

# The Impact of Completeness and Web Use Motivation on the Credibility of e-Health Information

By Mohan J. Dutta-Bergman

*Recent articles on the quality of health information on the Internet reveal 2 critical criteria: completeness and credibility. This article investigates the effect of Web use motivation on the relationship between completeness and consumer perceptions of credibility. Based on a 2 X 3 experiment conducted with 246 respondents, the article demonstrates that the extent of completeness of health information on the Internet impacts consumer assessment of source and website credibility. In contrast to the extant research on the orthogonality of content and source characteristics, this research demonstrates their interaction.*

The exponential growth in consumer use of the World Wide Web for procuring health information has led to an increasing scholarly and pragmatic interest in interrogating the quality criteria used by consumers for evaluating online health information (Cline & Haynes, 2001; Dutta-Bergman, 2003a, 2003b; Eysenbach, Powell, Kuss, & Sa, 2002; Harris Interactive, 1997). After all, scholars argue that consumer evaluations of quality are central to the processing of e-health information and subsequent consumer decision-making based on the information (Dutta-Bergman, 2003a, 2003b; Eysenbach et al., 2002). This interest in quality has been further catalyzed by a critical question facing scholars and practitioners alike: how to effectively draw consumers to e-health platforms through successful communicative strategies. Although numerous journal articles have engaged experts in elaborating upon quality criteria in an online environment, not much research exists in consumer processing of e-health information (Cline & Haynes, 2001). In an exploratory attempt to fill the existing void in online health information processing, this article examines consumer perceptions of health information quality.

Two critical indicators of health information quality that have emerged from the extensive expert discourse on e-health information are source credibility and information completeness (Eysenbach et al., 2002). Medical experts posit that health information provided by a source that is not believable is detrimental to consumer outcomes; hence, receivers of e-health messages ought to be able to

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judge the credibility of sources as a preliminary step to information processing (Eysenbach et al., 2002). Researchers also argue that unless health information is complete, it is likely to mislead the consumer to making uninformed decisions (Dutta-Bergman, 2003a; Eysenbach et al., 2002). Although credibility is a characteristic of the source, information completeness is a characteristic of the message content (O'Keefe, 2002).

Traditional persuasion theories have argued that receivers of messages, depending on their situations, make decisions either based on content cues, source cues, or the combination of both (Benoit & Strathman, in press; Petty & Cacioppo, 1986).<sup>1</sup> The elaboration likelihood model (ELM) has been systematically used to argue that user motivation determines the extent to which consumers attend to source or content characteristics (Petty & Cacioppo, 1986). Although source and/or content characteristics have been traditionally manipulated in ELM research, little research has been done on the effects of content characteristics on source perceptions and vice versa. To supplement the impressive body of work on the role of source and content characteristics in consumer information processing, this paper seeks to lay the groundwork for the examination of the interaction between message completeness and Web use motivation in the realm of source credibility perception. More specifically, it investigates the effect of the completeness of e-health information on source credibility judgments under different Web use motivations.

### **Web Use Motivation**

Web-based behavior is typically categorized into two distinct styles of navigation: goal-directed and experiential (Chen, Houston, Sewell, & Schatz, 1998; Dutta-Bergman, 2003a; Li & Bukovac, 1999). This dichotomy is captured in word pairs such as surfing/browsing–searching, hedonistic–utilitarian, sensory–functional, experiential–goal-directed, play–work that are typically used to refer to Web navigation (Chen et al., 1998; Dutta-Bergman, 2003a; Li & Bukovac, 1999). Although browsing is characterized by its exploratory nature and absence of planning, goals, or objectives (Marchionini, 1987; Marchionini & Shneiderman, 1988), searching is goal-directed and the user looks for specific information to solve a problem or to fulfill specific information needs (Chen et al., 1998). Whereas the browser is not particularly attentive to specific issue-relevant information objects, the searcher is driven by his or her very specific interest in the search topic.

The dichotomy captured in consumer Web use is also observed in extant literature in psychology and communication (Eagly & Chaiken, 1993). Both the elaboration likelihood model (ELM) proposed by Petty and Cacioppo (1986, 1990) and the heuristic-systematic model (HSM) developed by Eagly and Chaiken (1993) suggest two different information-processing mechanisms. One of these routes,

<sup>1</sup> Traditional ELM research demonstrates that content cues are used as central cues that impact persuasion under high involvement, and source cues serve as peripheral cues that impact persuasion under low levels of involvement. In spite of the dichotomization in ELM research, Petty and Cacioppo (1986) pointed out that information elaboration falls on a continuum ranging from low involvement to high involvement.

known as the peripheral route in ELM, is more superficial than the central processing route (Petty & Cacioppo, 1986; Petty, Cacioppo, & Schumann, 1983). Peripheral route processing does not involve argument scrutiny; the receiver is persuaded by affective or heuristic cues (Petty, Cacioppo, & Schumann, 1983). Examples of typical peripheral cues used in persuasion research are number of arguments, attractiveness of source, source credibility, and the number of sources endorsing a position (Benoit & Strathman, 2004; Petty & Cacioppo, 1986). The central route involves deeper and more effort-intensive processing (Petty & Cacioppo, 1986; Petty, Cacioppo, & Schumann, 1983). When processing information via the central route, the receiver pays attention to the strength of the arguments presented in the message (Petty & Cacioppo, 1986, 1990; Petty, Cacioppo, & Schumann, 1983).

