Participatory Web Users' Information Activities and Credibility Assessment

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1. Introduction

Assessment of information credibility is a ubiquitous human activity given that people constantly make decisions and selections based on the value of information in a variety of information seeking and use contexts. Assessing credibility is an important part of human judgment because people eventually use the information that they have found for various purposes – to learn, keep up to date, make a decision, share with other people, or to verify or evaluate the information. In the process of interacting with information, there are indeed a number of aspects people consider when making judgments about information credibility – is it trustworthy; is it accurate; is it complete; is it reliable; is it authoritative; and is it current? (Rieh, Kim, Yang, & St. Jean, 2010) Based on their judgments in regard to these multiple dimensions of information credibility, people are likely to select which information to use.

Information and communication technology (ICT) and credibility issues have long been tied closely together. Major interest in credibility research began in the 1950s, when television was first introduced and became a competitor with newspapers. The concept of credibility received renewed attention in the late 1990s because the Web, in general, lacks quality control mechanisms as compared to traditional channels in which information typically has to undergo several levels of gatekeeping such as factual verification, editorial review, refereeing processes, and the oversight of publishers seeking to safeguard their reputations (Janes & Rosenfeld, 1996). Today we are experiencing a new generation of ICT applications and tools – the so-called Web 2.0 – that form participatory Web use environments (O'Reilly, 2005). People are becoming increasingly involved in the creation of content on the Web through their participation in various types of information activities such as posting documents, writing personal blogs, tagging, rating, making recommendations, posting on wikis, and participating in online community sites.

The problem of credibility is more critical than ever given that Web 2.0 presents both new barriers and new opportunities. Some credibility assessment strategies that people adopted during the earlier phase of the Web may not be applicable in the new environment. For instance, as information is being widely disseminated through participatory websites such as personal blogs, wikis, and social networking sites and is often disconnected from institutional sources, people may find it difficult to identify the original source of the information. In the traditional Web environment, people tend to evaluate information differently depending on whether the information is posted by established media (such as nytimes.com or cnn.com) or by individuals (USC Annenberg School Center for the Digital Future, 2007). In Web 2.0 environments people encounter a greater amount of information posted by individuals than they do on the traditional Web, which may make credibility assessment more challenging.

Simultaneously, however, the growth of Web 2.0 has been accompanied by the development of new features and tools that can assist people with making credibility judgments. While the greater dispersion of roles such as information mediators and information producers

can pose challenges to most people's ability to assess the relative credibility of various pieces of information; on the other hand, current ICT provides unprecedented ways of helping people to make more informed credibility judgments. Various Web 2.0 applications make it easier to verify information and to obtain other people's second-hand evaluations, for example, the consumer ratings on websites like amazon.com or epinions.com and the user feedback on ebay.com.

These changes have lead to the identification of a new research problem requiring investigation – how are people making credibility assessments using these new ICT tools and applications and how can they be assisted so that they become more effective information ICT users who are capable of making accurate judgments about information credibility in the Web 2.0 era? While credibility assessment on the Web has been studied actively across multiple disciplines, most extant studies have looked at only small slices of the diverse information activities people are now engaging in on the Web, e.g., focusing primarily on people's information searching or news reading behavior. This study examines people's perceptions of online information credibility within a more diverse set of information activities, in the context of their everyday lives. The research questions addressed by this study are:

1. How do people perceive credibility concepts when they engage in participatory information activities using Web 2.0 tools and applications?
2. What sets of credibility heuristics have emerged in the participatory Web environment?
3. To what extent do people make an effort in order to ensure the credibility of information?

2. Conceptions of Information Credibility

Credibility is a broad and complex concept and is often defined with respect to multiple constructs. Fogg (2003a) defines credibility as believability: believable information is credible information and believable people are credible people. Rieh (2010) defines credibility as "people's assessment of whether information is trustworthy based on their own expertise and knowledge" (p. 1338). She noted in this definition that credibility does not reside in an information object, source, or person; rather it is people who ultimately make judgments of information credibility.

