A. Flanagin (Eds.), *Digital media, youth, and credibility*. *MacArthur foundation series on digital media and learning* (pp. 5–28). Cambridge, MA: The MIT Press.

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

Fogg, B. J. (2003b). Prominence-Interpretation Theory: Explaining how people assess credibility online. *CHI'03 Extended Abstracts on Human Factors in Computing Systems*, 722–723.

Fogg, B. J., Marshall, J., Laraki, O., Osipovich, A., Varma, C., Fang, N., et al. (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.

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 2500 participants. In *Proceedings of the 2003 conference on designing for user experiences (DUX'03)*. http://portal.acm.org/citation.cfm?id=997097&coll=ACM& dl=ACM&CFID=36236037&CFTOKEN=18606069.

Glaser, B. G., & Strauss, A. (1967). *The discovery of grounded theory: Strategies for qualitative research*. Chicago, IL: Aldine.

Hong, T. (2006). The influence of structural and message features on Web site credibility. *Journal of the American Society for Information Science and Technology, 57*(1), 114–127.

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

Huerta, E. (2003). *The credibility of online information*. Unpublished doctoral dissertation. Claremont Graduate University.

Johnson, T. J., & Kaye, B. K. (1998). Cruising is believing? Comparing internet and traditional sources on media credibility measures. *Journalism and Mass Communication Quarterly, 79*(3), 619–642.

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 and Mass Communication Quarterly, 77*(4), 865–879.

Liu, Z. (2004). Perceptions of credibility of scholarly information on the Web. *Information Processing and Management, 40*, 1027–1038.

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. 293–335). Mahwah, NJ: Lawrence Erlbaum Associates Inc.

Meyer, P. (1988). Defining and measuring credibility of newspapers: Developing an index. *Journalism Quarterly, 65*, 567–574.

Newell, A., Shaw, J. C., & Simon, H. A. (1960). *Report on a general problem solving program*. Paper presented at the international conference on information processing, Paris.

Newhagen, J., & Nass, C. (1989). Differential criteria for evaluating credibility of newspapers and TV News. *Journalism Quarterly, 66*, 277–284.

Petty, R. E., & Cacioppo, J. T. (1981). *Attitude and persuasion: Classic and contemporary approaches*. Boulder, CO: Westview Press.

Petty, R. E., & Cacioppo, J. T. (1986). The Elaboration Likelihood Model of persuasion. *Advances in Experimental Social Psychology, 19*, 123–205.

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

Rieh, S. Y. (2004). On the Web at home: Information seeking and Web searching in the home environment. *Journal of the American Society for Information Science, 55*(8), 743–753.

Rieh, S. Y., & Danielson, D. (2007). Credibility: A multidisciplinary framework. In B. Cronin (Ed.). *Annual review of information science and technology* (Vol. 41, pp. 307–364). Medford, NJ: Information Today.

Rieh, S. Y., & Hilligoss, B. (2007). College students' credibility judgments in the information seeking process. In M. Metzger & A. Flanagin (Eds.), *Digital media, youth, and credibility*. *MacArthur Foundation Series on Digital Media and Learning* (pp. 49–72). Cambridge, MA: The MIT Press.

Rieh, S. Y., Hilligoss, B., & Yang, J. (2007). Toward an integrated framework of information and communication behavior: College students' information resources and media selection. In *Proceedings of the 70th annual meeting of the American society for information science and technology*, 44. Available from: http://www.asis.org/Conferences/AM07/proceedings/papers/34/34_paper.html.

Salwen, M. B. (1987). Credibility of newspaper opinion polls: Source, source intent and precision. *Journalism Quarterly, 64*, 813–819.

Self, C. S. (1996). Credibility. In M. Salwen & D. Stacks (Eds.), *An integrated approach to communication theory and research* (pp. 421–441). Mahwah, NJ: Lawrence Erlbaum Associates.

Sundar, S. S. (1999). Exploring receivers' criteria for perception of print and online news. *Journalism and Mass Communication Quarterly, 76*, 373–386.

Sundar, S. S. (2007). Technology and credibility: Cognitive heuristics cued by modality, agency, interactivity and navigability. In M. Metzger & A. Flanagin (Eds.), *Digital media, youth, and credibility*. *MacArthur Foundation Series on Digital Media and Learning* (pp. 73–100). Cambridge, MA: The MIT Press.

Toms, E. G., & Duff, W. (2002). "I spent 1 1/2 h sifting through one large box..." Diaries as information behavior of the archives user: Lessons learned. *Journal of the American Society for Information Science and Technology, 53*(14), 1232–1238.

Tseng, S., & Fogg, B. J. (1999). Credibility and computing technology. *Communications of the ACM, 42*(5), 39–44.

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.

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

Digital Media and Youth: Unparalleled Opportunity and Unprecedented Responsibility

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With the sudden explosion of digital media content and access devices in the last generation, there is now more information available to more people from more sources than at any time in human history. Pockets of limited availability by geography or status notwithstanding, people now have ready access to almost inconceivably vast information repositories that are increasingly portable, accessible, and interactive in both delivery and formation. Basic human activities have changed as a result, and new possibilities have emerged. For instance, the process by which people locate, organize, and coordinate groups of individuals with shared interests, the number and nature of information and news sources available, and the ability to solicit and share opinions and ideas across myriad topics have all undergone dramatic change as a result of interconnected digital media.

One result of this contemporary media landscape is that there exist incredible opportunities for learning, social connection, and individual entertainment and enhancement in a wide variety of forms. Indeed, recent evidence indicates that 45 percent of users in the United States say that the Internet played a crucial or important role in at least one major decision in their lives in the last two years, such as attaining additional career training, helping themselves or someone else with a major illness or medical condition, or making a major investment or financial decision.[1] Enhanced connectivity and information availability have changed not only *what* people know, but *how* they know what they know.

However, the wide-scale access and multiplicity of sources that ensure vast information availability also make assessing the credibility of information extremely complex. The origin of information, its quality, and its veracity are now in many cases less clear than ever before, resulting in an unparalleled burden on individuals to locate appropriate information and assess its meaning and relevance accurately. Doing so is highly consequential: assessing credibility *in*accurately can have serious social, personal, educational, relational, health, and financial consequences. As a result, determining trust, believability, and information bias—key elements of credibility—become critical as individuals process the information in their lives gleaned from digital media.

Understanding credibility in this environment is also important because it is a concern that cuts across personal, social, and political domains. For instance, digital media increasingly deliver information that results (or fails to result) in an informed citizenry that, in turn, drives the pursuit of particular social agendas, the degree and nature of engagement in public discourse, and the determination of public policy.[2] In addition, in light of the prevalence of interactions with others that now routinely occur online, personal and social identity is often established and known primarily or exclusively through computer-mediated interactions.[3]

Thus, the credibility of information sources is no longer necessarily a function of sustained, face-to-face interaction, nor is it established solely through the endorsement of those whom one knows personally or directly. Nonetheless, source credibility remains a key component of persuasion, with decision-making implications ranging from consumer choices to political candidate selection.

Contemporary youth are a particularly interesting group to consider with regard to credibility today. In many ways, this generation (demarcated roughly by birth around 1980, give or take a few years) is different from any before in its relationship to information technology, and also in its relationship to information sources.[4] Known variously as "The Millenials,"[5] the "Net Generation,"[6] "Digital Natives,"[7] and "Generation Y,"[8] members of this generation share the feature of having been immersed in an environment of digital technologies (e.g., computers and the Internet) for their entire lives. They have been described, for instance, as "digital natives in a land of digital immigrants" whose experience with digital media has led them to have "new and different expectations about how to gather, work with, translate, and share information."[9] Compared to their elders, they are more likely to turn to digital media first when researching a topic for school or personal use, to read news on the Internet than in a printed newspaper; and to use online social network tools to meet friends and to find information. In other words, the primary sources of information in their world are often (although not exclusively) digital, which is quite different from any generation prior.

Their special relationship to digital media greatly influences the way they approach learning and research.[10] As the first generation to grow up with interactive digital media, millennials are comfortable with collaborating and sharing information, and do so "in ways that allow them to act quickly and without top-down direction."[11] This, of course, has profound implications for credibility construction and assessment. The interactivity afforded by digital media has set up an expectation among many young people to play roles of both information source and receiver simultaneously as they critique, alter, remix, and share content in an almost conversational manner using digital media.[12] Here again, the implications of the uses of technology that are favored by young people present new and different challenges for both discerning and learning to create credible information.

Nonetheless, despite these realities, examinations of youth and digital media have often been somewhat crude, focusing for example on the popular generation gap caricature, where youth are portrayed as technologically adept compared with adults. Such considerations fail to focus on the most important and enduring by-products of heavy reliance on digital media: The impact of "growing up digital"[13] is that more and more of the information that drives our daily lives is provided, assembled, filtered, and presented by sources that are largely unknown to us, or known to us primarily in nontraditional ways. Yet, we have only begun to explore what this means, particularly for younger users who are not only immersed in digital media now but will be for the entirety of their lives.

In terms of credibility specifically, youth are also intriguing in large part due to the tension between their technical and social immersion and skill with digital tools and their inherent limitations owing to their limited development and experience. On the one hand, those who have literally grown up in an environment saturated with digital media technologies may be highly skilled in their use of technologies to access, consume, and generate information. This view suggests that in light of their special relationship to digital tools, youth are especially well positioned to navigate the complex media environment successfully. On the other hand, youth can be viewed as inhibited, in terms of their cognitive and emotional development, life experiences, and familiarity with the media apparatus. This perspective suggests that

although youth are talented and comfortable users of technology, they may lack crucial tools and abilities that enable them to seek and consume information effectively.[14]

As a way of beginning to understand the complex relationship between credibility, digital media, and youth, we proceed by first defining credibility after situating it in relation to allied terms and concepts. With this background, we consider credibility in the digital media environment, and examine the various credibility assessment strategies in use today, particularly those relying on group and social engagement. From there, we consider why credibility is worthy and important as a topic of inquiry, including what is and is not new about credibility in the context of digital media. Next, we examine the major issues with regard to credibility and, in particular, what special concerns arise for youth populations. Finally, we offer some perspectives of scholars, educators, and, most important, youth regarding credibility, and with this context we examine the research, policy, and educational implications. We conclude by considering the gaps to be filled in credibility research and providing recommendations for practitioners of all kinds who are affected by youth, credibility, and digital media.

Credibility Origins, Definitions, and Current Issues

Origins of Credibility Research

Scholarly interest in credibility dates back to Aristotle's writings on rhetoric and his notions of ethos (appeal based on the character of a speaker; e.g., reputation), pathos (appeal based on emotion; e.g., fear appeals), and logos (appeal based on logic or reason; e.g., the content of a speech). According to Aristotle, all three were necessary to be trustworthy,[15] although in his view credibility was mainly in the speaker and his or her ability to relate to different audiences. Ethos was thus "the communicator's ability to inspire confidence and belief in what was being said,"[16] and high-ethos speakers were considered fair, trustworthy, sincere, reliable, and honest.

Source credibility was addressed in earnest during the twentieth century by psychologists interested in studying persuasion, largely as a response to propaganda efforts during the World Wars. The "Yale Group," led by social psychologist Carl Hovland, defined credibility as expertise and trustworthiness and, for the first time, drew a distinction between source credibility, message credibility, and audience credulity.[17] In contrast to Aristotle's view, they suggested that credibility is a receiver-based construct and is determined by the acceptance of a speaker by the audience. The Yale group conducted numerous studies of source credibility as it pertained to persuasion and attitude change and identified the major components of what it means for a source to be perceived as credible by an audience. This work spurred a large body of research looking at both "source" and "message" credibility—characteristics of speakers and characteristics of messages or information.

The next major interest in credibility research came from professional rather than academic concerns. As television diffused widely in the 1950s, subscription rates for daily newspapers started to sag. As a result, newspaper professional organizations became interested in the perceived credibility of newspapers versus television (i.e., "media credibility"). The major finding in this domain was that the more people relied on a medium for news—television or newspapers—the more credible they believed that medium was.[18]

The study of credibility was resurrected in the late 1990s by the emergence of the Internet, the Web, and academic (psychology, communication, persuasion) and professional (news, e-commerce) concerns surrounding these technologies. In this domain, the Internet and

Web conflate notions of source, media, and message credibility, which formerly have been treated as rather distinct, or at least addressed largely separately.[19]

Defining Credibility

There exists no one, clear definition of credibility that has arisen from this heritage. Rather, the overarching view is that credibility is the *believability* of a source or message, which is made up of two primary dimensions: trustworthiness and expertise. Some secondary dimensions include source dynamism (charisma) and physical attractiveness, for example. Moreover, the two primary dimensions (trustworthiness and expertise) have both objective and subjective components. That is, trustworthiness is a receiver judgment based primarily on subjective factors. Expertise can be similarly subjectively perceived but includes relatively objective characteristics of the source or message as well (e.g., source credentials or information quality).

The study of credibility is highly interdisciplinary, and definitions are also somewhat field-specific. For example, communication and social psychology treat credibility as a perceptual variable: credibility is not an objective property of a source or a piece of information; instead, it is a subjective perception on the part of the information receiver.[20] Thus, this perspective emphasizes audience *perceptions* of credibility rather than the objective credibility of a source or piece of information. Information science perspectives, by contrast, view credibility as more of an objective property of information given that field's focus on defining credibility in terms of information "quality," which is how useful, good, relevant, reliable, accurate, and so forth some information is for a specific purpose. Thus, one key disciplinary distinction is that while psychology and communication tend to focus on *source credibility*, information science focuses instead on message or *information credibility*. Nonetheless, these distinctions are not perfectly clean. For example, source credibility is often a criterion for judging information credibility. Furthermore, researchers variously study the objective characteristics that make some source or piece of information *worthy* of being believed (e.g., a source's qualifications or how "good" a piece of information is compared to some accuracy metric), while others study what characteristics make sources or information *likely* to be believed by audience members (e.g., the attractiveness of a source or the congruence of some message with the receiver's own point of view).

Moreover, the notion of credibility is allied closely with several concepts, including trust, reliability, accuracy, reputation, quality, authority, and competence. Although several of these concepts include both of the core dimensions of credibility, some seem to more closely resemble the trustworthiness dimension (e.g., reputation, reliability, trust), while others seem to tilt toward the expertise dimension (e.g., quality, accuracy, authority, competence). It is beyond the scope of this discussion to elucidate the complex and intricate relationships between these concepts, but Rieh and Danielson[21] provide a useful discussion of this issue.

Understanding Credibility in the Digital Media Environment

Many studies of credibility of Web-based information rely in some form on the traditional distinctions of source, message, and medium credibility. *Source credibility* has conventionally considered characteristics of persuasive sources (traditionally, speakers), primarily expertise and trustworthiness, but also dynamism, composure, sociability, liking for the source, and similarity to the source.[22] Conceiving of Web sites as sources that engender greater or lesser credibility has shown that it is possible to translate several components of source credibility to the Web environment. Specifically, expertise may be communicated through the accuracy

and comprehensiveness of a Web site's information, its professionalism, and its sponsor's credentials.[23] Trustworthiness is associated with a Web site's integrity as demonstrated by its policy statements, use of advertising, professionalism, and firm or author reputation.[24] Attractiveness and dynamism, or how "entertaining" a site is, may be reflected in the site's use of colorful graphics, interesting content, or interactive features.[25] Finally, differences exist across Web content "sponsors": institutional Web sites are perceived as more credible than other types, for example, commercial, advocacy, and personal Web sites.[26]

Message credibility typically examines how message or information characteristics influence perceptions of believability. Major dimensions of message credibility include message structure, content, language, and delivery.[27] Although little research has directly addressed message credibility online, Internet users report very similar criteria in judging online and offline information.[28] Aspects of message content such as accuracy, use of evidence and citations, comprehensiveness, and currency have been shown to affect perceptions of the credibility of information online.[29] Moreover, Fogg et al.[30] found that structural characteristics of online messages, such as their organization (or navigability), and message delivery elements, like the presence of typographical errors, affect credibility assessments. Looking across the literature, several message attributes appear to affect credibility perceptions of messages when they appear online.