Although the extant literature on information processing (both ELM and HSM) provides a great deal of information regarding the impact of central and peripheral processing on the effect of source and message cues, not much research delves into the role of surfing–searching in the context of consumer processing of source and content cues. Acknowledging the analogy between Web use and the large body of research on dual processing, Murphy (1998) articulated that surfing, with its experiential orientation, involves peripheral processing whereas searching, with its focus on goal-directed action, involves central processing (Murphy, 1998, p. 63). On a similar note, Li and Bukovac (1999) point out that information seekers in searching situations selectively orient their attention to information based on its need relevance and surfers are experientially oriented and are drawn toward whatever is interesting in their information environment (Li & Bukovac, 1990). In other words, although surfing is diffusely oriented toward the information environment, is unplanned, and comprises an exploratory information-processing strategy that heavily depends upon serendipity, searching involves planned information seeking marked by goal-directed processing of relevant information (Carmel, Crawford, & Chen, 1992; Marchionini, 1987; Marchionini & Shneiderman, 1988).

Searching, then, generates the audience member's involvement in a particular issue by orienting him or her toward the specific information need that is driving the search (the topic of the information search, say breast cancer treatment), whereas surfing does not generate audience involvement in a specific target issue. The application of the analogy between involvement (high–low) and Web use motivation (surfing–searching) proposes to explain the different evaluative criteria used by consumers under different situations (surfing–searching) to evaluate health information on the Internet. The ELM analogy suggests that, although message-based criteria are used under searching (high involvement), source-based criteria are used under surfing (low involvement) for consumer decision-making.

### **Information Completeness**

A growing body of current research in Internet-based health communication suggests that the completeness of health and medical information is perhaps the most

important information criterion in decision making and choice situations (Dutta-Bergman, 2003a, 2003b; Eysenbach et al., 2002). According to the Merriam Webster's collegiate dictionary (1995), completeness is defined as "having all necessary parts, elements, or steps" (p. 235). Therefore, complete information about a medical claim would include all the elements necessary to establish it (Cline & Haynes, 2001). Scholars studying scientific information point to the presence and/or absence of explanations, methodological details, and relevant data or statistics as the necessary elements (Korpan, Bisanz, Bisanz, & Henderson, 1997). Focusing on the causal explanations underlying claims, Toulmin (1958) argued that the necessary elements that build an argument are the logic links underlying it. The Toulmin model (1958) of completeness suggests that an argument that is logically complete contains three elements: claim assertions, evidence (grounds), and authority (warrants and backing). The presence or absence of these elements makes an argument strong or weak. A claim asserts the advantages or disadvantages of a proposed action. Evidence (grounds) are facts presented to back the claim. Warrants provide the link between the claim and the presented evidence, often serving as an explanation. Backing, in turn, is the factual element that supports the warrant.

The argument that completeness is a central criterion in medical decision-making is clearly indicated by a growing body of work (Dutta, 2001; Eysenbach et al., 2002). Completeness of health information refers to the extent to which the discussion of a health topic is comprehensive, balanced, and adequate in its portrayal (Eysenbach et al., 2002). Complete health information not only presents the positive effects of a particular preventive or remedial behavior, but also explains the process underlying the effects and expands upon the possible side effects. In the context of health information, it may be argued that the more complete the information is, the better equipped is the patient in making a decision based on the information. Incomplete information does not give the full picture, and by missing necessary and relevant information, it misleads the consumer. Consumer trust in the information, research suggests, increases with increasing levels of completeness (Dutta, 2001; Dutta-Bergman, 2003).

Completeness has been systematically investigated in the library and information sciences literature and is documented as one of the critical elements of information quality; the more complete the information, the better is its quality (Dutta, 2001; Dutta-Bergman, 2003a). Based on the articulations that completeness is integral to quality and that quality information is integral to creating a strong argument, it may be argued that the degree of completeness of a message contributes to its argument strength. A more complete message is also a stronger message because it provides the audience member with the necessary logic links, supporting data, information on the methodology, side effects, and so on. It is critical to point out that completeness is only one of the many criteria that contribute to the better quality of a message; the library and information sciences literature suggests a plethora of other criteria such as relevance, accuracy, and recency that might be used to construct a strong argument. In other words, argument strength is a complex construct that is made up of a number of subdimensions, one of which is completeness. The review and systematic incorporation of these criteria

would perhaps provide clear guidelines in terms of how to construct a message with strong argument quality, thus proposing to solve a historical void in the ELM literature about the constitution of a strong argument.<sup>2</sup>