Since the pioneering research conducted in the 1950s, the concept of credibility has grown as a research topic in its own right across several different academic disciplines. However, credibility research has tended to evolve in field-specific ways, with each field developing its own conceptions and approaches over the past five decades (Rieh, 2010). A series of early studies by Yale Group defined credibility as a receiver-based construct and suggested that credibility is determined by an audience's acceptance of a speaker (Hovland, Janis, & Kelley, 1953). In the field of communication, credibility research has traditionally been tied together with the investigation of persuasion. When people find certain information or sources to be sufficiently credible, the information is likely to persuade them to change their knowledge, attitudes, or behavior. Fogg (2003a) viewed computers as persuasive social actors and developed credibility concepts within the framework of human-computer interaction. He points out that the cultural view of computers as credible sources has been challenged due to the proliferation of the Internet and that it is important for designers of persuasive technology to understand the nature of credibility. In the information science field, most researchers have conceptualized credibility

as one of the evaluation criteria used for making judgments about the relevance of information. Rieh (2002) noted that information quality, cognitive authority, and credibility have consistently emerged as more important than other relevance criteria in previous empirical studies. Because of different historical origins, the fields of information science and communication have studied credibility from different perspectives and from different assumption bases. However, as both fields began to pay more attention to the impact and growth of people's online information activities, these two fields, as well as other disciplines such as education, psychology, and public health, have drawn closer together than ever before (e.g., Flanagin & Metzger, 2008a). As a result, contemporary credibility research has begun to take a multidisciplinary approach in order to better understand people's credibility assessment within various information contexts across work and everyday life (Rieh & Danielson, 2007).

As the concept of credibility has received renewed attention in various research communities due to increasing concerns about the credibility of online information, several different frameworks have emerged about the conceptions of credibility. They can be characterized as *media-based, website-based, content-based, and interaction-based frameworks*. Below, I first review these four approaches and then suggest a *unifying framework.*

2.1. Media-based Framework

The *media-based framework* is the earliest framework and was developed primarily within the field of communication. Mass communication scholars have long been interested in investigating the relative credibility of various media channels through which information is delivered. Since the 1950s, typical research questions within this framework asked respondents which medium they would believe if they heard conflicting messages from radio, television, magazines, and newspapers (Roper, 1985). Numerous communication researchers identified factors affecting media credibility, such as technological features (i.e., visual nature of television), structural differences in newspaper and television industries, and economic constraints (Metzger, Flanagin, Eyal, Lemus, & McCann, 2003). As the Internet became widely adopted, researchers added the Web as another type of media and compared people's perceptions of Web-based information with their perceptions about information from other media. The findings from previous studies tend to be somewhat puzzling and inconsistent. For instance, Johnson and Kaye's (1998) survey showed that respondents perceived online newspapers and political issue-oriented Web sites to be more credible than their traditional counterparts. In contrast, Mashek, McGill, and Powell (1997) found that respondents rated traditional media as less credible than their Internet equivalents with respect to political information.

There have been a number of criticisms of the media-based framework. One of the major criticisms is that people might use different reference points in their survey responses , e.g., in the case of newspapers and television, some people assess the credibility of national network news relative to a local newspaper. Comparing these two media directly can be problematic. Newhagen and Nass' (1989) study found that people evaluate the credibility of television news based on the newscasters whereas they evaluate the credibility of the newspaper as an institution. Another limitation of this framework is that most empirical studies in this area were primarily based on people's assessment of news information or political information. Therefore, the findings tend to be limited to certain kinds of topical areas. Overall, this framework draws implications from people's general perceptions of a medium rather than from their actual use of information obtained from it.

2.2. Website-based Framework

The *website-based framework* goes beyond examination of the Web as a unitary medium. Using this framework, researchers investigate credibility as a key factor in assessing an individual website's ability to persuade its users. It is presumed that there is variability in web credibility; that is, each website can be perceived to be a highly credible or not credible source of information, depending on numerous characteristics of the website itself. Studies by Fogg and other members of the Stanford Web Credibility Project (e.g., Fogg, et al., 2001) have examined several elements of a website that might influence users' credibility assessments either positively or negatively. Their results demonstrate that five types of elements (real-world feel, ease of use, expertise, trustworthiness, and tailoring) increased credibility perceptions whereas commercial implications and amateurism decreased credibility perceptions. Based on several empirical studies, Fogg (2003b) developed the prominence-interpretation theory, which describes two stages of website credibility evaluation: the likelihood of an element being noticed (prominence) and the value assigned to the element based on the user's judgment (interpretation). He further identified five factors affecting prominence: user involvement, information topic, task, experience level, and other individual differences. He also describes three factors affecting interpretation: user skill and knowledge, and contextual factors. Hong (2006) examined the influence of message and structure features on perceptions of website credibility, and found that message features such as expertise, trustworthiness, goodwill, depth, and fairness, were more important than structure features such as site navigation tools or site authorship. Robins and Holmes (2008) explored the link between page aesthetics and users' judgments of a website's credibility. Their findings indicate that given the same content, the content with a higher aesthetic treatment was judged as having greater credibility. The strengths of the website-based framework lie in its comprehension of both content and peripheral cues, such as presentation, design, and appearance as components of credibility. The weakness of this framework is that it does not consider the fact that most websites are information-intensive and that all of the information contained within one website is not necessarily equally credible.