Finally, studies of *media credibility* focus on the relative credibility or believability of various media channels through which a message is sent. Cross-media comparisons have sought to assess the credibility of digital media relative to other communication channels, with mixed results. While some studies have found that traditional mass media (e.g., newspapers) are perceived as more credible than the Internet and Web,[31] others have found the opposite results[32] or have found no differences between traditional and digital channels of information.[33] Overall, research in this area indicates that although the Web is largely considered an equally credible source of information as compared to traditional venues, it may be perceived as more credible among those who are particularly motivated to seek out specific types of information and who may rely on the Web to a large extent.[34]

While conceptually tidy, Chaffee[35] argued that various dimensions of credibility overlap, and that many information consumers do not distinguish, for example, between the source of a message and the channel through which they receive the message. This type of convergence is especially pronounced in today's media environment that offers an astonishing amount of information, across various media, from a vast array of providers. Moreover, perceptions of credibility vary from person to person and between various media; digital media venues such as Web sites are themselves moving targets, constantly changing and evolving; users are also evolving, with regard to their experiences, capabilities, and the media environment in which they mature; and, there are many levels of analysis consider. For example, it makes sense to measure the credibility of the Web as a medium of communication, various forms or tools of Internet communication separately (e.g., Web sites, blogs, e-mail), entire Web sites, particular information or messages on a Web site, a site operator (e.g., nytimes.com), or individual authors of information (e.g., former *New York Times* reporter Jayson Blair). Thus, source, message, and medium credibility are overlapping concepts in many instances, and research designs that do not always enable clear distinctions among these factors complicate our current understanding of online credibility. Overall, such factors underscore the complexity of credibility in the current media environment.

Indeed, making sense of credibility today requires accounting for the various types of digital media and forms of information currently available, in order to understand how

individuals assess both information and source credibility, and how each of these influences the other. To date, however, research examining the credibility of information people obtain via digital media has primarily examined the perceived credibility of Web sites, as opposed to considering the full range of available digital information resources (e.g., e-mail, blogs, text messaging), and has tended to emphasize how individuals assess credibility in isolation, rather than considering group and social-level processes. Yet, in addition to commercial, informational, and other Web sites produced by organizations or individuals, blogs, wikis, social networking sites, and other digital media applications—linked across a wide variety of devices—constitute a significant portion of today's media environment. In fact, these tools may be especially popular among younger users.[36] It is crucial, therefore, to consider what new and emerging types of credibility and credibility assessment are implicated in these media tools.

To highlight this, we next propose a categorization of credibility construction, which is leveraged to draw attention to the range of relevant credibility assessment strategies available to information consumers today. This approach is intended to provide a way to organize and consider the diverse means by which information consumers understand, approach, and assess credibility in the contemporary digital media environment.

Contemporary Forms of Credibility and Credibility Assessment

A hallmark of the digital media environment is the ability of individuals to connect to one another more easily owing to reductions in the costs of communication and information sharing. Nonetheless, the majority of research on online credibility considers individuals largely as isolated appraisers of credibility, rather than as networked actors engaged with others. Group and social engagement, however, are crucial to credibility construction and assessment, and are likely increasingly important to younger user groups, which are the first to mature with a full appreciation of the potential of networked environments.

Processes of social endorsement—a fundamentally network phenomenon—have always been central to credibility. In communities where individuals and other entities are relatively well known to one another, a small number of endorsements can serve to effectively establish credibility. However, in large, relatively anonymous environments, personal connections become more tenuous. In these instances, credibility may be constructed by members of informally bounded groups of individuals who have some form of firsthand experience with the target under scrutiny, which can range from individuals, to products, to organizations or institutions, to which they lend their endorsement. In essence, endorsed credibility in the digital media environment compensates for the relative anonymity of tools like the Web with the sheer volume of users, at least some of whom have had private experiences that they make public via communication networks. The means of sharing these assessments can take many forms, resulting in several variants of credibility, most notably *conferred*, *tabulated*, *reputed*, and *emergent* credibility.

Credibility may be conferred on some information or its source when well-regarded entities, such as organizations, agencies, or associations, produce or recommend things like information repositories or service providers to information consumers. For example, libraries and teachers confer credibility on the information databases they make available to their patrons and students,[37] and doctors confer credibility on the sites they recommend to patients.[38] Similarly, organizations confer the credibility of their "preferred vendors," and the Better Business Bureau confers credibility on those businesses that adhere to their standards of conduct. In such instances, entities establish credibility by leveraging their expertise to approve a resource.

Of course, the effectiveness of *conferred credibility* rests on the referring entity's widely recognized, positive reputation that alleviates users' skepticism. However, if users fail to recognize relationships between sources and recipients of conferrals that might compromise credibility, conferred credibility may be earned falsely. For example, the search engine Google currently provides a number of sponsored links, for which Google has been financially compensated, that appear on each page of search results. Research shows, however, that the majority of users is unaware of the sponsored status of such links and views these resources as equivalent to the remainder of search results shown.[39] In this case, Google has conferred its credibility to the sponsored links, if not intentionally than at least functionally, in light of users' ignorance of the preexisting sponsorship model. Similarly, hyperlinks among blogs and Web pages of similar content might indicate a presumed endorsement when instead the linkage might be based simply on shared topical interest.

Tabulated credibility relies on peer rating of some dimension of an individual, organization, transaction, opinion, or product that is subsequently tallied to provide an omnibus rating score. For example, the online auction site eBay.com relies on its members to rate others with whom they have engaged in a transaction, in order to mitigate the considerable risk involved in such financial transactions by enhancing trust, or the "perception of the degree to which an exchange partner will fulfill the transactional obligations in situations characterized by risk or uncertainty."[40] Several studies have demonstrated that tabulated group-based credibility rating systems such as the one used by eBay are consequential for users: indicators of positive reputation can result in higher bid prices, more bid activity, items that are more likely to sell, and fewer problematic transactions[41] and indicators of negative reputation can result in lower bid prices or fewer bids.[42]

Tabulations may also emerge from individuals who interact with one another indirectly. For example, amazon.com provides not only a venue for users to rate their experiences with products and retailers, but also provides means by which users can assess reviews provided by fellow Amazon users. In this manner, those providing reviews earn a reputation over time as being (non)credible information sources. Importantly, such reputational ratings demonstrate the complexity of the concept of credibility: reputation differs from credibility inasmuch as one can potentially be highly credible, but yet have a negative reputation.

Tabulation procedures can also be fairly complex. The online forum slashdot.org, for instance, provides a sophisticated group-based credibility tool to rate its users, their posts, and content provided by and to members. Especially active and valued members are given "moderator" status, whereby they can edit conversational strands and rate contributions to the forum. Moderators rotate over time and are selected from among good contributors, defined by their "karma," which is assigned based on an assessment of "good" versus "bad" posts to the forum. Although complex, this system appears to be effective among slashdot's approximately 700,000 users. From the user's perspective, the ability to aggregate ratings from known or unknown others widens the range of social input that information consumers can use to judge credibility in a way that was not possible before the appearance of networked digital media.

Reputed credibility is also a form of endorsement that is perpetuated through personal and social networks.[43] A good reputation is a powerful mechanism for persuasion. Individuals may not even be able to recount the origins of their reputational credibility perceptions of various sources, relying on general recollections rather than specific information or on subtle cues conditioned over experience and time. In this manner, information consumers might widely recognize and understand differences between the *New York Times* and *New York Post*, for example, in both their print and online forms. Indeed, studies show evidence that

information seekers rely on reputational cues gleaned from their social networks as a primary means of assessing credibility online.[44] Accordingly, sources strive to construct credibility by establishing a good reputation and perpetuate that reputation through social networks. In addition, there is evidence for "credibility transfer," where "recipients use the credibility of a medium or media product as a (heuristic) indicator for the credibility of a single news story or programme."[45] In this manner, credibility transfer can occur both between different media (e.g., from the *New York Times* printed version to NYTimes.com) and within a medium (e.g., from a credible Web site such as CNN.com to a story residing on that site).

Finally, *emergent credibility* also arises from group and social engagement. Several online venues including wikis, social networking sites, and many other applications now provide vast information repositories created by largely self-coordinating individuals, rather than by a central organization. The result is that credibility can sometimes be an emergent phenomenon that arises from a pool of resources, achieved through a system of open access to all. Emergent credibility is at the core of Lankes's[46] "reliability approach" to credibility and Eysenbach's[47] discussion of "apomediaries" as the new arbiters of credibility, particularly among youth who are at ease with social uses and applications of digital media.[48] Wikipedia.com, the vast online encyclopedia with over one million entries provided entirely by individual users, is a prime example of emergent credibility. Indeed, a direct comparison of the accuracy of science entries in Wikipedia and Encyclopedia Brittanica revealed very few differences.[49] Ultimately, credibility through emergence draws attention to crucial elements of credibility assessment: in such environments, users would be wise to consider issues of bias, source identity, and perspective as they navigate resources provided collectively by multiple interested parties.

Concerns about Credibility and Digital Media

Concerns about the credibility of sources and information certainly pre-date the advent of digital media. The need to teach young people to critically appraise information has long been a part of educational efforts, under various monikers such as literacy training and critical thinking.[50] In many ways, the core skills and issues in this domain are the same today as they were before the recent rise in digital technologies. As argued elsewhere, digital media have not so much changed what skills are needed to evaluate the credibility of information as they have changed the need for people to know how and when to exercise those skills.[51]

Digital media do, however, present new challenges for information consumers, and have in many ways shifted the burden of information evaluation from professional gatekeepers to individual information consumers. Accordingly, several scholars have addressed the question of what *is* new about digital media that makes the need for effective critical evaluation more pressing today.[52] This discussion focuses on why digital media present special problems with regard to credibility and credibility assessment, including the quantity and access of information afforded by digital media technologies, the lack of gatekeepers and quality control standards, source and context ambiguity, convergence of information and media channels, disintermediation, and shifting norms and expectations for information retrieval and processing. These functions are examined next.

Special Circumstances of Digital Media and Credibility
Today, few question the notion that digital, networked media have profoundly changed the information landscape, as well as the means of social interaction. Perhaps the greatest change

is that digital media have provided access to an unprecedented amount of information available for public consumption. Until recently, the enormous cost and complexity involved in producing and disseminating information limited the number of information providers, who generally had substantial financial investment in the media apparatus.[53] Network and digitization technologies, however, have lowered the cost of information production and dissemination, thus increasing the sheer amount of information available. Indeed, the adage "On the Internet, anyone can be an author" is largely true, barring, of course, a few well-known caveats about cost and access to technology.

The combination of the vast quantity of and accessibility to digitally stored and transmitted information has prompted concerns about its credibility because, as Rieh and Danielson[54] argue, this combination creates greater uncertainty regarding both who is responsible for information and, consequently, whether it can be believed. Two important and related issues are the nature of gatekeeping in the digital media environment and the level of ambiguity surrounding both the source and context of information.

Several scholars have pointed out that information posted on the Web may not be subject to filtering through professional gatekeepers and, as a result, digital information may be more prone to being poorly organized, out of date, incomplete, or inaccurate.[55] Others have noted that digital media sometimes lack traditional authority indicators such as author identity or established reputation.[56]

Indeed, source information is crucial to credibility because it is the primary basis on which credibility judgments are thought to rest. At the same time, however, "source" has become muddled as media shifted from analog to digital forms.[57] There are several ways in which the source of information is problematic in the digital media environment. In some cases, source information is unavailable, masked, or entirely missing from a Web site, chat group, blog, wiki, and so on. In other cases, source information is provided, yet hard to interpret, such as when information is coproduced; re-purposed from one site, channel, or application to another; or when information aggregators display information from multiple sources in a centralized location that may itself be perceived as the source. These technological features create a kind of "context deficit" for digital information.[58] Moreover, the hyperlinked structure of the Web contributes to this deficit by making it psychologically challenging for users to follow and evaluate various sources as they move from site to site. Research by Eysenbach and Kohler,[59] for example, showed that source and message information become confused or disassociated in users' minds almost immediately after performing searches for medical information online.

Concerns about credibility within the digital media environment also stem from the fact that there are few standards for quality control and evaluation. There are no universal standards for posting information online, and digital information may be easily altered, plagiarized, misrepresented, or created anonymously under false pretenses. The malleability and dynamic nature of digital information exacerbate potential problems of information reliability, given that the alteration of digital information is difficult—if not impossible—to detect. In addition, the global nature of the Web makes it challenging to enact standards for quality control in the form of government regulation.[60] Finally, there is greater ambiguity about how to evaluate digital information owing simply to the relative newness of these channels of information that, in turn, makes the lack of standards for information presentation and evaluation more significant in comparison to traditional media.[61]

Another reason that the credibility of digital information may be suspect relative to more traditional media is due to channel convergence and conflation of content types afforded

by digital technologies. Some have suggested that visual and other types of distinctions that were once clear between, for example, information and commercial content are not so easily distinguished in the digital environment.[62] Examples include sponsored and unsponsored links on search engine result pages and ads embedded in Web page content. Indeed, Burbules[63] has suggested that because information is presented in a similar format on Web sites, a psychological "leveling effect" is created that puts all information on the same level of accessibility and, thus, all sources on the same level of credibility.

In the extreme, "spam" messages (unsolicited or inappropriate messages often used for mass commercial advertising) create instances where individuals lack knowledge of the sender, although peripheral cues can serve to inform credibility evaluations. Less obvious, however, are other hybrid e-mail forms. "Phishing" techniques (e-mail messages from presumably known sources that are designed to entice individuals to visit fraudulent Web sites) are designed to appear credible in order to elicit individuals to provide personal data such as bank account information, and have been shown to be very effective, in spite of widespread knowledge of such techniques.[64] In addition, as "viral" e-mails are forwarded from one person to another, the content of the message can sometimes be so thoroughly divorced from its source as to make evaluation nearly impossible. Interestingly, spam, phishing, and viral e-mails can be viewed as attempts to construct credibility by capitalizing on users' perceptions of the credibility of the e-mail medium, which is derived in large part by its highly personal nature, as most e-mail communication takes place between parties known to one another.

Finally, digital media prompt increased concern about credibility by elevating the negative consequences of misinformation for consumers. As part of their efforts to economize, organizations are migrating more and more critical information to the Web, or making such information accessible exclusively via digital means.[65] Digital media have thus enhanced both capabilities and expectations for people to be more self-serving and self-informing. Individuals are now encouraged or expected to do everything from choose between medical treatment options, decide on retirement benefits and investment options, book airline reservations, and select and register for college courses entirely on their own, using information provided via digital media rather than interacting with live agents, experts, or customer service representatives. This trend toward "disintermediation" enabled by digital media raises the stakes for consumers to be able to locate and discern credible information online.[66]

Overall, while it is true that these characteristics and realities of digital media may not have changed the basic skills needed for credibility assessment, they certainly have changed the *need* to assess credibility, the *frequency* with which to do so, and the *strategies* that may be useful and available to assess information and its source. As Burbules[67] notes, "conventional methods for assessing credibility may not be feasible on the Web because of its speed, complex features and link structure, and lack of referencing and organizational conventions."[68]

Youth, Credibility, and Digital Media
Digital media present special credibility issues for youth. To date, however, the vast majority of research on credibility has focused on news, health/medical, and commercial information, which are often assumed to be "adult" topics, or at least topics that are of more interest to adults. Consequently, extremely little research has focused on credibility and youth, in spite of the fact that youth are avid information seekers across many domains of information, whether for class assignments or personal use.[69] It may be the case, however, that youth seek different *types* of information using digital media than do adults. For example, Eysenbach[70]

points out that while adults often seek medical information about treatments or disease, youth are more likely to seek information on health (e.g., fitness, dieting) or sexuality.