### **Source Credibility and e-Health**

Source credibility was catapulted to the limelight in the expert literature on e-health information because of (a) the growing concern about the extent to which consumers are getting their information from websites that are not trustworthy and do not have the qualifications to provide health information, and (b) the attempts of e-health information providers to create a positive Web presence that persuades consumers to use their portals (Eysenbach et al., 2002; Fogg, Sooho, Marable, Stanford, & Tauber, 2002). On one hand, experts argue that source credibility is important in consumer decision-making in a medical context because sources that are not believable are likely to mislead the consumer, impacting the quality of medical decision-making. On the other hand, marketers of e-health initiatives seek to find ways to enhance their credibility (Cline & Haynes, 2001; Eysenbach et al., 2002; Fogg et al., 2002). Although the interests in the two camps are driven by very different goals, the object of scrutiny is source credibility. In spite of the growing interest in credibility, not much research exists on consumer perceptions of source credibility in an online health information environment (Dutta-Bergman, 2003a, 2003b).

Exploration in the realm of traditional persuasion research reveals a long-standing interest in source credibility since the early pronouncements of Aristotle about the faith audience members put in sources with a good character (Benoit & Strathman, in press). Although scholars disagree about the exact number of dimensions that underlie source credibility, trustworthiness and expertise of the source are the two most widely used dimensions in the operationalization of source credibility. Demonstrating the effect of source factors on persuasion, ELM researchers argue that source factors can “serve as arguments, they can serve as cues, and they can affect argument processing” (Petty & Cacioppo, 1986, p. 205). Although Petty and Cacioppo (1986) discussed the possibility of source characteristics impacting persuasion through the central route by serving as message arguments (e.g., Cindy Crawford posing for a shampoo advertisement), the majority of research on source characteristics has examined their role as peripheral cues. Receivers attend to source characteristics under low levels of involvement when

<sup>2</sup> Although argument quality plays a central role in the dual-processing model, the construct has not been clearly and consistently defined (Reinard, 1988; Stiff, 1986). Critics of the ELM (Mongeau & Stiff, 1993; Reinard, 1988; Stiff, 1986) have questioned the categorization of arguments based on the valence of thoughts they generate (favorable or unfavorable; see Petty & Cacioppo, 1986). These critics argued that the operation may actually be manipulating message cognitions rather than manipulating argument quality (Mongeau & Stiff, 1993). Scholars have also pointed out that Petty and Cacioppo’s (1986) operationalization of argument quality ignores the question of what makes an argument strong or weak (Mongeau & Stiff, 1992; O’Keefe, 2002; Reinard, 1990). Traditional ELM studies have operationalized strong and weak arguments by asking subjects to focus on arguments related to an issue (high involvement) and rate them (Mongeau & Stiff, 1993; Reinard, 1988; Stiff, 1986). Therefore, the ELM becomes an artifact of the very process of operationalizing a strong argument.

they process the message peripherally, whereas the message content exerts persuasive impact under high involvement levels when the message is processed centrally (Benoit & Strathman, in press; Petty & Cacioppo, 1986).

Reviewing the research on source credibility, Benoit and Strathman (2004) posit that the manipulation of source credibility is often problematic because the underlying dimensions of trustworthiness and expertise are confounded. Instances of manipulation often include manipulation of both trustworthiness and expertise, leaving the researcher unable to pinpoint the observed effects to one particular dimension. Additional confounds are introduced by factors such as source similarity, source attractiveness, and liking. Future research on credibility needs to fine-tune the manipulation of credibility and eliminate potential confounds (Benoit & Strathman, in press). Finally, the literature on source credibility reveals a lacuna in the domain of the effect of message characteristics on credibility assessments.

### **Research Questions**

Questions related to quality, particularly completeness and credibility remain limited to the realm of expert discourse (Dutta, 2001; Eysenbach et al., 2002). Although the study of the experts' perceptions of patient use of medical information on the Internet is a worthwhile endeavor, such studies do not tap into the experiences of the patient. As a consequence, the discourse about consumer health information search on the Internet remains limited to the realm of the medical professional, reflecting the paternalistic sentiment of modern medical practice (Hibbard & Weeks, 1987). Based on the articulation that studying the health care consumer is central to the scholarship of Internet health information, this article applies a consumer-based perspective to investigate the interactive effect of Web use motivation and health information completeness on source credibility judgments.

In most of the extant persuasion research, source credibility has been treated as an independent variable, paying a great deal of attention to the question: How does credibility of the source affect persuasion? Accordingly, experimenters have manipulated source credibility by changing the levels of trustworthiness and expertise of the source. For instance, Johnson and Scileppi (1969) "manipulated credibility by telling message recipients that the source of the communication was a medical authority described as an expert on the topic or was a medical quack who served a prison term and who had written the article for a sensationalist publication" (Benoit & Strathman, 2004, p. 103), Chaiken and Maheswaran's (1994) manipulation involved *Consumer Reports* or K-Mart, and Chebat, Filiatraut, Larouche, and Watson (1988) told their subjects that the source was a college professor with expertise in a relevant discipline or a student (for a detailed discussion of source credibility manipulations, see Benoit & Strathman, 2004). As the review conducted by Benoit and Strathman demonstrates, although there exists a great deal of work that manipulates credibility to observe its effects on the persuasion process, the persuasion literature suffers from a dearth of research on the effect of content on credibility perceptions.