2.3. Content-based Framework

In the *content-based framework*, credibility assessment is made on the basis of individual information objects found on the web. The underlying notion of this framework is that information credibility can vary even within the same site. The primary emphasis of this framework is that when people access information, they focus on evaluating its quality. They may find that the various cues indicating information quality may be inconsistent: the text appears to be well-written, but not current; it is current, but not scholarly; it is scholarly, but not comprehensive, and so on. Wilson (1983) defined credibility as a chief aspect of information quality. Thus, when people find inconsistent information quality attributes, they tend to ask whether they can believe what the text says or whether they can take it seriously (Wilson, 1983). Rieh and Belkin's (1998) study identified seven facets of information quality judgments, noting that a document's content, format, presentation, currency, and accuracy are all used as important criteria for evaluation. More recently, Lankes (2008) suggested that users are shifting from authority methods of credibility assessment to a reliability approach in which they seek commonalities and coherence among multiple information sources. Flanagin and Metzger (2008b) noted the increasing availability of volunteered geographic information. This kind of user-generated content prompted concerns with regard to its credibility. Similar to Lankes' arguments, Flanagin and Metzger also claim "a shift from a model of authority based on

information scarcity and hierarchy to a model of multiple distributed authorities based on information abundance and networks of individuals" (p. 143) in digital media that makes it possible to separate out the concept of credibility from authority. Sundin and Francke's (2009) ethnographic work focused on the use of user-created information, such as the information available on Wikipedia. Based on a study with young people, these authors concluded that pupils assess credibility with respect to the particular contexts in which they use information. Kim's (2010) research focused on a specific information use environment – a social Q&A site. She noted that users of this type of site tend to evaluate credibility primarily based on the content itself because they have very limited cues as to source credibility. The strength of this framework is that it firmly positions credibility within the framework of information value. The weakness is that it implies, but does not explicitly incorporate, peripheral content cues, such as the aesthetic aspects of information objects or the emotional effects of interaction with information.

2.4. Interaction-based Framework

The *interaction-based framework* supports the notion that credibility assessment can be described as an interactive and iterative process rather than a discrete evaluative event. Moreover, this framework recognizes that credibility assessment can be best understood by looking at people's information seeking strategies and the choices that they make during the process of information searching. Rieh's (2002) study found that when people search for information on the web, their decision behaviors form a continuous process, advancing from a prediction phase to an evaluative phase. When people initiate the information seeking process, they make predictions that reflect what they expect to happen (Rieh, 2002). These predictions guide people in deciding on information spaces and actions to take given a number of different possible information seeking paths and resources. As a result of their predictive judgments, people access an information resource and then make an evaluation of this information. These are evaluative judgments by which people express their information-related preferences. Rieh and Hilligoss (2008) later conducted an empirical study that led them to add verification as a third type of credibility-related judgment.

Wathen and Burkell's (2002) model also proposes credibility assessment of online information as an iterative process with three levels of evaluation. When people first encounter a website, their credibility assessment is based on surface characteristics, such as appearance, interface design, download speed, interactivity, and organization of information. On the second level, they focus on the credibility of the source and message, evaluating source expertise, competence, trustworthiness, and credentials. Finally, when people reach the third level, the interaction of content and presentation is assessed with respect to their individual cognitive states. Wathen and Burkell noted that the possible interactions among contextual and intervening variables make credibility assessment quite a complex process.

Sundar's (2008) credibility assessment model also adopts the interaction framework in identifying four broad affordances within digital media: modality (M), agency (A), interactivity (I), and navigability (N). These four affordances are all structural features that help to explain the perceived credibility of digital media. In general, the interaction framework reinforces the fact that credibility judgments are highly subjective and dependent upon people's prior experiences and existing knowledge. The limitation of this approach is that most studies conducted in this area tend to focus on only one type of human information activity – the process of searching for and navigating information.