The credibility of information obtained via digital media is important for youth, however, not only because they are active information seekers but also because there are some key differences between youth and adult information seekers in general, and specifically in their information-seeking goals. Compared with adults, for example, youth tend to be relatively heavily immersed in digital media by virtue of growing up in an environment saturated with these tools.[71] There is also evidence that youth access an equal or greater proportion of information via digital media than do adults, suggesting that they may find using these tools to locate information more natural compared with adults.[72]

Indeed, librarians and educators around the country have commented on a significant decline of (physical) library patronage since the appearance of the Internet and searchable databases.[73] Martell documents these trends with statistics across various university libraries, showing corresponding declines in physical library usage with increases in remote, virtual usage.[74] Beyond locating information for academic purposes, youth also rely heavily on digital media for other informational purposes on a daily basis, using a wide array of digital media technologies such as social networking Web sites, chat groups, interactive games, cellular telephones, e-mail, and text messaging to do so.[75]

Such heavy reliance on digital media could also be a consequence of the fact that youth may perceive greater social pressures to use digital media in ways consistent with their peers than do adults. Recent studies demonstrate that social and group-based applications of digital media, such as social networking sites, are extremely popular among young people,[76] and youth may feel greater desire and opportunity to expand their social connections and locate opinion leaders via these media, thus perhaps taking better advantage of opportunities for "emergent credibility" construction and assessment, as discussed earlier. At the same time, however, youth may also perceive less risk of disclosing personal information while using these applications, because they might think of themselves as having less financial and identity consequences at risk than adults. This presents complex credibility issues with regard to discerning the trustworthiness of some person with whom one is interacting via these media that are not unique to youth, but could be more pressing and widespread for this population.

Children's relative lack of life experience as compared to adults may also put them at greater risk for falsely accepting a source's self-asserted credibility, since such assessments are based on accumulated personal experience, knowledge, reputation, and examination of competing resources. As a group, youth have fewer life experiences to which they might compare information than do most adults. In addition, youth may not have the same level of experience with or knowledge about media institutions, which might make it difficult for them to understand differences in editorial standards across various media channels and outlets compared with adults who grew up in a world with fewer channels and less media convergence. As a consequence, some youth may not have the same level of skepticism toward digital media as adults do, because these media are not seen as "new" to younger users who cannot remember a time without them.

Specific instantiations of digital media technology may also pose particular credibility challenges for children, who possess less knowledge, experience, and skepticism than adults. E-mail serves as a good example. In the case of spam, younger children in particular might blindly transfer their perceptions of e-mail as a personal, credible medium and therefore not fully appreciate the sender's commercial intent. Similarly, children may not have sufficient

knowledge to be appropriately skeptical of phishing techniques or viral e-mail messages that make it difficult to determine the true message source and purpose. Also, differences in life experience may affect youth's ability to appropriately understand newer forms of credibility construction and assessment discussed earlier. Specifically, both "reputed" and "conferred" credibility rest on users' familiarity with the reputation of a particular source or conferring agent, a familiarity that many children may not possess. Furthermore, it may be difficult for children to grasp the often complex relationships between sources and recipients of credibility conferrals, such as the meaning of "sponsored links" in a Google search result page.

Beyond experiential differences, children differ from adults in their cognitive development. As described by Eastin,[77] there are clear differences between children and adults, and between younger and older children, in cognitive skill acquisition that may have important credibility implications. Youth, particularly younger children, may be more susceptible to digital misinformation and less able to discern credible from *non*credible sources and information than are adults who are more cognitively advanced. Evidence shows that young children have a hard time distinguishing commercial from noncommercial information within the broadcast medium,[78] a task that can only be more difficult given trends toward channel convergence and conflation of types of information in the digital media environment discussed earlier. Other credibility "aids" that may be effective for adults may be ineffective for children who have not reached cognitive maturity. For example, a popular tool to help people negotiate unfamiliar territory online is ratings and recommender systems. The intricacies of such systems might be too difficult for younger children to grasp since these systems can actually be quite complex. To take full advantage of ratings systems, for example, users must weigh knowledge about the quality and quantity of raters, the context in which ratings are proffered, and the specific tabulation system in place. This suggests that the advantages offered by "tabulated credibility" may be lost on younger digital media users.

Differences in reliance, motivation for and patterns of use, experience, and development notwithstanding, both children and adults face serious consequences of receiving unreliable information from digital media sources. These consequences may, however, be somewhat different for the two user populations. For adults, the financial or health ramifications of making decisions based on bad or outdated information may be of primary concern, whereas for children the consequences of misinformation may be more apparent in other realms, such as in learning or physical safety. Learning and, by extension, grades are crucial concerns for youth, given their importance as determinants of opportunities later in life. Ongoing news reports of kidnappings and assault highlight the importance of children's ability to assess whether those to whom they disclose personal information via digital media really are who they claim to be. In each case, the cost of assessing credibility inaccurately is highly consequential for youth.

Although differences in experience and cognitive development suggest that there are substantial challenges for youth to assess the credibility of digital sources and information, it is simplistic to conclude that youth are inherently disadvantaged compared with adults when it comes to credibility assessment. These characteristics of youth audiences present both challenges and opportunities. On the one hand, youth may be a particularly vulnerable audience because of their special characteristics. On the other hand, forms of credibility assessment that rely on information to be spread efficiently through social networks (e.g., emergent credibility) highlight some intriguing advantages for youth populations, who are often extremely interconnected compared to adults. In such instances, younger users may actually be better equipped than adults to transmit information pertaining to an entity's credibility quickly and efficiently via their social networks.[79]

What *is* safe to conclude is that youth's high degree of immersion, coupled with areas of naïveté, differences in cognitive development, and usage of digital media elevate the importance of understanding credibility within this user population. A primary purpose of this volume is, thus, a call to arms to researchers, educators, policy makers, and others concerned with these issues to understand how youth think about credibility in the digital media environment and to devise a plan to assist youth in finding and evaluating the information that they need.

Perspectives on Credibility from Scholars, Educators, and Youth

Scholars, educators, and youth bring different perspectives about digital media and youth, each informed by different concerns and foci. Collectively, these views combine to shed light on a number of relevant issues; yet, it is worthwhile to examine each of these voices singly as well.[80]

Scholars

Many intellectuals point out that digital media have changed not only people's access to information but also the ways in which we appraise information. Traditional notions of credibility as coming from a centralized authority (e.g., a teacher, expert, or author) and individualized appraisal processes are challenged by digital technologies.[81] Electronic networks make it easier to rely on the collective to assess information. Credibility assessments constructed through collective or community efforts (e.g., wikis, text messaging via cell phones, or social networking applications) emerge as a major theme in recent discussions, and phrases like "distributed" and "decentralized" credibility, the "democratization of information," and "collectively versus institutionally derived credibility" are common. At core is the belief that digital media allow for the uncoupling of credibility and authority in a way never before possible. Digital media thus call into question our conceptions of authority as centralized, impenetrable, and singularly accurate and move information consumers from a model of single authority based on hierarchy to a model of multiple authorities based on networks of peers.

For some, this change is scary while for others it is liberating. Indeed, there are two opposing reactions to the dangers posed by noncredible digital information. One reaction calls for "protectionist measures" involving censorship and restricted access to online information (e.g., filters or restrictive policies), which necessarily rely on systems of hierarchy and authority (e.g., portals and professional vetting of sites). For others, this shift is positive and is seen as the "solution" to the credibility "problem." This view advocates allowing *greater* openness and freedom of information and is evocative of John Milton's First Amendment principle that the best way to counter bad speech is to allow more speech. In this view, all perspectives should be allowed into the marketplace of ideas and, through that process, "bad" (i.e., noncredible) ideas will ultimately be discredited and discarded.[82]

It is interesting that both views are evident in discussions of digital media and credibility. Educational efforts have more often taken the protectionist approach, and have opted for forms of censorship to shield students from potentially "bad" information online. Others argue that censorship and filtering hamper students' ability to learn to think critically about the information they receive via digital media,[83] and that collaborative filtering processes made possible by digital networked technologies will solve many of the credibility problems raised by digital technologies, as everything will be subject to unprecedented levels of peer review via digital networks.

Educators

The notion that digital media are challenging our fundamental ideas about learning and education is prevalent among teachers and librarians. Specifically, many educators argue that digital, networked media provide new opportunities for students to learn from others in a much less hierarchical and institutional way than ever before. Some go so far as to suggest that schools and teachers are no longer needed since digital media enable students to access and learn from the collective experience and intelligence of peers or communities. Of course, this type of self-directed learning carries with it a greater burden for students to critically evaluate information from these sources. The urgency with which educators speak of digital literacy is exacerbated by their feeling that digital media have changed youths' expectations about information. They say that today, young people expect information to be available at any time, instantly. Many educators feel this places greater burden on students to evaluate the information they get online, presumably because they are processing more information more quickly, and because source identity may be harder to discern online.

Some educators feel strongly that learning to assess the credibility of digital media and information requires students to participate in the online communities from which they seek information. Others feel that a critical component of digital literacy requires kids to learn credibility assessment through digital media production, thereby teaching kids to be "architects of credibility." In other words, many feel that youth need to be taught how to be "prosumers" (i.e., both producers and consumers) of digital media as a starting point for learning credibility assessment.

Another, related theme is that educators need to find ways to support what kids are naturally doing with digital media and to leverage that into opportunities to teach critical thinking. This likely involves developing new models for teaching and learning, but a problem is that most schools cast a wary eye on incorporating new forms of digital media into the curriculum. One example is that most of youths' favorite applications and uses of digital media, including social networking applications, e-mail, cell phones, and e-commerce, are banned in schools. In fact, most school policy toward digital media, as well as most media literacy curricula, is based on the assumption that children are in need of protection from vast amounts of misinformation online and other dangers lurking on the Web.[84]

Youth

In contrast to the other stakeholders, youth themselves do not seem to be terribly concerned about credibility. What few empirical studies exist find that credibility is not a primary concern to young people when using digital media,[85] although two dimensions of minor apprehension have emerged. First, youth report that they are concerned about the reliability/accuracy of information that they find and use in their schoolwork (i.e., information or message credibility). Second, youth say that they are concerned about trusting people they may meet in the virtual world. Neither of these concerns is surprising, given that academic and social motivations prompt a good proportion of young people's use of digital media. As for solutions to the credibility "problem," many youth indicate that it is up to each individual to use caution and take the necessary steps of cross-validation and background research to verify digital sources and information. Whether they will rise to that challenge in every situation is both unknown and unlikely.[86]

Perhaps the most consistent theme across all these stakeholders is that digital technologies complicate traditional notions of hierarchy and authority structures. The digital media environment offers unprecedented flexibility, allowing kids to have more authority than

adults in some realms on some topics, nonexperts to be more credible than experts in certain circumstances, and unknown individuals to sometimes be more believable than the national news media. Many believe that digital media are shattering traditional models of authority and, as a result, credibility is being turned on its head. This upheaval suggests both problems and opportunities that require going beyond polemics in thinking about these issues.

Conclusions and Directions for Future Inquiry

Theoretical development provides researchers and practitioners a better understanding of the processes of credibility assessment that, in turn, aids them in devising strategies to help people become better information consumers. Although research on credibility and digital media to date has often neglected theory construction,[87] important theoretical applications and developments are currently emerging, many of which are represented in this volume. In particular, researchers are beginning to recognize the role of context and motivation in information searches and to incorporate this into models of credibility assessment.[88] In this regard, the application of dual processing theories, such as the Elaboration Likelihood Model or the Heuristic-Systematic Processing Model,[89] is particularly promising since these theories can help explain differences in credibility assessment processes across a variety of information-seeking contexts and situations.

With regard to youth specifically, theories of human development offer insight into the special problems that young people of varying ages may face when assessing the credibility of sources or information in the contemporary media environment. Eastin,[90] for instance, notes the cognitive developmental limitations that potentially inhibit youth of various ages from discerning information source, intent, and therefore credibility appropriately. In this area, the interdisciplinary nature of credibility research offers particularly exciting opportunities for innovative theoretical developments.

Credibility assessment research is also starting to profit from information-processing theories, such as the Limited Capacity Model and others, that help to understand how people evaluate and make decisions based on information they obtain from digital media.[91] Rieh and Hilligoss,[92] for example, propose that individuals make predictive evaluations of the usefulness of information sources and information-seeking strategies based on their own experiences and refine these assessments over time. In this manner, people learn to reuse or avoid information sources based on their verification of them. Similar to Sundar's[93] observation that individuals heavily invoke cognitive heuristics in their credibility assessments, rather than more laborious information-processing activities, such strategies result in increased predictability and reduced cognitive effort. In contrast to cognitive heuristics, however, predictive/evaluative strategies rely primarily on explicit and articulated social outcomes, as opposed to largely implicit evaluations of technical features and inferred social cues formed over time and experience. To gain the greatest benefit from information-processing models, future work should combine both of these perspectives.

Eysenbach similarly argues that people's evaluative strategies evolve with experience.[94] He proposes an iterative view of technology usage for credibility assessment whereby people shift from relying on information "intermediaries" (sources that stand between information consumers and pertinent information or services, such as librarians or doctors) to using "apomediaries" (sources that mediate without standing in between consumers and pertinent information or services, such as collaborative filtering via peers or technical tools) as they gain knowledge and self-efficacy. To have the greatest traction, the specific circumstances

under which apomediation might occur will need to be articulated and validated. Moreover, as suggested by this view, the role of various group processes needs to be more fully expressed in credibility research as well. As it stands, most research focuses on the cognitive processes of individuals acting alone (although with tacit awareness of others) to assess the credibility of information they get via digital media. To better reflect how people are increasingly using digital media, the explicitly social, networked circumstances of credibility assessment need to be addressed.

Nonetheless, experience with digital tools appears to be a necessary, although not sufficient, condition to take full and appropriate advantage of the many sources of information accessed via digital media. For instance, the nearly automatic heuristic judgments learned through interaction with digital media are honed through experience;[95] accumulated experience can result in reliable information search results across various media;[96] and Internet experience has been shown by some to be positively related to assessments of the credibility of Web-based information and to verification behaviors.[97] Experience, however, should not be confounded with expertise, nor should experience with Web technologies be equated to life experiences. Each is consequential in its own way for youth determining the credibility of online sources and information. For instance, technological experience alone does not enable individuals to discern credible from noncredible information (although it can help),[98] nor can those without sufficient life experiences make sense of certain information dilemmas they may confront online. As Eastin[99] argues, youth are faced with rather complex cognitive tasks online, and youth at different developmental stages are equipped to different degrees to resolve these dilemmas effectively. Nonetheless, youth may enjoy certain advantages due to their relative immersion in digital media, which might not yet be readily apparent. This, of course, suggests a wealth of possibilities with regard to our understanding of credibility assessment that can only be understood as data are collected over long periods of time. Indeed, as noted earlier, we have only begun to explore what "growing up digital" means for media users who will be immersed in digital media for their entire lives.

From a practical standpoint, understanding the processes of credibility assessment among youth is critical. Credibility is a cornerstone of people's interactions, personal representation, academic and professional performance, and democratic expression and choice. As more delivery mechanisms become available, more information content migrates online, and more of the world's population is interconnected, it is crucial that individuals understand the implications of their media environment and learn to assess credibility in ways appropriate to their situational demands. This is especially significant for youth, who are uniquely and simultaneously advantaged and disadvantaged by their relation to contemporary media technologies.

Teaching youth about credibility assessment, then, must both make use of their existing knowledge of contemporary technologies and address their outstanding deficiencies. As Rainie[100] argues, research and learning among youth are increasingly self-directed, interactive with networks of peers, and reliant on group outreach and knowledge. Consequently, opportunities that use the lessons inherent in the tools that already engage youth offer strategies for teaching critical distinctions that may result in appropriate digital media literacy.[101] For example, showing students existing Web sites whose focus is to reveal published misinformation, prompting youth to examine Wikipedia's "talk pages" where collaborators discuss contested encyclopedia entries, encouraging youth to become information providers themselves, and using direct comparisons of competing news accounts all present means by which digital tools and resources can be leveraged to illustrate credibility assessment concerns and

strategies.[102] These methods offer opportunities for demonstrating core credibility issues by invoking real-time and real-world instances of contested content and behaviors, via the media technologies and tools that youth naturally enjoy using. In this manner, even "managed" environments like schools can take advantage of so-called autonomous, informal learning environments and opportunities found online, which may themselves be more credible to youth.[103]

Nonetheless, in the end such strategies must overcome the "structural" challenges that are built into the political and cultural schooling environment.[104] In addition, issues of credibility and new media are subject to a range of supportive to restrictive sociopolitical interventions[105] that can alter their form and effectiveness. Ultimately, the relation among youth, digital media, and credibility today is sufficiently complex to resist simple explanations. This volume represents a first step toward mapping that complexity and providing a basis for future work that seeks to find explanations that will ultimately help scholars, educators, policy makers, and youth take advantage of the new opportunities for empowerment and learning offered by digital networked media.