In classic ELM studies, credibility and content characteristics are treated as independent and orthogonal entities that are manipulated separately to study their effect on attitude change (Petty & Cacioppo, 1986). Based on the assumption of orthogonality, these studies have not looked at the effect of each manipulated independent variable on the other. Taking a cue from the current concerns about Web credibility, this article takes a different approach to the question of credibility. Treating consumer perceptions of credibility as a dependent variable, it asks the question: How does information completeness on a website affect the judgments about source and website credibility? A review of the literature does not provide concrete directions for formulating hypotheses. Also, given the exploratory nature of the concept of credibility judgment as a dependent variable, the following research questions were presented:

RQ1a: What is the effect of Web use motivation and information completeness on the evaluation of source credibility when the actual sources of information are held constant?

RQ1b: What is the effect of Web use motivation and information completeness on the evaluation of website credibility when the actual sources of information are held constant?

## **Method**

Web use motivation and completeness were manipulated while source and website credibility were treated as dependent variables. Pretests and pilot studies were conducted to fine-tune the manipulations and measurements.

### *Web Use Motivation Manipulation*

The Web use motivation of the consumer was manipulated in this study. The manipulation was embedded in the introductory page and role-playing was used here to create the manipulation. Web use motivation was dichotomized into surfing and searching. The two conditions differ in the amount of goal directedness; heart disease was chosen as the goal situation to manipulate surfing or searching. The respondents in the searching assignment were asked to imagine a scenario where they have been detected with heart disease. Pretending as if they were looking for specific heart-related information, the respondents were asked to search the website. This created a high level of goal-directedness with the respondent focusing his or her attention toward heart-related issues.

As opposed to the searching situation, the role-playing instruction in the surfing situation completely lacked in goal directedness. Subjects were asked simply to imagine they were browsing the website for fun. It is worth repeating that the goal-directed searchers were expected to be highly involved with the target issue (heart disease) and spend a great deal of cognitive effort processing the article related to the target issue (heart disease) whereas the non-goal-directed surfers were expected to be not highly involved with the target issue. The surfing/searching instructions were checked in pilot studies and pretests.

### *Message Development*

Completeness was manipulated at three levels (complete, jargon, and incomplete), resulting in three different versions of the test article. The topic “tea is good for your heart” was chosen as the target issue because of its low initial relevance for the target population; furthermore, it was conceptualized that the high-issue-involved searchers would be oriented toward heart-related issues. Once the target issue was selected, the researcher embarked on a thorough search of the existing literature to identify key evidence and supporting information connecting tea and the heart. The systematic literature search was conducted between January 2001 and March 2001. For the purpose of generating information, a wide range of sources including academic indices, professional medical journals, health archives, health websites, tea websites, and popular outlets such as newspapers and magazines, were explored, resulting in 134 articles on the topic of tea and the heart. Once all the information was gathered, the researcher (a former researcher and copywriter) synthesized it to generate the fundamental building blocks of the Toulmin model, supportive statistical and methodological information, and information on side effects and limitations. The presence or absence of these blocks defined the level of completeness of the message (complete and incomplete versions).

The complete version contained all the necessary elements that formed a complete argument. The incomplete and jargon versions of “Tea Is Good for Your Heart” lacked the grounds, warrants, backing, and method presented in the complete version. Instead, these two versions contained irrelevant arguments that had nothing to do with the linkage between tea and heart (instances of such irrelevant information include the use of tea in the East, the growing popularity of tea, and patient satisfaction with tea studies). The jargon and incomplete versions were essentially the same in terms of the content of the irrelevant information presented. The jargon-based version was created by simply adding eight scientific words to the jargon-free incomplete version. These eight scientific words were the same eight words that appeared in the complete version.

To control the heuristic effect of length, all three versions of the article, “Tea Is Good for Your Heart,” contained approximately the same number of words (equal length), the same number of paragraphs, and approximately the same length of each paragraph. To control the confounding effects of source credibility, the same sources were used in all three versions. Also, the positioning of the sources within the article was exactly the same across the versions. The source used was an expert. Yet another heuristic that was anticipated to confound the study was the “It has numbers, so it is more persuasive” heuristic. The number-based heuristic was controlled by inserting an equal number of numerical figures in all three versions. To prevent the magnitude of the numbers from confounding the study, the numbers used were of the same magnitude across all three levels of completeness. To control for the effect of a visual heuristic, no pictures were included in the articles.