2.5. Unifying Framework

Considering the strengths and limitations of the previous four frameworks, I now propose a *unifying framework* of credibility. The purpose of this framework is to characterize the concept of credibility across a variety of media, information objects, and content with respect to diverse information activities. An initial unifying framework was developed by Hilligoss and Rieh (2008) through their empirical study using information-activity diaries. Their study results identified three distinct levels of credibility judgments: construct, heuristics, and interaction. The construct level pertains to how an individual person constructs, conceptualizes, and defines credibility. The heuristics level involves a person's general rules of thumb, which are fairly broad and general enough to apply to a variety of situations. The interaction level refers to credibility judgments in which specific information objects or sources are examined. Hilligoss and Rieh's model includes an additional dimension – context – which they described as the social, relational, and dynamic frame of reference surrounding the information seeker. They noted that any or all of the three levels might affect a particular credibility assessment, and ultimately, the person's decision to accept or reject the information.

Rieh and her colleagues (Rieh, Kim, Yang, & St. Jean, 2010) expanded Hilligoss and Rieh's (2008) initial unifying framework of credibility assessment by further articulating the three judgment levels and extending the conceptualization of contexts by incorporating the goals and intentions associated with the information behaviors in which people engage in their everyday lives. In addition, Rieh et al. (2010) examined information use contexts in terms of a variety of information activities extending beyond information searching and browsing, including watching, downloading, voting, rating, commenting, tagging, posting, and creating. Their results indicated that the two traditional dimensions of credibility – trustworthiness and expertise – might need to be redefined in the current participatory Web environment. According to Rieh et al., authoritativeness and creator/author expertise ranked relatively low in terms of the importance of credibility constructs. They pointed out that given the current digital environment, people tend to make credibility judgments by incorporating and synthesizing multiple concepts, such as accuracy, currency, reliability, trustworthiness, and truthfulness rather than relying on a single author's or creator's expertise. This unifying framework presumes that credibility judgments can be best understood when considering the complex processes constituting information behavior, including the various information behaviors involved in each information activity episode, and the multiple levels involved in people's credibility judgments. This approach necessitates going beyond focusing on static information evaluation patterns based simply on cues and criteria.

3. Research Design

Given the breadth of the unifying credibility assessment framework, any potentially effective research design must enable the researcher to capture data about a variety of information activities and the credibility assessment processes which guide people's actions. The research method should also allow the researcher to investigate people's perceptions in terms of their specific viewpoints about judging credibility and to examine how people's credibility assessment processes help them to select information conveniently and quickly. In this study I chose to conduct a Web-based information activity diary survey to capture a range of people's information activities and their credibility judgments within their daily lives. This research design was influenced by two related methods: the diary study method and the experience

sampling method (ESM) (Kubey, Larson, & Csikszentmihalyi, 1996). Diary studies have been used widely in the field of information science as a form of collecting data, usually eliciting entries once a day over multiple days (e.g., Cool & Belkin, 2002; Rieh, 2004). In the ESM, respondents are completing a questionnaire or an interview by responding to a researcher's signal, such as a phone ring or beeper, administered several times per day at random intervals. The common goal of these two methods is to capture data about people's current activities under naturalistic conditions.

The survey questions in the diary are structured around three research themes: information activities, users' engagement and participation in the activity, and credibility assessment. Questions soliciting respondents' descriptions of their information activities (select the one online activity on which you spent the most time and describe it) and their goals and intentions for their selected information activity (what were you trying to accomplish in conducting this activity?) were asked using an open-ended format so that respondents could describe the nature of their information activities and the information resources they used in their own words. Questions related to respondents' motivation and confidence levels, and the importance of different credibility constructs were gathered through scaled response choices. Questions about respondents' credibility heuristics and interactions were presented as multiple-choice.

Our sample of respondents is composed of heavy Internet users who have embraced the Internet as part of their daily routine. In order to be eligible to participate, respondents had to use the Internet every single day of the week, including weekend days, and spend at least one hour per day on the Web engaging in information activities other than email communications. The recruitment of participants was limited to residents of the state of Michigan, U.S.A. All survey respondents received an email with a link to a diary survey five times a day on Sunday, Monday, and Tuesday during the week of their participation. On each of these three days, five emails were sent out throughout the day – at 9 am, 12:30 pm, 4 pm, 7 pm, and 10 pm. The respondents were instructed to respond to a survey only when they had engaged in an online activity at some point during the past three hours. Data collection took place across 10 weeks during the months of April through June of 2009.