Notes

1. John Horrigan and Lee Rainie, When Facing a Tough Decision, 60 Million Americans Now Seek the Internet's Help: The Internet's Growing Role in Life's Major Moments, 2006, http://pewresearch.org/obdeck/?ObDeckID=19 (retrieved October 13, 2006).

2. See Lance Bennett, ed., *Civic Life Online: Learning How Digital Media Can Engage Youth*, The MacArthur Initiative on Digital Media and Learning, 2007.

3. See David Buckingham, ed., *Youth, Identity, and Digital Media*, The MacArthur Initiative on Digital Media and Learning, 2007.

4. Matthew Grimm, . . . 'Bout your G-g-generation (Generation Y), *American Demographics* 25, no. 7 (2003): 38–41; Lee Rainie, Life Online: Teens and Technology and the World to Come (keynote address to the annual conference of the Public Library Association, Boston, MA, March 23, 2006), http://www.pewinternet.org/ppt/Teens%20and%20technology.pdf (retrieved November 7, 2006).

5. Neil Howe and William Strauss, *Millennials Rising: The Next Great Generation* (New York: Vintage Books, 2000).

6. Don Tapscott, *Growing Up Digital: The Rise of the Net Generation* (New York: McGraw-Hill, 1997).

7. Marc Prensky, Digital Natives, Digital Immigrants, *On the Horizon* 9, no. 5 (September/October, 2001): 1–6.

8. Grimm, . . . 'Bout your G-g-generation (Generation Y).

9. Rainie, Life Online; see also Prensky, Digital Natives, Digital Immigrants, 1–6.

10. Rainie, Life Online.

11. Ibid., 7.

12. Ibid.

13. Tapscott, *Growing Up Digital*.

14. Matthew Eastin, Toward a Cognitive Developmental Approach to Youth Perceptions of Credibility, this volume.

15. Gary C. Woodward and Robert E. Denton Jr., *Persuasion & Influence in American Life*, 4th ed. (Prospect Heights, IL: Waveland, 2000).

16. Charles C. Self, Credibility, in *An Integrated Approach to Communication Theory and Research*, eds. Michael B. Salwen and Don W. Stacks (Mahwah, NJ: Erlbaum, 1996), 421–41.

17. Carl I. Hovland, Irving L. Janis, and Harold H. Kelley, *Communication and Persuasion* (New Haven, CT: Yale University Press, 1953).

18. Richard F. Carter and Bradley S. Greenberg, Newspapers or Television: Which Do You Believe? *Journalism Quarterly* 42 (1965): 29–34; Bruce H. Westley and Werner J. Severin, Some Correlates of Media Credibility, *Journalism Quarterly* 41 (1964): 325–35.

19. See Miriam J. Metzger, Andrew J. Flanagin, Karen Eyal, Daisy R. Lemus, and Robert M. McCann, Credibility for the 21st Century: Integrating Perspectives on Source, Message, and Media Credibility in the Contemporary Media Environment, *Communication Yearbook* 27 (2003): 293–335, for more detail.

20. B. J. Fogg and Hsiang Tseng, The Elements of Computer Credibility, *Proceedings of CHI '99, Human Factors in Computing Systems* (1999): 80–87; Albert C. Gunther, Biased Press or Biased Public? Attitudes toward Media Coverage of Social Groups, *Public Opinion Quarterly* 56 (1992): 147–67.

21. Soo Young Rieh and David R. Danielson, Credibility: A Multidisciplinary Framework, in *Annual Review of Information Science and Technology* 41, ed. Blaise Cronin (Medford, NJ: Information Today, 2007), 307–64.

22. David Berlo, James Lemert, and Robert Mertz, Dimensions for Evaluating the Acceptability of Message Sources, *Public Opinion Quarterly* 33 (1969): 563–675; Robert H. Gass and John S. Seiter, *Persuasion, Social Influence, and Compliance Gaining* (Boston: Allyn & Bacon, 1999); Hovland, Janis, and Kelley, *Communication and Persuasion*; William E. Jurma, Evaluations of Credibility of the Source of a Message, *Psychological Reports* 49 (1981): 778; James C. McCroskey, Scales for the Measurement of Ethos, *Speech Monographs* 33 (1966): 65–72; Robert M. Perloff, *The Dynamics of Persuasion* (Hillsdale, NJ: Erlbaum, 1993).

23. B. J. Fogg, C. Soohoo, David R. Danielson, Leslie Marable, Julianne Stanford, and Ellen R. Trauber, How Do Users Evaluate the Credibility of Web Sites? A Study with Over 2,500 Participants (paper presented at the Designing for User Experiences, San Francisco, CA., 2003).

24. Janet E. Alexander and Marsha A. Tate, *Web Wisdom: How to Evaluate and Create Information Quality on the Web* (Hillsdale, NJ: Erlbaum, 1999); Mary J. Culnan and Pamela K. Armstrong, Information Privacy Concerns, Procedural Fairness, and Impersonal Trust: An Empirical Investigation, *Organization Science* 10, no. 1 (1999): 104–15; Fogg et al., *How Do Users Evaluate the Credibility of Web Sites?*

25. Qimei Chen and William D. Wells, Attitude toward the Site, *Journal of Advertising Research* 39, no. 5 (1999): 27–37; Eastin, Toward a Cognitive Developmental Approach.

26. Andrew J. Flanagin and Miriam J. Metzger, The Perceived Credibility of Web Site Information as Influenced by the Sex of the Source, *Computers in Human Behavior* 19 (2003): 683–701; Andrew J. Flanagin and Miriam J. Metzger, The Role of Site Features, User Attributes, and Information Verification Behaviors on the Perceived Credibility of Web-based Information, *New Media and Society* 9, no. 2 (2007): 319–42.

27. E.g., Gass and Seiter, *Persuasion, Social Influence, and Compliance Gaining*; M. A. Hamilton, Message Variables That Mediate and Moderate the Effect of Equivocal Language on Source Credibility, *Journal of Language and Social Psychology* 17 (1998): 109–43; James C. McCroskey, A Summary of Experimental Research on the Effects of Evidence in Persuasive Communication, *The Quarterly Journal of Speech* 55 (1969): 169–76; James C. McCroskey and R. Samuel Mehrley, The Effects of Disorganization and Nonfluency on Attitude Change and Source Credibility, *Speech Monographs* 36 (1969): 13–21; Gerald R. Miller and

Murray A. Hewgill, The Effect of Variations in Nonfluency on Audience Ratings of Source Credibility, *Quarterly Journal of Speech* 50 (1964): 36–44; Daniel J. O'Keefe, *Persuasion: Theory and Research* (Newbury Park, CA: Sage, 1990).

28. See Metzger et al., Credibility for the 21st Century, for a review.

29. Soo Young Rieh and Nicholas J. Belkin, Understanding Judgment of Information Quality and Cognitive Authority in the WWW, in *Proceedings of the 61st Annual Meeting of the American Society for Information Science* 35, ed. Cecilia M. Preston (Medford, NJ: Information Today, 1998), 279–89; S. Shyam Sundar, Effect of Source Attribution on Perception of Online News Stories, *Journalism and Mass Communication Quarterly* 75, no. 1 (1998): 55–68.

30. Fogg et al., *How Do Users Evaluate the Credibility of Web Sites?*

31. Andrew J. Flanagin and Miriam J. Metzger, Perceptions of Internet Information Credibility, *Journalism and Mass Communication Quarterly* 77, no. 3 (2000): 515–40; Spiro Kiousis, Public Trust or Mistrust? Perceptions of Media Credibility in the Information Age, *Mass Communication & Society* 4, no. 4 (2001): 381–403.

32. Thomas J. Johnson and Barbara K. Kaye, Cruising Is Believing? Comparing Internet and Traditional Sources on Media Credibility Measures, *Journalism and Mass Communication Quarterly* 75, no. 2 (1998): 325–40; Thomas J. Johnson and Barbara K. Kaye, Wag the Blog: How Reliance on Traditional Media and the Internet Influence Credibility Perceptions of Weblogs among Blog Users, *Journalism and Mass Communication Quarterly* 81, no. 3 (2004): 622–42.

33. Online News Association, Digital Journalism Credibility Survey, 2001, http://www.journalists.org/ Programs/ResearchText.htm (retrieved June 25, 2001).

34. Thomas J. Johnson and Barbara K. Kaye, Using Is Believing: The Influence of Reliance on the Credibility of Online Political Information among Politically Interested Internet Users, *Journalism and Mass Communication Quarterly* 77, no. 4 (2000): 865–79; Thomas J. Johnson and Barbara K. Kaye, Webelievability: A Path Model Examining How Convenience and Reliance Predict Online Credibility, *Journalism and Mass Communication Quarterly* 79, no. 3 (2002): 619–42.

35. Steven H. Chaffee, Mass Media and Interpersonal Channels: Competitive, Convergent, or Complementary? in *Inter/Media: Interpersonal Communication in a Media World*, ed. Gary Gumpert and Robert Cathcart (New York: Oxford University Press, 1982), 57–77.

36. Amanda Lenhart, Mary Madden, and Paul Hitlin, *Teens and Technology: Youth Are Leading the Transition to a Fully Wired and Mobile Nation*, Pew Internet & American Life Report (July 2005), http://www.pewinternet.org/report_display.asp?r=162 (retrieved April 17, 2006).

37. See Soo Young Rieh and Brian Hilligoss, College Students' Credibility Judgments in the Information Seeking Process, this volume.

38. See Gunther Eysenbach, Credibility of Health Information and Digital Media: New Perspectives and Implications for Youth, this volume.

39. Deborah Fallows, *Search Engine Users: Internet Searchers Are Confident, Satisfied and Trusting—But They Are Also Unaware and Naïve*, Pew Internet & American Life report, January 2005, http://www.pewinternet. org/PPF/r/146/report_display.asp (retrieved April 17, 2006).

40. Brian P. Bailey, Laura J. Gurak, and Joseph A. Konstan, Trust in Cyberspace, in *Human Factors and Web Development*, ed. Julie Ratner (London: Erlbaum, 2003), 311–21.

41. Patrick Bajari and Ali Hortacsu, The Winner's Curse, Reserve Prices, and Endogenous Entry: Empirical Insights from eBay Auctions, *The Rand Journal of Economics* 34, no. 2 (2002): 329–55; Andrew

J. Flanagin, Commercial Markets as Communication Markets: Uncertainty Reduction through Mediated Information Exchange in Online Auctions, *New Media & Society* 9, no. 3 (2007): 401–23; Daniel Houser and John Wooders, Reputation in Auctions: Theory, and Evidence from eBay, University of Arizona, 2000, http://info-center.ccit.arizona.edu/~econ/working_papers/Internet_Auctions.pdf (retrieved October 1, 2003); Cynthia G. McDonald and V. Carlos Slawson, Reputation in an Internet Auction Market, *Economic Inquiry* 40 (2002): 633–50; Mikhail I. Melnik and James Alm, Does a Seller's ECommerce Reputation Matter? Evidence From eBay Auctions, *The Journal of Industrial Economics* 50, no. 3 (2002): 337–50; Paul Resnick and Richard Zeckhauser, Trust among Strangers in Internet Transactions: Empirical Analysis of eBay's Reputation System, in *Advances in Applied Microeconomics*, vol. 11, *The Economics of the Internet and E-Commerce*, ed. Michael R. Baye (Amsterdam: Elsevier Science, 2002); Stephen S. Standifird, Reputation and E-Commerce: eBay Auctions and the Asymmetrical Impact of Positive and Negative Ratings, *Journal of Management* 27 (2001): 279–95.

42. Bajari and Hortacsu, The Winner's Curse, Reserve Prices, and Endogenous Entry; Ulrich Brinkman and Mathias Siefert, Face-to-Interface—The Establishment of Trust in the Internet: The Case of E-Auctions, *Journal of Sociology* 30 (2001): 23–47; David Lucking-Reiley, Doug Bryan, Naghi Prasad, and Daniel Reeves, Pennies from eBay: The Determinants of Price in Online Auctions, Vanderbilt University working paper, 2000, http://eller.arizona.edu/%7Ereiley/papers/PenniesFromEBay.pdf (retrieved August 5, 2006); Standifird, Reputation and E-Commerce.

43. See Shawn Tseng and B. J. Fogg, Credibility and Computing Technology, *Communications of the ACM* 42, no. 5 (1999): 39–44.

44. See Rieh and Hilligoss, College Students' Credibility Judgments, and S. Shyam Sundar, The MAIN Model: A Heuristic Approach to Understanding Technology Effects on Credibility, this volume.

45. Wolfgang Schweiger, Media Credibility—Experience or Image? A Survey on the Credibility of the World Wide Web in Germany in Comparison to Other Media, *European Journal of Communication* 15, no. 1 (2000): 41.

46. R. David Lankes, Trusting the Internet: New Approaches to Credibility Tools, this volume.

47. Eysenbach, this volume.

48. Frances Jacobson Harris, Challenges to Teaching Credibility Assessment in Contemporary Schooling, this volume.

49. Jim Giles, Internet Encyclopedias Go Head to Head, *Nature* 438 (December 15, 2005): 900–901.

50. See Harris, this volume.

51. Miriam J. Metzger, 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, no. 10 (2007); Metzger et al., Credibility for the 21st Century.

52. David R. Danielson, Web Credibility, in *Encyclopedia of Human-Computer Interaction*, ed. Claude Ghaoui (Hersey, PA: Idea Group, 2005), 713–21; B. J. Fogg, *Persuasive Technology: Using Computers to Change What We Think and Do* (San Francisco: Morgan Johnson, 2003); Metzger et al., Credibility for the 21st Century; Rieh and Danielson, Credibility: A Multidisciplinary Framework.

53. It is interesting to note, though, that high cost certainly does not ensure credibility. For instance, "yellow journalism" of the late 1800s relied on partisanism, strong editorial opinions mixed with "news," and tactics of sensationalism. Similarly, contemporary publications like the *National Enquirer* remain wildly successful, in spite of (and partially because of) the nature of their stories and reportage, which are commonly understood not to be credible.

54. Rieh and Danielson, Credibility: A Multidisciplinary Framework.

55. Danielson, Web Credibility; Flanagin and Metzger, Perceptions of Internet information credibility; Flanagin and Metzger, The Role of Site Features; Joseph W. Janes and Louis B. Rosenfeld, Networked Information Retrieval and Organization: Issues and questions, *Journal of the American Society for Information Science and Technology* 47, no. 9 (1996): 711–15; Metzger et al., Credibility for the 21st Century; Rieh and Danielson, Credibility: A Multidisciplinary Framework.

56. Danielson, Web Credibility; John W. Fritch and Robert L. Cromwell, Delving Deeper into Evaluation: Exploring Cognitive Authority on the Internet, *Reference Services Review* 30, no. 3 (2002): 242–54; Metzger, Making Sense of Credibility on the Web.

57. See Sundar, The MAIN Model, this volume.

58. See Eysenbach, this volume.

59. Gunther Eysenbach and Christian Kohler, 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 (March 9, 2002): 573–77.

60. See Fred W. Weingarten, Credibility, Politics, and Public Policy, this volume, for a discussion of policy issues related to credibility.

61. Danielson, Web Credibility; Flanagin and Metzger, Perceptions of Internet Information Credibility; Rieh and Danielson, Credibility: A Multidisciplinary Framework.