### *Website Development*

To create a real Web scenario, the test article needed to be embedded within a larger health website. Therefore the website served as the carrier of the indepen-

dent manipulation and three different websites were needed for the purpose of the study, reflecting the three different levels of information completeness. The three different versions of the website contained a different version (incomplete, jargon, and complete) of the article “Tea Is Good for Your Heart,” and served as the manipulation of information completeness. Each version of the website was titled “ABC’s of Health.” Special attention was paid to make sure that the websites looked like a real-life health website, especially in the context of the health information content. In addition to the article on tea, thorough research of 58 health websites led to the selection of seven health articles. All three versions of the website contained three feature articles and five news articles. In concordance with the usual layout of information in popular health sites, the feature articles were placed at the top of the web page and the news articles were placed toward the bottom.

#### *Main Study Design*

A 2 X 3 (Web use motivation X completeness) factorial design was employed to answer the research questions. In the main study, a total of 246 subjects were randomly assigned to the six cells in the 2 X 3 design (41 subjects per cell). While Web use motivation was manipulated and measured at two levels (surfing versus searching), completeness was manipulated and measured at three levels (complete, jargon, and incomplete). The dependent variables were attitude and intention toward the issue. Participants were isolated from each other so they could complete the experiment independently, and respondents in each session participated in different experimental conditions. The availability of enough participants in a single session allowed the researcher to conduct all six experimental conditions simultaneously. This procedure avoided confounding session with experimental condition. Participants participated in groups of varying sizes in computer laboratories equipped with computer stations that could access the website. After spending approximately 10 minutes at the website, respondents were asked to fill out a questionnaire evaluating the website.

Respondents were recruited from classrooms by offering them extra credits for participation. Students are Web literate and science literate (Pingree, Hawkins, Yun, Park, & Serlin, 2000). Based on their level of education and the degree of exposure to the Web, they may be expected to possess the same degree of ability to process information on the Web. Two-hundred-and-forty-six undergraduates enrolled in journalism classes in a large mid-Western U.S. research one university participated in this study. There were 151 females and 87 males in this sample. Their ages ranged from 17- to over 30-years-old, with 90.5% of the student sample belonging to the 18–24 age group. The mean age of the sample was 20.58 years. Average Internet usage of this sample was rather high compared to adults in general. The mean number of hours spent by this sample on the Internet each day was 1.93 with a median of 2.0 hours; 74.8% of the sample spent between 1 and 2 hours on the Internet; 12.6% spent 3 to 4 hours; and 6.1% spent 5 hours or more on the Internet. Also, compared to the general adult population, the sample had a higher level of experience on the Internet. The average Internet years was 5.58. Eighty one percent of the sample had used the Internet for 3 to 7 years. Thirteen

percent of the sample had used the Internet for 8 years or more, and only 3.2% of the sample reported having used the Internet for 2 years or less; 73.6% had previously used the Internet for health information.

*Measurement and Manipulation Check of Web Use Motivation.* As articulated in the literature review section, theory building in this paper was based on the relationship between surfing–searching and low–high involvement. It was expected that the surfing instructions would produce a low level of involvement while the searching situation would produce a high level of involvement in the realm of the target article. In other words, surfers, being less involved in the issue (heart disease here) would spend significantly less cognitive effort in processing the article and the website compared to the searchers who had been oriented to seek out information on the specific topic. Therefore, the manipulation of surfing and searching was checked in the main study at three different levels: article involvement, website involvement, and article readership. To check the manipulation, one-way analysis of variance was conducted on the involvement (self-reported cognitive effort) measure with the Web use motivation (surfing–searching) manipulation serving as the independent variable.

The four items that emerged from the pilot studies to measure article involvement were “tried hard to evaluate the communication,” “thought a lot about the arguments in the message,” “spent a lot of effort evaluating the arguments,” and “put a lot of effort into evaluating the communication.” When the four items representing article involvement were subjected to a principal axis factor analysis with promax rotation for the main study, all four items were retained. The items were highly intercorrelated and had factor loadings between .85 and .93, explaining 82.02% of the variance. The Eigenvalue of the five-item factor was 3.28. Similar to the results of the pilot studies, Cronbach’s alpha for article Web use motivation was high at .94.

The four items for the measurement of website involvement were “put a lot of effort into evaluating the site,” “was highly involved in evaluating the site,” “tried hard to evaluate the information on the site,” and “thought a lot about the arguments presented in the articles in the site.” Principal axis factor analysis with promax rotation of the four items yielded a single factor, with an Eigenvalue of 3.37 and factor loadings falling between .83 and .95. Cronbach’s alpha for the scale was .94. Article readership was measured on a 1 to 6 scale.