62. Alexander and Tate, *Web Wisdom*.

63. Nicholas C. Burbules, Digital Texts and Future of Scholarly Writing and Publication, *Journal of Curriculum Studies* 30, no. 1 (1998): 105–24.

64. Rachna Dhamija, J. D. Tygar, and Marti Hearst, Why Phishing Works, *Proceedings of CHI 2006 Human Factors in Computing Systems*, Montreal, Quebec, 2006, 581–90.

65. See Lankes, this volume.

66. See both Lankes and Eysenbach, this volume, for discussions of these and related issues.

67. Nicholas C. Burbules, Paradoxes of the Web: The Ethical Dimensions of Credibility, *Library Trends* 49 (2001): 441–53.

68. As cited in Rieh and Danielson, Credibility: A Multidisciplinary Framework, 311.

69. Lenhart, Madden, and Hitlin, *Teens and Technology*.

70. Eysenbach, this volume.

71. Lenhart, Madden, and Hitlin, *Teens and Technology*.

72. Ibid.

73. E.g., Scott Carlson, The Deserted Library: As Students Work Online, Reading Rooms Empty, Leading Some Campuses to Add Starbucks, *Chronicle of Higher Education*, 2001, http://chronicle.com/free/v48/i12/12a03501.htm (retrieved August 5, 2005).

74. Charles R. Martell, The Ubiquitous User: A Reexamination of Carlson's Deserted Library, *Portal: Libraries and the Academy* 5, no. 4 (2005): 441–53.

75. Lenhart, Madden, and Hitlin, *Teens and Technology*; Susannah Fox and Mary Madden, *Generations Online*, Pew Internet & American Life, 2005, http://www.pewinternet.org/PPF/r/170/report_display.asp (retrieved July 24, 2006); Rieh and Hilligoss, College Students' Credibility Judgments; Teenage Research Unlimited, *Teen Internet Safety Survey*, National Center for Missing and Exploited Children and Cox Communications, 2006, http://www.netsmartz.org/safety/statistics.htm (retrieved July 24, 2006).

76. Lenhart, Madden, and Hitlin, *Teens and Technology*.

77. Eastin, this volume.

78. See ibid.

79. See Lankes, this volume, and Eysenbach, this volume, for similar arguments.

80. The following section was informed by online dialogues with researchers, educators, and interested members of the public, as well as by youth participants in the Global Kids Digital Media Essay Contest. Over thirty people participated in the online dialogues, which were held in the fall of 2006 and were sponsored by the MacArthur Foundation as part of the Digital Media and Learning initiative. Excerpts of the online discussions may be found at http://spotlight.macfound.org/main/category/c/Credibility/. For information about the Global Kids Digital Media Essay Contest, including the winning essays, see http://www.globalkids.org/.

81. See Lankes, this volume.

82. See Weingarten, this volume, for a similar discussion with regard to policy.

83. See Harris, this volume.

84. See ibid., for a full discussion of these educational issues.

85. Denise E. Agosto, A Model of Young People's Decision-Making in Using the Web, *Library & Information Science Research* 24 (2002): 311–41; Denise E. Agosto, Bounded Rationality and Satisficing in Young People's Web-based Decision Making, *Journal of the American Society of Information Science and Technology* 53 (2002): 16–27; Raya Fidel, Rachel K. Davies, Mary H. Douglass, Jenny K. Holder, Carla J. Hopkins, Elisabeth J. Kushner, Bryan K. Miyagishima, and Christina D. Toney, A Visit to the Information Mall: Web Searching Behavior of High School Students, *Journal of the American Society of Information Science* 50 (1999): 24–37; Sandra Hirsh, Domain Knowledge and Children's Search Behavior, in *Youth Information-seeking Behavior: Theories, Models, and Issues*, eds. Mary K. Chelton and Colleen Cool (Lanham, MD: Scarecrow Press, 2004): 241–70; Andrew Large, Information Seeking on the Web by Elementary School Students, in *Youth Information-Seeking Behavior*, 293–320.

86. See Rieh and Hilligoss, College Students' Credibility Judgments, this volume, for a discussion of when youth are more likely to invest effort in assessing credibility.

87. Metzger et al., Credibility for the 21st Century.

88. E.g., Metzger, Making Sense of Credibility on the Web; Rieh and Hilligoss, College Students' Credibility Judgments, this volume.

89. See Sundar and Eysenbach chapters, this volume.

90. Eastin, this volume.

91. See ibid.

92. Rieh and Hilligoss, College Students' Credibility Judgments, this volume.

93. Sundar, The MAIN Model.

94. Eysenbach, this volume

95. Sundar, The MAIN Model.

96. Rieh and Hilligoss, College Students' Credibility Judgments, this volume.

97. Flanagin and Metzger, Perceptions of Internet Information Credibility; J. Ha, Questioning Internet Credibility: A Test on the Cyber Marketplace (paper presented at the Annual Meetings of the

International Communication Association, Washington DC, May 2001); Johnson and Kaye, Cruising Is Believing?

98. See Lankes, Trusting the Internet, this volume.

99. Eastin, this volume.

100. Rainie, Life Online.

101. Harris, Challenges to Teaching Credibility Assessment in Contemporary Schooling.

102. H. Jenkins, Confronting the Challenges of Participatory Culture: Media Education for the 21st Century (white paper produced for the MacArthur Foundation's Digital Media and Learning initiative, November 13, 2006), http://www.digitallearning.macfound.org (retrieved November 14, 2006).

103. Bennett, *Civic Life Online*.

104. Harris, Challenges to Teaching Credibility Assessment in Contemporary Schooling.

105. Weingarten, Credibility, Politics, and Public Policy.

Trusting the Internet: New Approaches to Credibility Tools

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It has been said that the Stone Age did not end because humans ran out of stones. Instead, Stone Age technology was superseded by new tools and capabilities. At some point in history, it simply became more advantageous to adopt new methods and tools rather than trying to solve problems inherent in older methods. Society may soon be at this inflection point in terms of how people, and particularly youth, identify credible information, abandoning traditional methods of determining credibility that are based on authority and hierarchy for digital tools and new network approaches. Far from being a negative development, new methods and tools for determining credibility may reflect a more distributed and open approach than in the past. Such an approach has important implications for how youth are educated, how policy is determined, and how future information systems are built.

This chapter first highlights some reasons why youth, the institutions that serve them, and society as a whole are moving online, as well as some of the consequences of this move— namely, the paradox of "information self-sufficiency." A reformulated vision of credibility is offered in this context, which highlights features of digital information and networks. Then, a shift among credibility tools and techniques from traditional authority models to more of a "reliability approach" is discussed. Based on this, a framework for understanding the implications of information self-sufficiency for learning in a networked digital world is presented. This framework is used to highlight the often invisible effects that technology has upon credibility. Finally, implications of this are explored and current and anticipated developments on the Internet are considered. The chapter concludes by discussing implications of the information self-sufficiency paradox in the context of the education of youth in the current digital media environment.

The Shift Toward Increased Information Self-Sufficiency

There is little doubt that in the United States and other developed countries, citizens are increasingly relying on the Internet to gather information. Seventy-three percent of U.S. adults are Internet users, and 42 percent of Americans (about 84 million) now have broadband connections at home, up from 29 percent in January 2005.[1] The numbers are even more striking for youth. Lenhart, Madden, and Hitlin recently reported that 87 percent of youth in the United States ages 12 to 17 are Internet users, 51 percent of whom say that they use the Internet on a daily basis.[2] Other estimates indicate that half of children in grades 1–5 are online, as are 80 percent of high school students.[3]

Increasing Internet reliance is also evidenced by the dramatic increase of self-service options available to Internet users. Today, individuals are expected to book their own airline tickets, determine their own retirement plans, and even decide between life-and-death medical treatments using Internet tools and information available on the Web, without the assistance of traditional information intermediaries.[4] However, the quality of these services varies. Examples of bad self-service options abound and nearly everyone has a horror story of getting tangled in a phone tree or diving deep into a company Web site desperately looking for a phone number to call or person to e-mail. Yet, there are also plenty of examples where online self-support systems and customer service have been designed and implemented well. Examples include Lands' End live chat support service[5] and package tracking through UPS, FedEx, and other overnight carriers, to name a few.

The trend toward online self-support services and "disintermediation" more generally[6] is also apparent in nonprofit and governmental sectors. For example, the National Science Foundation has supported extensive research into "digital government" that seeks to provide support of digital integration over a wide variety of government tasks such as electronic voting, public comments, security, and more.[7] In the K–12 arena, Rice discusses several national policy initiatives involving the use of digital media to expand educational opportunities for U.S. students.[8]

Youth in particular are increasingly dependant upon online systems and support. From homework help services such as Tutor.com to completely virtual high schools,[9] school-based learning is increasingly complimented by online services. As early as 2001, for example, Lenhart, Simon, and Graziano noted "71% of online teens say that they used the Internet as the major source for their most recent major school project or report."[10] This increasing use and reliance on the Internet means that for a growing percentage of students the quality of online services and self-support options can directly affect their learning.[11]

Presumably, the chief advantage to customers of online information self-sufficiency is greater control and satisfaction. However, this may not be the reality. ServiceXRG found that of the 60 percent of customers who used Web self-service, only 23 percent reported that they found what they were looking for online,[12] suggesting that only a small minority who choose to use online self-service features are able to find content that satisfies their needs. Thus, and ironically, many customers turned online actually require *additional* customer support. Unfortunately, such outcomes are not atypical.[13]

This shift to digital over physical media, however, is only partly a response to citizen demand for increased self-service. Another important factor is economic pressure felt by organizations to minimize cost by eliminating expenses such as printing and customer service personnel. According to the Web consulting firm Adaptive Path, in the last few years companies have "pushed labor-intensive tasks out to the customer, and they did so in a way that provided the customers with direct access to and control over information that they care about."[14] The advantage to organizations is substantial cost savings. For example, ServiceXRG, a market research firm, found that whereas first contact closure cost of phone transactions is $49.10, it is $36.70 when done via e-mail, and only $11.60 via Web self-service.[15]

The awkwardness with which some organizations have shifted the responsibility of support from employees to users is understandable given that the transition to digital methods of information creation, storage, analysis, and distribution has happened in an astoundingly short period of time. In less than fourteen years, the U.S. federal government, for example, has gone from mandating executive agency Web sites (initially little more than simple online

brochures), to requiring electronic voting,[16] Web-based submittals of grant applications,[17] and electronic banking transactions. There simply has been too little time and too much change in the Internet environment to formalize and codify "good online service." To put it bluntly, what users need in order to take charge of their own online decision making is at best an art and, more often than not, a series of trial-and-error solutions.

Moreover, what may be called "information self-sufficiency" or "disintermediation" is far from an Internet-only phenomenon. Anyone who has checked into a flight at the airport knows that the number of touch screens is steeply on the rise, while ticket agents are in steep decline. Libraries now have self-checkout kiosks as do grocery and other retail stores. Information self-sufficiency is obvious in a world where so many aspects of life are either online (e.g., online banking, music downloads, shopping, medical information, government documents access) or are facilitated by online transactions (e.g., electronic fund transfers, traffic management systems, automated payroll systems). In the end, information self-sufficiency has dramatic impact: it affects how products are marketed, how organizations manage information, how courts assess liability, and even how the current and future workforce is trained.

Information Self-Sufficiency and the Heightened Importance of Credibility

Although information self-sufficiency could (and should) be examined in a number of ways—including economic, political, and even in terms of social and class roles—this chapter concentrates on the effects of information self-sufficiency on credibility, or the believability (i.e., the trustworthiness and expertise) of some source of information. Indeed, credibility, particularly in the context of youth and the Internet, is fundamental to the long-term success of information self-sufficiency and, by implication, the success of digital media themselves. An emphasis on credibility is crucial in the success of society's digital migration because information is increasingly disconnected from its physical origin and, as a consequence, the credibility of information has taken on new complexities, with new implications.

Consider the simple act of buying a book over the Internet. When people buy a book online, they are not basing their buying decision on a single, physical item. They are instead basing the buying decision on information *about* a book (e.g., its price, author, shipping terms, reviews). Even if they had previously checked the book out of a library, or paged through it at the local bookstore (where they could have bought the book based on the information it contained *and* the physical attributes of the book such as whether it is in good shape, etc.), in the online environment they are simply putting in an order for a book based on some proxy, such as a digital image of a physical item.

This seemingly mundane and obvious fact actually has sweeping implications for credibility on the Internet. In particular, for any online transaction that involves delivery of some physical item, a central means of determining credibility—physical examination and testing—is gone, or is at least greatly diminished (since one can usually return the book after a physical inspection at the end of the process). No more is it possible to review a signature to make sure it is original. No more is examination of the quality of paper used in a publication practical. No more can one audit a physical inventory prior to purchase.

Another example that serves to illustrate the point is a digital fingerprinting system for use by law enforcement personnel in New York State. When suspects are arrested, instead of inking fingers and making cards with copies of fingerprints, in many jurisdictions prisoners now place their fingers on glass and have them digitized. The system was intended to speed

up processing of fingerprints, and to make them more accessible for searches (P. Lorenzo, personal communication). However, removing the physical collection of fingerprints had an unintended consequence. At one arrest a processing officer took a suspect's name and date of birth, and simply copied a fingerprint already stored under that name and date of birth into the new case file (which was against policy). It turns out the date of birth and name given by the suspect were false, and the prints copied belonged to a prisoner already incarcerated. More striking, when the mistake was revealed, and the suspect's prints were actually scanned, it was discovered that he was wanted for another crime—murder. This mistake was possible, and undetectable, in a digital networked environment because every transaction is an information-only event: that is, transactions exist only as digital information with no physical record or artifact. As such, some transactions work better in the digital environment than others.

For example, while buying books online has become popular, buying homes online is still a rarity. This is due both to the size of the transaction, and also to how much of an object's information is intrinsic and how much is extrinsic to its physical form.[18] The more mass produced and standardized an item is, the more information can be "separated out" from that item. In the case of the book, nearly all of the information within the book—including the author, the price, the title, and even the visual images of the pages themselves—can be recreated accurately in digital form. Thus, the information is extrinsic to the physical item. With a house, however, the condition of the roof, the true color of the paint, the "feel" of the neighborhood, and the creakiness of the floors are all intrinsic qualities that need physical inspection to assess accurately. This also explains why buying a new car online is not only possible, but is a growing industry. Although it is a large transaction, new cars are fairly standard, so a test drive of a car in New York is assumed to be identical to test driving the same make and model in California. Therefore, buying that new car in California does not require a second test drive. The same cannot be said of a house. Houses are unique, and so the information relevant to a buying decision is intrinsic to the house.

Since information is the only evidence available to people when making an online transaction (e.g., buying something, talking to someone, learning about something), the credibility of that information is essential. Moreover, methods of building trust, and methods to test assertions have changed. For example, if one goes to buy a book online, that person can no longer test the book to see if it is complete and in good condition prior to delivery. They must now trust the online vendor of that book. This is the great paradox in information self-sufficiency on the Internet: *end users are becoming more responsible for making information determinations, but because they have fewer physical cues to work with, they are becoming more dependent on the information provided to them by others*.

This paradox is complicated further by the fact that people are simply unable to, or fail to, recognize many of the more technical influences on the information with which they are provided in the first place. In fact, there is a great deal of information manipulation that occurs that is *never* perceptible to the user. Built into the tools themselves are filters, assumptions, biases, and outright distortions that can never be factored into a user's credibility decision.[19] Indeed, there has been much discussion and research of how the media used to access information can affect perceptions of the credibility of that information.[20] There have also been a number of studies into how the online environment itself affects credibility.[21] Together, this work highlights how credibility can be both determined and manipulated by technical elements, such as load time of Web pages or site design.[22] Research also points out that while technology influences credibility decisions, it is often invisible to the end user.[23]

Perhaps because these things are so invisible to most people, this point is completely missed in many examinations of how users make credibility decisions online.