At the level of article involvement, the ANOVA showed that the searchers processed the issue-relevant article (“Tea Is Good for Your Heart”) to a significantly greater extent than the surfers did. Participants assigned to the searching group had a significantly higher level of article involvement ( $M = 4.76$ ,  $SD = 1.06$ ) than those participants who were assigned to the surfing group ( $M = 3.15$ ,  $SD = 1.10$ ),  $F(1, 241) = 135.88$ ,  $p < .001$ ,  $\chi^2 = .36$ . At the level of website involvement, participants assigned to the searching condition ( $M = 4.681$ ,  $SD = 1.123$ ) reported a significantly greater level of website involvement than the participants assigned to the surfing condition ( $M = 3.57$ ,  $SD = 1.39$ ),  $F(1, 240) = 47.05$ ,  $p < .001$ ,  $\chi^2 = .16$ . Finally, the searchers ( $M = 5.88$ ,  $SD = 1.57$ ) read the article significantly more thoroughly than did surfers ( $M = 4.83$ ,  $SD = 1.58$ ),  $F(1, 240) = 34.70$ ,  $p < .001$ ,  $\chi^2 = .13$ .

*Measurement And Manipulation Check of Information Completeness.* Eight items were used to measure completeness: “thorough,” “contains sufficient information,” “contains all the necessary elements,” “contains sufficient evidence,” “supported,” “complete,” “extensive,” and “sufficient.” The eight items were subjected to a principal axis factor analysis with promax rotation. A single factor with an Eigenvalue of 5.42 was generated from the factor analysis. The items all had factor loadings of greater than .63, and the factor accounted for 67.80% of the sample variance. Cronbach’s alpha of the aggregated scale was .93.

As pointed out in the earlier sections, argument strength serves as a conduit for introducing completeness into the ELM-based theoretical framework of the study. By demonstrating that completeness is directly related to argument strength, it is established that completeness is indeed a central criterion. Argument strength of the article was measured using four items, which were “convincing,” “well supported,” “persuasive,” and “contains strong arguments.” When subjected to principal axis factor analysis with promax rotation, the four items representing article argument strength formed a single factor. The factor loading ranged from .53 to .95, and the factor explained 74.34% of the sample variance. The Eigenvalue of the single factor was 2.98. The aggregated scale had a high reliability, with a Cronbach’s alpha of .87.

To check the completeness manipulation, one-way ANOVA was conducted with the completeness measure being the dependent variable. The completeness manipulation (complete, jargon, and incomplete) served as the independent variable. Subsequently, post-hoc tests were conducted using Bonferroni method. The complete version of the article was evaluated as being significantly more complete than the jargon and incomplete versions. Respondents assigned a significantly,  $(2, 241) = 76.92, p < .001, \chi^2 = .39$ , higher mean to the complete version ( $M = 5.04, SD = .79$ ) than the incomplete ( $M = 3.48, SD = .99$ ) and jargon ( $M = 3.60, SD = .87$ ) versions. The post-hoc Bonferroni test further revealed that there was a clearly significant difference in completeness scores between the jargon and complete versions (mean difference = 1.43,  $p < .001$ ) and between the incomplete and complete versions (mean difference = 1.55,  $p < .001$ ). However, the completeness scores did not significantly differ between the jargon and incomplete versions.

The pilot studies and pretests had shown support for the completeness-argument strength link. To further ascertain the proposed relationship between completeness and argument strength, I conducted a one-way ANOVA. Argument strength formed the dependent variable while completeness formed the independent variable. The complete version was significantly stronger,  $F(2, 242) = 123.97, p < .001, \chi^2 = .51$ , in argument quality ( $M = 5.55, SD = .91$ ) than the jargon ( $M = 3.39, SD = 1.12$ ) and incomplete ( $M = 3.16, SD = 1.15$ ) versions. Post-hoc Bonferroni tests showed significant difference in argument strength between the complete and jargon (mean difference = 2.16,  $p < .001$ ) versions and between the incomplete and complete (mean difference = 2.39,  $p < .001$ ) versions. No significant difference was observed between the jargon and incomplete versions. As expected, completeness was highly correlated with argument quality ( $r = .80, p < .001$ ).

*Measurement of Source Credibility.* The pilot studies revealed five items to measure article source credibility. These items were “trustworthy,” “credible,” “be-

lievable," "qualified," and "expert." These five items measuring the credibility of the source(s) of information used in the article were factor analyzed using principal axis analysis with promax rotation. Only factors with Eigenvalues greater than 1.0 were accepted. The items generated a single factor that explained 69% of the variance in the sample. The Eigenvalue was 3.45 and the factor loadings ranged from .35 to .93, and the Cronbach's alpha of aggregated scale was .86.

*Measurement of Website Credibility.* The five items intended to measure Website credibility were "trustworthy," "believable," "credible," "qualified," and "expert." When subjected to a principal axis factor analysis with promax rotation, the items produced a single factor. The factor loadings ranged from .78 to .92 and the Eigenvalue was 3.61; 72.32% of the variance was explained by the factor and the aggregated scale had a high reliability (Cronbach's alpha = .90).