Youth in particular are increasingly dependent on software and hardware tools while accessing information and services on their own within the digital environment. Put simply, there is no way to be on the Internet without some intermediating piece of technology. Be it a Web browser, a cell phone, or some other tool, information flowing to and from the Internet, as well as information crucial for determining credibility, all flow through seemingly invisible agents of code and silicon. The Lankes/Eisenberg Architecture[24] can be used to highlight the kind of information manipulation that occurs solely in the province of the tools of the digital environment. This architecture divides the Internet and, by extension, digital networks into four distinct layers: infrastructure, application, information service, and user. Each of these layers can manipulate information in a way that is completely transparent to the recipient. Consequently, there are implications of each layer in terms of youth learning.

Infrastructure is composed of hardware (e.g., routers, protocols) used to move information from one place to another on the Internet, and the organizations, such as Internet Service Providers (ISPs), that provide and maintain these mechanisms. This layer is often the most invisible to end users, yet can have a profound impact on the information available to users to enable them to make credibility assessments. For instance, many people do not realize that infrastructure providers can easily block traffic to and from certain destinations, and can make such blocked traffic invisible. When a school blocks access to certain Web sites, they may post a message to a student's browser stating that the site is blocked, or they can more simply provide a "site not found" indication to a user's browser, the same error it would send if the user misspelled a URL. One component of people's credibility assessments in the online environment is the comprehensiveness of the information they obtain.[25] As such, filtering programs used in schools may negatively influence students' perceptions of the comprehensiveness, and perhaps even the impartiality, of Internet-based information. In addition, ISPs can block access to any application, disabling software such as instant messaging or social networking at the network layer. The user, not aware of such a block, would only know that their IM (instant messaging) program did not connect to a server and may assume that the error lies in the remote server, thus erroneously affecting their credibility assessment of the remote server, rather than the infrastructure provider.

Applications on the Internet consist of software that allows information to be exchanged between different actors on the network. Applications include Web browsers and instant messaging clients, as well as high-level protocols such as HTTP that transfer Web pages. This broad category covers everything from e-mail applications that automatically mark incoming messages as "junk mail" to the Simple Mail Transfer Protocol (SMTP) that enables e-mail over the Internet, including spam. Spam filters are excellent examples of technology affecting credibility in a nearly invisible way. Many schools have implemented spam filters based on opaque and often propriety algorithms at the organization level, discarding numerous e-mail messages before any human eyes ever see them. While this type of protection from inappropriate or harmful content can be good, it can also have the unintended consequence of inadequately preparing youth for the digital world they may encounter outside the school environment. Indeed, as both Harris[26] and Weingarten[27] argue, blocking young people's exposure to information that may not be credible is probably not the best strategy for teaching students to identify and defend themselves against such information, which they will almost certainly encounter at some point in their lives.

Information services are organizations that use applications and infrastructure to meet users' informational needs on the Internet, such as Google and MySpace. From a credibility standpoint, there are ample studies that look at how information services such as Google skew results in their search engines.[28] In fact, most search engines, including Google, determine the "quality" and "relevance" of sites using a "link-popularity" metric. This metric selects which Web sites to display and the order in which to display them on the search results page based on how many other sites link to a site. Consequently, more popular pages are selected and are displayed higher in the search results. Because few people go beyond the first few pages of the search output, however, "even if a page is of high quality, the page may be completely ignored by Web users simply because its current popularity is very low."[29] This kind of a system sets up a sort of "popularity equals credibility" heuristic[30] that could be dangerous or at least disadvantageous to students' learning. As another example of the bias inherent at the level of information services, and the resulting credibility implications, top results tend toward shopping and technology services in Google.[31] Without knowing this, youth may assume that top results are the "best" regardless of context.

Finally, the *user layer* is composed of individuals and groups, such as teachers and students, who primarily seek and consume information on the Internet to meet their own information needs. Of course, users bring their own biases to both information consumption and production that may affect their credibility perceptions as well as learning. Perhaps the best example is the online encyclopedia Wikipedia. While the collaborative editing afforded by Wikipedia may in fact produce credible information, users must be cognizant that contributors and their contributions may be biased, uninformed, or outdated and should evaluate the information accordingly. A young person using Wikipedia for class assignments who is unaware of the process and accompanying pitfalls of collective editing is thus vulnerable to relying on misinformation.

Decisions at each of these layers can affect credibility judgments by all Internet users, but perhaps particularly by youth, given their heavy reliance on digital media, coupled with meaningful developmental and experiential differences between youth and adults.[32] In the end, having tools as intermediaries deepens the information self-sufficiency paradox by making youth more independent in their information seeking, while simultaneously making them more dependent not only on the information they receive but on the tools they use to access this information.

Shifting Credibility from Authority to Reliability

One outcome of this paradox is a shift from an authority-based approach to credibility to a "reliability approach." This shift represents a sea change from the way in which credibility has traditionally been conceived. Whereas credibility has historically been tied to concepts of authority and hierarchy, in the reliability approach, users determine credibility by synthesizing multiple sources of credibility judgments.[33] Both the need for synthesis and the richer set of resources to be synthesized are products of the pressure for participation enabled and imposed by networked digital media.

Traditional approaches to credibility strongly emphasize authority, where a trusted source is used to inform an individual's credibility determinations. In essence, trusted sources are used to "vouch" for the credibility of a given piece of information. People may have many such authority sources, and may themselves serve as an authority in various settings. The

process of becoming or choosing an authority is a process of developing trust and seeking coherence and consistency in the authority.

Some claim that authority is dead on the Internet, for example, some have said Wikipedia (http://en.wikipedia.org/wiki/Main_Page) and group editing have become at least as authoritative as traditional methods for producing encyclopedias, if not more so.[34] Others feel that blogging will supersede or at least parallel the authority of traditional news outlets.[35] There are indeed a number of ways in which traditional means of authority have been supplanted by open, flat structures for information creation and credentialing. However, to call this tantamount to the death of authority is, at best, an imprecise use of terminology. This new paradigm is not without authority, but more sophisticated methodologies may be required for evaluating it.[36] Moreover, while they may not have been as celebrated or accessible as they are currently, history is replete with examples of waves of centralization and decentralization of authority. The dramatic increase in information self-sufficiency has merely led to celebrating the large-scale nature of this decentralization today.

Beyond this historical view, most people use the term *authority* to refer to a single entity, or small set of entities. That is, authority has traditionally been conceived of as hierarchical and centralized. For example, libraries have come together to invest the power of authority in a given institution. For example, the Library of Congress keeps a file of book authors' names, birth, and death information. When citing an author (or including them in a library record) someone can consult these authority files for proper spelling, aliases, and confirmation of an author's identity. This can be thought of as "authority by consent," where all parties in a situation or context agree on who is the authority—that is, who provides the accurate information.

Nonetheless, it might be more precise to use the terms *authoritarian* and *authoritative* to clarify traditional notions of authority. *Authoritarian* is defined as the enforcement of an authority: in essence, the removal of choice by force of law, policy, structure, or some other means. *Authoritative*, on the other hand, is authority granted on the basis of perceptions of trust and expertise. The former is active and enforced, the latter is earned. Wikipedia is more likely to be the death of an authoritarian view that encyclopedias come from only Britannica, Groliers, or other large publishing houses, than it is to be the death of authority per se.[37] Thus, the problem of determining the credibility of Internet-based information is not a crisis of authority, but rather a crisis of choice. There are simply currently more choices about whom to trust. Although this is true for virtually all media venues to some degree, the scale of choice makes the Internet particularly affected by shifts in authority.

Libraries have been wrestling with this issue of shifting modes of authority since at least the early 1990s. Many in the library community—though not all, of course—have reacted to the overwhelming number and variety of information choices available to their clients via the Internet by adopting an authoritarian view that the library is where to get good, accurate, and credible information, while the open Internet is filled with bad and wrong information. One famed tag line of the time was, "Information on the Internet is free, but you get what you pay for." Many want the library to become a preferred provider of information, yet the concept of "preferred" only works in an authoritarian view when there is someone who can make others prefer or select something over something else.

This resistance to the democratization of authority among librarians is ironic because there are few professionals better suited to the authoritative world of the Internet than are librarians. They have a culture of open and free expression and access to ideas. They are generalists who move agilely across different topical domains. They are skilled at searching

out information, and locating potential biases in information. Their enterprise (i.e., the library) has little invested in the production of information, and much invested in the consumption of information products from a wide variety of sources. Furthermore, librarians already have a reputation as authoritative, not authoritarian.

The resistance to the democratization of authority is not limited to librarians. Teachers, college professors, doctors,[38] and indeed just about any information intermediary has had to wrestle with the new environment of plurality in authority. For some areas of the economy, the effects have been drastic. For example, the travel industry has been rocked by the growth in online bookings.[39] And, although people may not be buying houses online, they are using Internet real estate listing services to even the marketplace.[40] Perhaps one of the most striking examples of the role of authority can be seen in the insurance industry. As Levitt and Dubner note, the simple act of allowing consumers to directly compare term life insurance rates from different organizations over the Internet, rather than depending on the authority of a life insurance salesperson, led to the cost of term life insurance in the United States to drop by $1 billion.[41] Interestingly, in this case the concept of an authority in a field (an insurance agent) was actually used to mask truly credible information (in the form of lower prices).

The decentralization of authority has turned out to be particularly attractive for teenagers. This shift against stated authority and hierarchy on the Internet is perfectly matched to teenagers' own internal shift against authority of all types.[42] Note, for example, that the most common tools used by teens include IM, MySpace, and Google, all of which allow for a sort of level playing field, where the "right" or authoritarian answers are virtually indistinguishable. IM, a peer-to-peer technology that allows for instant access to friends and social peers, may constitute a wide network of potential experts in this environment built by the teen, not imposed by some adult "expert." In other words, the technology allows greater opportunity for young people to themselves become authoritative experts in many areas, potentially even shifting the power balance between children and adults in some cases. Eysenbach makes a parallel argument for how digital media have impacted the relationship between doctors and patients.[43]

Not surprisingly, many adults feel it is a problem that teens may not look to vetted and traditional sources of "valid" information. Their answer to the problem is often phrased in educational terms: "If only we show them the good stuff, they'll use it." This approach has several guises, normally in terms of literacy: digital literacy, information literacy, information problem solving, and those approaches that rely upon checklists to determine "right" and "wrong" information. However, while these approaches can have a positive effect in certain populations, such as undergraduates and elementary school children, under certain conditions they do not always "fix" the problem.[44]

Of course, the concept of multiple authorities existed prior to the Internet. But, the cost in terms of time, money, and even reputation to seek out a multitude of authorities was very high. With the Internet and other digital media, the range of possible authorities has expanded greatly. Before the Internet, for example, a young person might have to rely on his or her local television news or newspaper to predict the weather. Now he or she can go to the Weather Channel, AccuWeather, or even the National Oceanic & Atmospheric Administration for weather information. The task then becomes determining from a number of sources which among them is most credible.

Moreover, a consequence of the culture of information self-sufficiency is that people, even youth, can more easily become authorities themselves. Not only do users have more

sources to choose from, but now they can also access data and information directly, thereby avoiding traditional authority sources altogether.[45] For example, now young people can gather weather data directly from a variety of satellites and radar installations (including home-based weather stations), and train themselves, until they feel they have sufficient expertise and trustworthiness to credibly interpret information. As users take it upon themselves to become authorities by directly evaluating, synthesizing, and even producing information themselves, the notion of a singular authority ends, and "reliability" becomes the predominant form of credibility assessment.

Reliability commonly refers to something or someone perceived as dependable and consistent in quality. If you have a reliable car, it is one that runs well over time. Reliability to the scientist is simply the consistency of data, such that the same treatment (e.g., questions, experiments, or applications) yields the same result over time. If an authority approach is exemplified by believing that a given news anchor will give a credible answer, then switching from news station to news station looking for commonalities in the same story exemplifies a reliability approach. Reliability approaches to credibility can be seen in the physical world. The fact that a person's signature is seen as a marker of credibility in legal settings is the belief that a person signs his or her name in a reliable fashion. Reliability is also seen in the cornerstone of good journalism: to confirm information with a second source.

Authority and reliability approaches are often used in conjunction in both the physical and digital world. In the aftermath of Hurricane Katrina in New Orleans in 2005, many residents turned to chat rooms and community-run Web sites to resolve contradictory and often false information coming from traditional channels and sources (including the federal government and the mass media). Local Web sites, such as NOLA.com, allowed communities to come together and share information. Users were able to hear from multiple sources, including eyewitnesses and residents, and to get a more accurate, complete, and thus credible picture of the situation in the neighborhoods. Users who provided the most consistently accurate information became trusted authorities, and traditional authorities (the government and the mass media) were deemed less credible than the users. This is but one example of how digital media have turned credibility on its head.

Perhaps the most common way to become an authority, however, is through reliability. If someone consistently gives out testable and *accurate* information, they are often seen as an authority.[46] Experts are not simply people with the most experience, but people who have the longest track record in using their experience successfully. The true power of reliability, however, is not only in its capacity to create authority but in its power to destroy it as well. While the necessary degree of reliable performance for authority status varies across contexts (e.g., a baseball player who bats .350 is considered outstanding even though he hits the ball less than half of the time, but a mathematician would not be considered an expert if she got math answers right only half of the time), it is clear that agents giving out unreliable information over time will lose their authority status and, by extension, their credibility.

Authority and reliability also have "halo effects," meaning that a person who is seen as an authority in one area may be presumed to be an authority in other domains as well, even without proven performance. This can be seen, for example, in celebrity product endorsements. Likewise, unreliable performance in one area can cast doubt on performance in other areas. Like an accountant who cheats at Monopoly, or a minister who cheats on his wife, loss of credibility in one area can cast suspicion on one's other domains of authority. These halo effects become even more pronounced in the digital environment when the information

about and from an agent (person, organization process) can be more voluminous, diverse, and mobile than in offline environments.

Ultimately, reliability and authority anchor the endpoints of a continuum of approaches to credibility. With authority, preexisting agreements are in place and assumed: the conversation is over. With reliability, by contrast, the conversation is open and ongoing. Networked digital media enhance this conversation and thus are more likely to encourage users to seek out more information and other people to come to a credibility judgment compared to traditional media. Since digital networks bring to youth an overwhelming amount of information and people to engage with in arriving at a credibility judgment, there is pressure for the tools they use to incorporate some ability to participate, or engage in a conversation with people and sources. Builders of digital network tools and information services have begun to respond by being more open and by creating more opportunity for user participation in content creation and dissemination. In so doing, the tools built for users today to find and use credible information facilitate reliability approaches to credibility assessment, and thus learning via constant "conversation."

Digital Media and Credibility by Reliability

Recent trends in digital media facilitate the shift to a reliability approach of credibility assessment. The Internet is by its very design open, providing only minimal control at the network level. The guiding technical protocol of the Internet, Transmission Control Protocol/Internet Protocol (TCP/IP), simply breaks data into packets and makes sure these packets get to the proper destination with fidelity. What these data packets contain, what they do, and how they do it is completely ignored by most users. From this very simple packet-switching technology, Internet users have built e-mail, the Web, instant messaging, and all of the services that users enjoy today. Indeed, the Internet's interoperability, open access, and decentralized control are especially well suited to innovation on the scale of the individual user.[47]

As a result, even higher-level Internet functions are not defined or controlled by the Internet itself. Indeed, there is no central authority that controls the Internet, beyond its basics such as domain name registration and the structure of TCP/IP. Even so-called governing bodies such as the World Wide Web Consortium (W3C) merely suggest standards that are often embellished, altered, or ignored by software developers.[48] The Internet is, in a very real sense, an agreement, and an ongoing conversation where organizations and individuals share information.

This open architecture and decentralized control provide enormous capacity for participation, which contributes to accurate credibility assessment through reliability among multiple shared perspectives and experiences. Yet, there is nothing inherent in digital networks that makes infrastructure participatory. There are many historical examples of large-scale networks that were centrally controlled, where infrastructures were provided to users with little input by those users. Commercial online networks ranging from CompuServe, Prodigy, and America OnLine to not-for-profit Freenets and BitNet networks were "black boxes" that only allowed users to manipulate pre-made tools. These are historical examples, however, because, even in the case of AOL, these proprietary networks have either been superseded by the Internet, or have had to radically change their underlying infrastructures to accommodate the Internet.[49] Thus, although involvement in the infrastructure and at the level of specific software applications is not a certainty, the Internet's evolution appears to favor involvement and participation.

Indeed, involvement and participation have led many Internet software designers to view the very process of software development as a means toward credibility. For instance, so-called open source software at its most basic is when the developer of a piece of software makes the underlying source code of the software application available to the public. Anyone with sufficient programming skills can then take the source code and analyze it, add to it, or incorporate it into another software package. On the Internet, this simple concept has been expanded to a more complex approach to any system development.[50] While anyone with sufficient skill can use open source software, if they improve or expand the original code, they must give the additions back to the open source community.

Open source software and the associated movement propose a new concept of credibility in terms of tools: credible tools are ones that are built in the open, where a conversation on the merits and structure of infrastructure can be debated and tested. This stands in stark contrast to more traditional models of credible software development. In a traditional approach to software development, credibility is defined by the organization that produced the software. This organization would have some standing in the community, good practices, and a proven track record of quality products (i.e., authority). Interestingly, this is often proffered in terms of security. A system is "secure" if few have access to its inner workings, and if the few programmers who put it together used a common quality process. The open source approach takes an opposite stance: To be secure, software must first be transparent and then tested by others (i.e., be reliable). The idea is that, if everyone can see the code, and can test it, flaws will be easier to find and because the process of implementation is tested in public, everyone can trust the product. Open source advocates would argue that by being able to dissect and test all aspects of a piece of software, right down to the very source code, they can better determine both the trustworthiness of a tool as well as the expertise of the tool's creators (i.e., its credibility).

While there is an ongoing debate between the "open" and "closed" software development approaches, there is no question that it has changed the shape of tool building on the Internet. For example, the Internet produced the concept of "open beta" where software products were made available to any Internet user to test while still in production. Over time, these beta test processes run longer, sometimes never leaving beta (i.e., "continuous beta"). Even traditional software developers such as Microsoft and Adobe have moved toward a more open approach "to enlist a large army of bug testers to help iron out any kinks"[51] in their products.

This openness goes a long way toward addressing the information self-sufficiency paradox among youth, but only for those with sufficient technology skills and education. That is, youth with sufficient technical skills now have the ability to choose and shape the tools themselves. Skilled youth who are wary of a given Web browser can use another one, or even write their own, often in concert with others sharing a similar concern. If a school wants to know exactly how its e-mail program is filtering spam, it can now shop multiple filtering packages until it finds the right one, sometimes evaluating the very source code of the filter.

This ability of *skilled* users fluent in the technologies of the Internet has important implications for youth and education. If society wants youth to be truly able to make credibility decisions in digital networks, then youth must understand the technical nature of the network itself—from the use of tools to the creation of tools. Simple use skills, such as browsing the Web, are insufficient to truly understand the role that tools play in the credibility of Internet-based information. Furthermore, if schools and other institutions prevent youth from participating in the underlying infrastructure,[52] they are limiting youths' ability to

resolve the information self-sufficiency paradox and, by extension, limiting youths' ability to learn about and act upon credibility.

   This limitation, and youths' reaction to limiting access to the underlying infrastructure of digital networks, can be seen in content filtering put in place at many schools and libraries today. When faced with limited access to the Web, many youth have begun to document the limitations of the filters themselves. Privacy organizations and civil liberties groups have joined students in challenging the efficacy of filters, and have called for change.[53] Because the infrastructure that these filters are built upon is open, and because the filter is not part of the network itself, it can be modified or replaced by those who possess the skills to do so. Suddenly the invisible nature of the network itself is visible—and indeed debatable.

The "Credibility Conversation"

To be effective both at constructing reliability-based credibility assessments and in working collaboratively to build innovative technical tools, youth must be able to engage in appropriate conversations with appropriate others via the Internet. Accordingly, Nielsen/NetRatings indicates that teens' usage of digital media is shifting. While the top sites for youth ages 12 to 17 used to be those offering a selection of instant messaging buddy icons, in the last three years the most popular sites have shifted to social networking sites or those providing assistance with social networking content, profiles, and page layouts.[54] While social networking sites such as MySpace, the Facebook, and others are relatively recent, teens' desire for online social interaction is not new. Teens have preferred social uses of the Internet for some time. For example, in 2001 Lenhart, Raine, and Lewis found that extremely popular uses of the Internet among teens included e-mail, instant messaging, and visiting chat rooms.[55] Teens' desire for social Internet experiences also shows up in institutional education settings, where Simon, Graziano, and Lenhart found that a large percentage of teens "say they use e-mail and instant messaging to contact teachers or classmates about schoolwork."[56]

   Beyond simply a person's age or cultural fads, the migration to social applications on the Internet is in part due to the very nature of learning. Conversation theory,[57] for example, proposes that learning and knowledge are gained through the interaction of agents around ideas as they go back and forth describing an idea. This interaction can then be used to develop new understandings and new knowledge through a process that contemporary learning theorists call *scaffolding*: one idea building upon another. Learning conversations can take place between two individuals (say a teacher and pupil), two organizations (negotiating a set of academic standards), or even two societies (debating over the best way to educate youth).

   Framed by conversation theory, the utility of social interactions in online learning environments (be they formal or informal) for youth is obvious. As youth engage in conversations they learn, and the online environment allows for a greater scale and scope of conversants. Furthermore, as they encounter systems for learning in the digital environment, they may seek out tools to aid in interactions and conversation. The tools they seek out do not simply present credibility information, or third-party credibility assessments, but instead allow youth to participate in the conversation, and therefore the process of credibility verification and knowledge creation. Indeed, recent research suggests that members of open-source online communities are able to effectively build collective knowledge through "virtual re-experience," whereby individuals share their work using online tools to co-construct applicable knowledge.[58] Clearly, among other uses, youth are well poised to take advantage of precisely this type of conversation.

The concepts of openness, and indeed participation, in the development of tools exemplified in the open source movement can also be seen at the level of the Web sites and remote resources that users access on the Internet. Information services are under increasing pressure to open their sites and resources to youth participation. Information services today understand the power of participation. Where once services might count hits to a Web page, or unique visitors, today whole industries are devoted to analyzing a user's path through a Web site to discover what information he or she encountered, where this information led to successful "goal conversion," such as buying a product or, in an educational context, learning a piece of information, and where the information led to confusion or exiting a site. Educational organizations are now beginning to understand that the true power of the Internet for learning is not simply wide-scale and one-way distribution of information, but instead is getting closer to what is happening inside users' (learners', customers') brains. This trend follows larger forces at work in the educational setting that have resulted in the shift from accreditation and evaluative education bodies to outcomes evaluation and performance standards.[59]

Recognition of the increasingly participatory nature of information services can also be seen in the rise of social networking sites, where the information service is little more than an infrastructure for user-contributed conversations and artifacts. Such services are the purest example of a trend finding its way into a large number of Web sites: users contributing to the ongoing conversation about an artifact (such as a book listed on Amazon), fact (such as an entry in Wikipedia), place (such as Flickr communities devoted to a given city), or other entity. In much the same way that traditional tool developers feel an increasing pressure for community input, content providers are also feeling an equal pressure for community input on their content. Part of this pressure comes from users who see participation as a crucial part of assessing the *credibility* of these artifacts, facts, and topics.

The advent of services that allow greater user involvement, such as blogs, social networks, and recommender, rating, or commenting in e-commerce and other sites, has led to increased demand by youth and other users for involvement in Internet services of all types. Key issues here in terms of credibility are, can one trust a person one has encountered online, and does that person know what he or she is talking about? Increasingly youth and others are looking to user-submitted comments, editorial reviews, and open conversations on a given topic, artifact, or idea to determine trust and expertise. And, in many cases where sites do not provide these functions, the youth community can take advantage of the open nature of the Internet to create their own. This has led to the rise of an entire class of network destinations known as "protest sites" devoted to user discontent with a given institution, person, brand, or product. In the physical world, youth might be limited in their protests to complaints to the principal or reliance on third parties such as better business bureaus, but online youth and others can seek out and build communities of discontented users regardless of geographic location.[60] Moreover, users new to the brand or item can now easily find such sites, allowing them to incorporate the dissenting views, as well as the official information, when making credibility decisions. In this way, youth can compensate for their relative lack of life experience[61] by leveraging that of others. Of course, these user communities gain strength in numbers and are assessed in terms of their reliability, rather than their authority, as discussed earlier.

This style of grassroots organization has quickly spread from the consumer to the political arena. With an open network, opposing voices that challenge the credibility of some "official" information have equal access to the network and, at times, equal weight compared to official

information outlets and forums. This type of information "leveling" afforded by open digital networks can also be seen in schools. Youth, dissatisfied with either the information available to them from their classes, schools, and teachers, or with the venues for complaint, have turned to the digital environment to disseminate information of protest or information otherwise unavailable within the school. For example, there are now several sites rating teachers, professors, and classes. Blogs, MySpace, and other community sites are filled with "counter information" meant to provide greater context to, or to at least raise concerns about, the credibility of a given piece of information.

Of course, the Web also provides ample opportunity for users to post false information. There are many examples of "astroturfing," whereby marketing firms have set up seemingly grassroots sites that actually promote particular products or approaches.[62] Certainly youth may put up false information on protest sites as well, either intentionally or unintentionally. The result is that credibility may be harder to determine for any piece of information. False information also increases pressure on information services to provide opportunities for community feedback, in essence inviting protestors and commentators into a controlled space where an organization can respond to counterinformation.

This pressure for a voice on the part of youth can be expected to result in more opportunities for discussion and conversation in both existing and emerging forms of digital media. It is not surprising that the distinctions between information seeking, learning, and communicating are breaking down. Where once users would e-mail (or instant message) in one application, and search the Web in another, they are now doing both simultaneously. This is not a simple matter of convenience, but rather is based on users' implicit or explicit preference for knowledge acquisition through conversation. Given what is happening on the Web in terms of social uses and applications, it appears that users are looking to talk with others in order to better evaluate what they find and to synthesize this information into actionable knowledge.

It is also likely that the trend of tracking users' conversations online will continue and will be enhanced. Information retrieval systems may well develop into conversational retrieval tools that link information by how others have used such information in their conversations. Just like libraries used to produce pathfinders and annotated bibliographies, users will soon be able to find a piece of information, such as a Web site, and follow that information to all of the other public information used in a given conversation. Such a holistic context will allow users to make credibility determinations about an item in the full context in which it resides. Digg.com provides an excellent present-day example of such a system.[63] When a Digg.com user finds an interesting news story on the Web, he or she can mark it, allowing other Digg users to not only view the site, but to discuss it in an online forum. What this does, in essence, is elevate the interest of one user to a group's consideration and evaluation.

Youth may understand this type of information seeking better than adults. Through e-mail, instant messaging, and texting, youth already create close-knit "research" teams that share findings and implicit credibility assessments.[64] Credibility in these contexts is not determined by the individual, or even the individual in interaction with a Web resource, but within a community engaged in a larger conversation. For school assignments, students may use sources they determine to be credible from their past experience, their heuristic appeal,[65] the input of experts such as teachers and librarians, and from others, including their peers. This "credibility conversation" may, however, extend past the actual assignment and well into the evaluation of that assignment. A low grade, or follow-up from teachers, may have an impact on how a student evaluates credible sources in the future, and how he or she conveys

information about the sources to others (via social networks or otherwise) who may want to use those sources in the future.[66] The grades and feedback that the peer group receives should also influence future credibility decisions. However, unless credibility is made explicit in this large and ongoing conversation, it will be ignored. That is, if teachers, parents, adults, and peers do not make credibility part of the discussion, and if there is no consistent result from either embracing or ignoring credibility, it will become invisible, not cognitively attended to by youth, and therefore not assimilated into knowledge. This situation is made worse by the growing educational environment that emphasizes "high-stakes" testing, which minimizes rich assessments and interactions between student and teacher.[67]

The need to highlight credibility in conversations has implications for educational policy makers as well. If youth are exposed only to vetted and "safe" resources, often pruned of a great deal of context and conversation, how are students to gain the invaluable skills required to determine credibility on their own, outside of guided environments? Harris identifies such "conservative attitudes" as a structural challenge that must be overcome.[68] What policy makers must understand is that, as Weingarten[69] and Harris[70] argue, the unintended consequence of creating "safe" learning environments is an environment that limits learning about credibility.

The fact that technology constrains youth information before youth are able to make credibility decisions has startling implications for education. To begin, a common strategy to prepare youth to make informed credibility decisions is based around educational programs normally under some literacy rubric such as information literacy, digital literacy, or media literacy.[71] These programs typically present young people with various strategies and checklists to determine the quality of information they find via digital media.[72] While this approach makes sense for much of the information a student might access through digital networks, it does not make sense for all Web-based information. For example, how can one judge the credibility of information at a given URL when the true URL is masked by inline frames that show content from some third-party destination as if it were just a part of a normal page? Although this is a specific feature of the Web today, there are sure to be many analogs in future digital technologies. Moreover, there is no amount of literacy instruction that can prepare the average young person for the effects of a network infrastructure that they cannot control directly.

Conclusion and Recommendations

This chapter described the growth of information self-sufficiency and the related paradox where users are simultaneously more responsible for decisions, while also more dependent on information provided by others and the tools used to manipulate information. It discussed how the Internet and digital networks that allow for community participation in the construction of the underlying network and infrastructure have become the predominant model for existing and future digital media, and how this has led to credibility assessment by reliability rather than by authority. It presented a model in which knowledge is gained through conversation and reflection, and argued that digital networks and tools must address this reality. Finally, it showed how this need for participation and involvement has influenced information services, and how users themselves define and assess credible information.

Primary aims of the chapter have been to highlight trends that will most likely endure, continue, or expand as future digital media develop, and to show how youth are both affecting and being affected by these trends. Large-scale digital networks have extended

youths' ability to build their own social networks to aid in the assessment of credibility. They have also allowed youth to participate in the networks in meaningful ways, in essence elevating their own personal credibility in certain domains. However, this new reality has serious implications for youth, as well as for society as a whole.

To prepare youth to make fully informed credibility decisions, they must become fluent in the tools that facilitate the conversation and become aware of potential biases in the network technology itself. As noted by Harris, schools may be an ideal place to do this, but they are limited in their ability to do so.[73] Without technical fluency, however, students become dependent on, and often unaware of, the stakeholders who control the network's infrastructure and the policies they create.[74] Yet, as others in this volume have pointed out, the extent to which youth are involved shapes the Internet and the services available. The omnipresent nature of the digital environment is necessitating more technical fluency and greater explicit consideration of credibility and technology at an earlier age.

So, what are the implications for youth and credibility in the digital environment? The first is that youth, with enough training, now have equal opportunity to access the infrastructure they increasingly depend on. Unlike previous media technology widely adopted by youth, such as radio, television, and the phone system, youth can not only adopt technology, they can shape it at its most fundamental levels—at the level of infrastructure. Furthermore, with the global nature and low cost of entry to the Internet, innovations that are started by a teenager in one schoolhouse or bedroom can become an internationally adopted standard. These changes highlight the possibility that, with the emphasis of open source on public function testing as a means to credibility rather than credibility determined by the reputation of the code's corporate origin, youth with sufficient technical skills can enter the infrastructure development arena on an equal footing to established organizations. This implies that any attempt to prepare youth for life in the digital world should incorporate some fluency in the basic technologies of the network, and the ethical guidance in how such technologies should be implemented.

Indeed, youth have now come to expect involvement in all aspects of information in the network. Schools, business, governments, and other institutions and organizations must change to accommodate this expectation. If not, youth will migrate their attention to venues that allow for conversation and debate of information, or create their own. This is perhaps the most important implication for youth from the increasing requirement for participation on the network. Youth can and will increasingly expect to shape their information domain, and define credible information on their own terms. Any system that seeks to either impose an authority view of credibility, or that seeks to change behavior, must now be done with the understanding that youth can simply bypass these attempts and create counter-structures. Furthermore, these alternative credibility structures can have a global reach and build communities of like minds across divisions of geography, race, gender, age, and other demarcations.