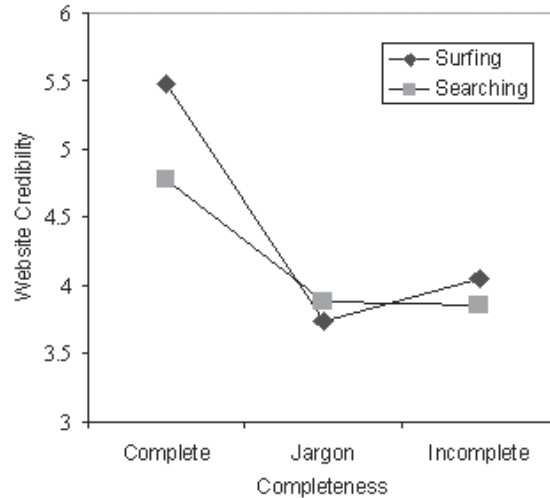
## **Results**

### *Source Credibility*

To answer the question of whether information completeness and/or Web use motivation affected source credibility evaluation, we conducted an analysis of variance. The results indicate that there was no interaction effect of web use motivation and completeness on evaluations of source credibility. However, direct effects of completeness and Web use motivation on source credibility were observed. Sources of information in the versions with more complete information ( $M = 5.07$ ,  $SD = .977$ ) were judged to be more credible than the sources in the incomplete, jargon-based ( $M = 4.16$ ,  $SD = 1.11$ ) and incomplete, nonjargon ( $M = 4.34$ ,  $SD = 1.17$ ) versions,  $F(2, 236) = 15.940$ ,  $p < .001$ . The partial eta-squared ( $\eta^2$ ) for the effect of completeness was .12, suggesting a medium effect size ( $f$ ) of .37 (Cohen, 1977). Post-hoc analysis using the Bonferroni method revealed significant differences in source credibility evaluations between the complete and incomplete versions (mean difference = .73,  $p < .001$ ) and between complete and jargon versions (mean difference = .91,  $p < .001$ ). In agreement with the nomological network, no significant difference in credibility evaluation were found between the jargon and incomplete versions. Also, surfers ( $M = 4.34$ ,  $SD = 1.08$ ) had a significantly lower likelihood to judge the sources of information as more credible than the searchers ( $M = 4.69$ ,  $SD = 1.21$ ),  $F(1, 236) = 5.98$ ,  $p < .05$ ,  $\eta^2 = .03$ .

### *Website Credibility*

Website credibility lies at the crux of multiple Web-based evaluation efforts. Are evaluations of website credibility affected by the interaction between completeness and Web use motivation? To answer this question, I conducted an analysis of variance. The results indicate an interaction effect of Web use motivation and completeness on evaluations of website credibility,  $F(2, 236) = 15.940$ ,  $p < .001$ ,  $\eta^2 = .03$ , with an effect size ( $f$ ) of .18 (Cohen, 1977). Additional ANOVAs were conducted within the surfing and searching situations to further interpret the interaction effect (see Figure 1). Surfers evaluated the website with the complete version ( $M = 5.48$ ,  $SD = 1.05$ ) to be significantly more credible than the jargon ( $M = 3.74$ ,



**Figure 1. Interaction between Web use motivation and information completeness in the context of website credibility.**

$SD = .97$ ) and incomplete versions ( $M = 4.06, SD = .97$ ),  $F(2, 117) = 34.81, p < .001$ ; similarly, searchers perceived the website with the complete version ( $M = 4.77, SD = 1.19$ ) of the target article to be more complete than the jargon ( $M = 3.88, SD = 1.12$ ) and incomplete ( $M = 3.85, SD = 1.27$ ) versions. However, the effect size in the surfing condition ( $\eta^2 = .37$ ) was significantly greater than that under searching ( $\eta^2 = .11$ ).

Separate post-hoc Bonferroni tests were conducted to compare the effects of the different versions of completeness for the surfing and searching situations. Under the surfing condition, the test showed that there was significant difference between the complete and incomplete versions (mean difference = 1.42,  $p < .001$ ) and between the complete and jargon versions (mean difference = 1.74,  $p < .001$ ). No significant difference was observed between the incomplete and jargon versions. Under the searching condition, although significant differences were observed between the complete and jargon versions (mean difference = .89,  $p < .01$ ) and the complete and incomplete versions (mean difference = .92,  $p < .01$ ), no significant difference was observed between the jargon and incomplete versions.

In addition, the website credibility scores of surfers and searchers were compared for the complete, jargon, and incomplete versions. The results of the ANOVAs revealed that, although surfers ( $M = 5.48, SD = 1.05$ ) were significantly more likely to form positive website credibility assessments of the complete version as compared to searchers ( $M = 4.77, SD = 1.19$ ),  $F(1, 78) = 8.02, p < .01, \eta^2 = .09$ , no significant differences were observed between surfers ( $M = 3.74, SD = .97$ ) and searchers ( $M = 3.88, SD = 1.12$ ) for the jargon version. Also, searchers ( $M = 4.05, SD = .97$ ) and surfers ( $M = 3.85, SD = 1.27$ ) did not differ in their credibility assessments of the incomplete version. Therefore, the interaction between Web

use motivation and information completeness originated in the difference in website credibility evaluations of surfers and searchers for complete information and the lack of difference between the two user groups under conditions of exposure to jargon and incomplete information.