Thus, there appears to be a pressing need to educate youth to assess credibility in participatory ways, thereby steering the potentially negative implications of digital networks toward positive outcomes. Because youth in particular are more self-sufficient in decision making, and also more dependent on the information that others are providing to them, digital media increase the importance of credibility, as well as their ability to make credibility judgments effectively. Learning through "conversation," typified by collaboration with others, is one avenue toward reliable credibility assessments. In the end, this is perhaps the most realistic

and effective means by which to increase knowledge among youth increasingly reliant on digital media for the information that is central in their lives.

Notes

1. Mary Madden, *Internet Penetration and Impact* (Pew Internet & American Life Project, 2006), http://www.pewinternet.org/PPF/r/182/report_display.asp (retrieved November 15, 2006).

2. Amanda Lenhart, Mary Madden, and Paul Hitlin, *Teens and Technology: Youth Are Leading the Transition to a Fully Wired and Mobile Nation* (Pew Internet & American Life Project, 2005), http://www.pewinternet.org/pdfs/PIP_Teens_Tech_July2005web.pdf (retrieved December 15, 2006).

3. National Center for Education, Rates of Computer and Internet Use by Children in Nursery School and Students in Kindergarten through Twelfth Grade: 2003 (2005), http://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2005111 (retrieved February 26, 2007).

4. See Gunther Eysenbach, Credibility of Health Information and Digital Media: New Perspectives and Implications for Youth, this volume, for a similar argument.

5. Jules Abend, Lands' End Uses Internet to Expand Sales, Personalize Customer Service; Bobbin, 1999, FindArticles.com, http://www.findarticles.com/p/articles/mi_m3638/is_10_40/ai_55609089 (retrieved December 15, 2006).

6. See Gunther Eysenbach, Credibility of Health Information and Digital Media, this volume.

7. Dg.o, The National Science Foundation's Digital Government Research Program, 2006, http://www.digitalgovernment.org/ (retrieved December 15, 2006).

8. Kerry Lynn Rice, A Comprehensive Look at Distance Education in the K–12 Context, *Journal of Research on Technology in Education* 38, no. 4 (2006): 425–48.

9. Florida Virtual School, http://www.flvs.net/educators/fact_sheet.php (retrieved December 28, 2006).

10. Amanda Lenhart, Maya Simon, and Mike Graziano, The Internet and Education: Findings of the Pew Internet & American Life Project, 2001, 2, http://www.pewinternet.org/PPF/r/39/report_display.asp (retrieved December 28, 2006).

11. Miriam J. Metzger, Andrew J. Flanagin, and Lara Zwarun, College Student Web Use, Perceptions of Information Credibility, and Verification Behavior, *Computers & Education* 41 (2003): 271–90; Rice, A Comprehensive Look at Distance Education in the K–12 Context.

12. Tina Miteko, Driving Value from Every Online Customer Interaction: The Power of Intent-Driven Personalization, *Customer Inter@ction Solutions* 24, no. 8 (2006): 38.

13. Matthew L. Meuter, Amy L. Ostrom, Robert I. Roundtree, and Mary Jo Bitner, Self-Service Technologies: Understanding Customer Satisfaction with Technology-Based Service Encounters, *Journal of Marketing* 64 (2000): 50–64; Allard van Riel, Veronica Liljander, and Petra Jurriens, Exploring Consumer Evaluations of E-Services: A Portal Site, *International Journal of Service Industry Management* 12, no. 4 (2001): 359–77.

14. Lane Becker, Self-Service Web Applications: Less Cost, More Value, 2002, http://www.adaptivepath.com/publications/essays/archives/000063.php (retrieved November 15, 2006).

15. Tina Miteko, Driving Value From Every Online Customer Interaction, 38–41.

16. Federal Election Commission, Help America Vote Act of 2002: Public Law 107-252, http://www.fec.gov/hava/hava.htm (retrieved November 15, 2006).

17. Grants.gov, http://www.grants.gov/ (retrieved November 25, 2006).

18. Joanne Silverstein, *Information Technology and Commerce: Attributes of Emerging Online Business* (doctoral dissertation, Syracuse University, 1997).

19. Batya Friedman, Peter H. Kahn Jr., and Alan Borning, Value Sensitive Design and Information Systems, in *Human-Computer Interaction in Management Information Systems: Foundations*, eds. Ping Zhang and Dennis Galletta (Armonk, NY, and London: Sharpe, 2006): 348–72.

20. B. J. Fogg, *Persuasive Technology: Using Computers to Change What We Think and Do* (New York: Morgan Kaufman, 2002); B. J. Fogg, Cathy Soohoo, David R. Danielson, Leslie Marable, Julianne Stanford, and Ellen R. Tauber, How Do Users Evaluate the Credibility of Web Sites?: A Study with Over 2,500 Participants, in *Proceedings of the 2003 Conference on Designing for User Experiences*, San Francisco, CA, 2003, 1–15; Miriam J. Metzger, Andrew J. Flanagin, Keren Eyal, Daisy Lemus, and Robert M. McCann, Bringing the Concept of Credibility for the 21st Century: Integrating Perspectives on Source, Message, and Media Credibility in the Contemporary Media Environment, in *Communication Yearbook 27*, ed. Pamela J. Kalbfleish (2003), 293–335; Miriam J. Metzger, Andrew J. Flanagin, and Lara Zwarun, College Student Web Use, 271–90; C. Nadine Wathen and Jacquelyn Burkell, Believe It or Not: Factors Influencing Credibility on the Web, *Journal of the American Society for Information Science and Technology* 53, no. 2 (2002): 134–44; Joseph B. Walther, Zuoming Wang, and Tracy Loh, The Effect of Top-Level Domains and Advertisements on Health Web Site Credibility, *Journal of Medical Internet Research* 6, no. 3 (2004): e24, http://www.jmir.org/2004/3/e24/ (retrieved January 3, 2006).

21. Andrew J. Flanagin and Miriam J. Metzger, Digital Media and Youth: Unparalleled Opportunity and Unprecedented Responsibility, this volume; B. J. Fogg, Jonathan Marshall, Othman Laraki, Alex Osipovich, Chris Varma, Nicholas Fang, Jyoti Paul, Akshay Rangnekar, John Shon, Preeti Swani, and Marissa Treinen, What Makes Web Sites Credible? A Report on a Large Quantitative Study, *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, Seattle, WA, March 31–April 4, 2001, 61–68.

22. Andrew J. Flanagin and Miriam J. Metzger, The Role of Site Features, User Attributes, and Information Verification Behaviors on the Perceived Credibility of Web-based Information, *New Media and Society 9*, no. 2 (2007): 319–42.; B. J. Fogg, Jonathan Marshall, Alex Osipovich, Chris Varma, Othman Laraki, Nicholas Fang, Jyoti Paul, Akshay Rangnekar, John Shon, Preeti Swani, and Marissa Treinen, Elements That Affect Web Credibility: Early Results from a Self-Report Study, *CHI '00 Extended Abstracts on Human Factors in Computing Systems*, The Hague, Netherlands, 2000, 287–88; Fogg et al., What Makes Web Sites Credible?

23. Melody Y. Ivory and Rodrick Megraw, Evolution of Website Design Patterns, *ACM Transactions on Information Systems* 23, no. 4 (2005): 463–97.

24. R. David Lankes, *Building and Maintaining Internet Information Services: K–12 Digital Reference Services* (Syracuse, NY: ERIC Clearinghouse on Information & Technology, 1999).

25. Metzger et al., Bringing the Concept of Credibility for the 21st Century.

26. Frances Jacobson Harris, Challenges to Teaching Credibility Assessment in Contemporary Schooling, this volume.

27. Fred W. Weingarten, Credibility, Politics, and Public Policy, this volume.

28. See, e.g., Junghoo Choo and Sourashis Roy, Impact of Search Engines on Page Popularity, in *International World Wide Web Conference: Proceedings of the 13th International Conference on World Wide Web* (New York: ACM Press, 2004), 20–29.

29. Choo and Roy, Impact of Search Engines on Page Popularity, p. 1.

30. See S. Shyam Sundar, The MAIN Model: A Heuristic Approach to Understanding Technology Effects on Credibility, this volume.

31. Abbe Mowshowitz and Akira Kawaguchi, The Consumer Side of Search: Bias on the Web, *Communications of the ACM* 45, no. 9 (2002): 56–60.

32. Matthew S. Eastin, Toward a Cognitive Developmental Approach to Youth Perceptions of Credibility, this volume; Flanagin and Metzger, The Role of Site Features.

33. Flanagin & Metzger, The Role of Site Features.

34. Thomas Chesney, An Empirical Examination of Wikipedia's Credibility, *First Monday* 11, no. 11 (2006), http://www.firstmonday.org/issues/issue11_11/chesney/index.html (retrieved January 4, 2006); Jim Giles, Internet Encyclopedias Go Head to Head, *Nature* 438 (2005): 900–1; Felix Stadler and Jesse Hirsh, Open Source Intelligence, *First Monday* 7, no. 6 (2002), http://firstmonday.org/issues/issue7_6/stalder/index.html (retrieved January 4, 2007); Aaron Weiss, The Power of Collective Intelligence, *netWorker* 9, no. 3 (2005): 16–23.

35. Tanni Haas, From "Public Journalism" to the "Public's Journalism"? Rhetoric and the Reality in the Discourse on Weblogs, *Journalism Studies* 6, no. 3 (2005): 387–96; Thomas J. Johnson and Barbara K. Kaye, Wag the Blog: How Reliance on Traditional Media and the Internet Influence Credibility Perceptions of Weblogs among Blog Users, *Journalism and Mass Communication Quarterly* 81, no. 3 (2004): 622–42.

36. Deborah L. McGunines, Honglei Zeng, Paulo P. da Silva, Li Ding, Dhyanesh Narayanan, and Mayukh Bhaowal, Investigations into Trust for Collaborative Information Repositories: A Wikipedia Case Study, *Proceedings of the Workshop on Models of Trust for the Web*, WWW2006, May 22–26, Edinburgh, UK, 2006, http://ebiquity.umbc.edu/_file_directory_/papers/274.pdf (retrieved January 4, 2007); Nikolaos Th. Korfiatis, Marios M. Poulos, and George Bokos, Evaluating Authoritative Sources Using Social Networks: An Insight from Wikipedia, *Online Information Review* 30, no. 3 (2006): 252–62.

37. Susan L. Bryant, Andrea Forte, and Amy Bruckman, Becoming Wikipedian: Transformation of Participation in a Collaborative Online Encyclopedia, in *Proceedings of the 2005 International ACM SIGGROUP Conference on Supporting Group Work*, Sanibel Island, FL, 2005, 1–10.

38. See Eysenbach, Credibility of Health Information and Digital Media.

39. Rob Law, Kenith Leung, and R. James Wong, The Impact of the Internet on Travel Agencies, *International Journal of Contemporary Hospitality Management* 16, no. 2 (2004): 100–7; Clive Wynne, Pierre Berthon, Layland Pitt, Michael Ewing, and Julie Napoli, The Impact of the Internet on the Distribution Value Chain: The Case of the South African Tourism Industry, *International Marketing Review* 18, no. 4 (2001): 420–31.

40. James E. Littlefield, Yeqing Bao, and Don L. Cook, Internet Real Estate Information: Are Home Purchasers Paying Attention to It? *Journal of Consumer Marketing* 17, no. 7 (2000): 575–90; Risa Palm and Michelle Danis, The Internet and Home Purchase, *Tijdschrift voor Economische en Sociale Geografie* 93, no. 5 (2002): 537–47.

41. Steven D. Levitt, and Stephen J. Dubner, *Freakonomics: A Rogue Economist Explores the Hidden Side of Everything* (New York: William Morrow, 2005).

42. Eysenbach, Credibility of Health Information and Digital Media.

43. Ibid.

44. Carrie Lowe, Yale University's PACE Research Center and the Big6[TM], 2005, http://big6.com/showarticle.php?id=459 (retrieved November 15, 2006).

45. See Eysenbach, this volume, for a similar argument.

46. For a greatly expanded discussion of attributes of authority and countervailing factors, see Richard Thomas De George, *The Nature and Limits of Authority* (Lawrence: University Press of Kansas, 1985).

47. Andrew J. Flanagin, Craig Flanagin, and Jon Flanagin, Technical Code and the Social Construction of the Internet, unpublished manuscript.

48. Jeffrey Zeldman, *Designing With Web Standards* (Berkeley, CA: New Riders Press, 2003).

49. Richard Wray and Dan Milmo, AOL Tries to Survive by Going Free, 2006, http://business. guardian.co.uk/story/0,1835908,00.html (retrieved January 2, 2007).

50. Eric S. Raymond, *Cathedral and the Bazaar: Musings on Linux and Open Source by an Accidental Revolutionary* (Sebastopol, CA: O'Reilly Media, 2001).

51. Galen Fott, Adobe Photoshop CS3 Beta, 2006, http://www.pcmag.com/article2/0,1895,2074376,00. asp (retrieved January 6, 2007).

52. See Harris, Challenges to Teaching Credibility Assessment.

53. For an example, see PEACEFIRE, 2006, http://www.peacefire.org/ (retrieved December 29, 2006).

54. Market Wire, U.S. Teens Graduate from Choosing IM Buddy Icons to Creating Elaborate Social Networking Profiles, According to Nielsen//NetRatings, 2006, http://www.marketwire.com/ mw/release_html_b1?release_id=171656 (retrieved December 28, 2006).

55. Amanda Lenhart, Lee Rainie, and Oliver Lewis, Teenage Life Online: The Rise of the Instant-Message Generation and the Internet's Impact on Friendships and Family Relationships, 2001, http://www.pewinternet.org/PPF/r/36/report_display.asp (retrieved December 15, 2006).

56. Maya Simon, Mike Graziano, and Amanda Lenhart, The Internet and Education: Findings of the Pew Internet and American Life Project. 2001, p. 6. http://www.pewinternet.org/PPF/r/39/report_display.asp.

57. Gordon Pask, *Conversation Theory: Applications in Education and Epistemology* (New York: Elsevier, 1976).

58. Andrea Hemetsberger and Christian Reinhardt, Learning and Knowledge-Building in Open-source Communities: A Social-Experiential Approach, *Management Learning* 37, no. 2 (2006): 187–214.

59. See Harris, Challenges to Teaching Credibility Assessment.

60. Peter S. Jenkins, Leafleting and Picketing on the "Cydewalk" – Four Models of the Role of the Internet in Labour Disputes, *UCLA Journal of Law and Technology* 7, no. 1 (2003).

61. See Eastin, Toward a Cognitive Developmental Approach to Youth Perceptions of Credibility.

62. Wikipedia, Astroturfing, 2006, http://en.wikipedia.org/wiki/Astroturfing (retrieved December 29, 2006).

63. http://digg.com/.

64. Chris Davies, Geoff Hayward, and Linariah Lukman, *Digital Technologies: A Review of Research and Projects* (2006): 14–19, http://www.futurelab.org.uk/download/pdfs/research/lit_reviews/futurelab_ review_13.pdf (retrieved December 29, 2006).

65. Sundar, The MAIN Model.

66. Soo Young Rieh and Brian Hilligoss, College Students' Credibility Judgments in the Information-Seeking Process, this volume.

67. Brett D. Jones and Robert J. Egley, Looking through Different Lenses: Teachers' and Administrators' Views of Accountability, *Phi Delta Kappan* 87, no. 10 (2006): 767–71; Harris, Challenges to Teaching Credibility Assessment.

68. Harris, Challenges to Teaching Credibility Assessment.

69. Weingarten, Credibility, Politics, and Public Policy.

70. Harris, Challenges to Teaching Credibility Assessment.

71. Ibid.

72. Miriam Metzger, 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, no. 10 (2007).

73. Harris, Challenges to Teaching Credibility Assessment.

74. See Weingarten, Credibility, Politics, and Public Policy.