### **Discussion**

The research questions sought to understand whether information completeness had an impact on the way consumers evaluated source and website credibility. At the level of source credibility judgments, strong main effects of completeness and Web use motivation were observed. Supporting the nomological network, it was found that the source of the e-health information was judged to be more credible when the information was complete as compared to instances when the information was incomplete. The presence of scientific jargons in the incomplete version did not have an impact on the consumer's assessment of source credibility, suggesting that the receivers of information indeed paid attention to the message content, making sure that the relevant elements of the message were present. This assessment of completeness, in turn, impacted the consumer's evaluation of the source. Receivers used their evaluations of the message generated by a particular source to attribute a certain level of credibility to the source. In other words, the research findings suggest that the receivers of messages make inferences about the characteristics of the source based on the nature of the message, implying a complex web of intertwined relationships between source and content characteristics; what a source says actually impacts how believable he or she is. This paper points out that source perceptions are enmeshed with assessments of message characteristics and are not simply limited to heuristic cues such as qualifications or association with the federal government or a university.

In the realm of development of e-health applications, the research findings suggest that it is critical for providers of health information, ranging from doctors to health organizations (medical universities, Centers for Disease Control and Prevention, etc.), to provide complete information. The credibility of the individual or organization providing the information is threatened when the information in an online environment is not complete. Loss in the credibility of the source, in turn, is likely to impact future consumer evaluations of the source (individual or organization) as a health information provider. It would be particularly relevant to explore the effects of a negative perception on future uses of services provided by the source. For instance, to what extent would the incomplete information provided by a doctor impact the credibility of the doctor and subsequently impact consumer usage of her or his services? This is a critical problem for future consumer decision-making in an online context. E-health information providers need to make sure that the information they are providing to the audience is indeed complete, and they need to check the completeness of each article offered on different platforms. In providing information about research results, prevention methods, and the like, health information sources need to ensure that the message is complete.

It is also worth emphasizing that the effect of completeness was evident across both surfing and searching situations. This is because both surfers and searchers scrutinized the message thoroughly and used the completeness cue to evaluate the credibility of the sources of information in the target article. The health context of the information perhaps sensitized consumers to evaluation of quality across both surfing and searching situations.

Judgments of credibility of the website demonstrated interaction effects between Web use motivation and completeness. The effect of completeness on website credibility judgments was stronger under surfing than under searching, suggesting a dual-processing effect in the context of website credibility. This may be explained by the notion that the more involved searcher who scrutinizes the message more thoroughly evaluates the website with complete information to be less credible than does the less involved surfer. The completeness of the one article (target article) presented to the searcher was not sufficient to drive a tremendous increase in Web credibility judgments. The website is a repository of information, and hence, is more removed from the sources embedded in any particular article presented to the receiver. Perhaps, the searcher is unlikely to make inferences about the credibility of the website based on the completeness of an article presented on it because he or she needs a larger body of evidence and the continuity of positive experiences to make Web credibility judgments. The findings in the domain of Web credibility suggest that the amount and type of information input that affects website credibility judgments vary for surfers and searchers.

This article makes several important contributions to current understandings of communicative practices on the Internet. First and foremost, it introduces completeness as a vehicle for constructing strong arguments. The finding that the complete message is evaluated to be of greater strength than the incomplete messages indeed demonstrates that manipulating the completeness of a message is one way to increase its argument strength. Future research should explore other criteria from the library and information sciences literature in operationalizing a strong argument. Second, the research presented here provides a valid and reliable measure of completeness that may be used in future work. Third, this work demonstrates the importance of the message content in shaping consumer perceptions of the credibility of the source; sources are evaluated on the quality of what they say, not simply on heuristic cues. It provides useful insights into how message characteristics influence perceptions of the sources, building further support for the notion of intrinsic credibility posited by Benoit (1991).

#### *Limitations*

This study suffers from some critical limitations. First, one of the important criticisms of any experimental research is that it introduces a certain degree of artificiality into the study. Second, the manipulation of involvement was achieved by asking the respondents to role-play. The efficiency of role-play may be questioned by critics because of the degree of artificiality it might create. Third, using students for the study, it may be argued, does not reflect the real-life situation of health information search although approximately 77% of the students sampled in this study had used the Internet to obtain health information.

### *Directions for Future Research*

Given the highly involved nature of the Internet as a medium, it is worth examining how the characteristics of the medium interact with the situation (such as low or high involvement) of the consumer. Also an interesting question to explore is whether truly low levels of involvement exist in the Internet scenario. Under what scenarios do such extremely low levels of involvement exist and do they lead to peripheral processing? Attempts may be made to study and compare involvement across media. For instance, how do involvement levels in television compare with involvement levels on the Internet? Finally, future research needs to examine the differences between surfing and searching in other topical areas beyond the realm of health. For instance, do surfers and searchers make similar completeness-based assessments in the context of sports information or entertainment information?

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