The final dataset contained 2,471 diaries submitted by 333 respondents. Approximately 60% were female and 40% were male. They were spread across all age groups and represented a wide range of occupations. The diary data were analyzed both qualitatively and quantitatively. The data collected from two open-ended questions were content-analyzed using the following categories: information behavior, type of information object, type of information content, user goals, and user intentions. In this paper, I report on the part of data analysis focusing on the three levels of credibility assessment – constructs, heuristics, and interaction – with regard to information activities within Web 2.0 sites such as social networking sites, forums, blogs, and wikis.

4. Study Results

4.1. Credibility Assessment and Web 2.0-related Information Activities

Based on 2,471 diary entries collected from 333 respondents, 2,675 information objects were counted. Out of these 2,675 information objects, 430 were classified as Web 2.0 information objects: social networking sites (n=255), forums (n=84), blogs (n=67), and wikis

(n=24). When respondents were asked to indicate the extent to which they trusted the information obtained from these Web 2.0 sites using a 7-point-scale (1 = not at all, 4 = somewhat, 7 = very much), they reported having lowest trust in blogs (M=5.95) and forums (M=6.00), while having somewhat higher trust toward social networking sites (M=6.24) and wikis (M=6.13).

Table 1
Credibility constructs in Web 2.0 sites

Credibility construct	Social networking sites (n=255)	Forums (n=84)	Blogs (n=67)	Wikis (n=24)
Current	5.80 (1.66)	5.95 (1.49)	6.05 (1.77)	5.59 (1.79)
Truthful	5.44 (1.85)	5.73 (1.58)	5.69 (1.86)	6.04 (1.26)
Trustworthy	5.28 (1.95)	5.45 (1.75)	5.25 (2.00)	6.09 (1.12)
Accurate	5.22 (2.07)	5.48 (1.80)	5.43 (2.00)	6.13 (1.15)
Reliable	5.22 (2.10)	5.26 (1.90)	5.28 (2.07)	6.09 (1.24)
Complete	4.80 (2.14)	5.05 (1.87)	5.00 (2.02)	5.21 (1.91)
Official	4.18 (2.46)	4.49 (2.17)	4.10 (2.33)	5.42 (2.12)
Unbiased	3.28 (2.22)	4.09 (2.15)	3.64 (2.31)	4.85 (2.21)
Authoritative	3.13 (2.22)	3.83 (2.14)	3.81 (2.30)	4.45 (2.22)
Expert	3.06 (2.27)	3.77 (2.39)	4.11 (2.43)	5.48 (1.88)
Scholarly	2.82 (2.13)	2.84 (2.17)	3.53 (2.44)	4.95 (2.06)

Note: Mean (SD.); Scale: 1=Not at all important, 4=somewhat important, 7=very important

Table 1 presents a summary of the perceived importance of eleven credibility constructs for each specific type of Web 2.0 site. In general, currency, truthfulness, trustworthiness, accuracy, and reliability were credibility constructs rated as highly important for all four types of sites. Regarding their use of wikis in particular respondents showed distinct perceptions about the importance of credibility constructs. In their use of wikis, respondents essentially rated the importance of all 11 constructs higher than in their use of other sites. While respondents reported that currency was the most important construct for them when using social networking sites, forums, and blogs, when using wikis they rated accuracy as most important. Currency actually mattered least when using wikis (M=5.59), compared to when using blogs (M=6.05), forums (M=5.95), and social networking sites (M=5.80). Trustworthiness, which has long been a core dimension of credibility, was highly rated for wikis (M=6.09); however, it received relatively lower ratings in the use of the other three types of sites, showing the means of 5.28 for social networking sites, 5.45 for forums and 5.25 for blogs. The construct of being expert, which has traditionally been another core dimension of credibility, was relatively high in the case of wiki use (M=5.48), while it was not considered to be important for forums (M=3.77) and blogs (M=4.11) and not surprisingly, social networking sites (M=3.06).

Another interesting finding is the low ratings given to the importance of being authoritative, even in the use of forums (M=3.83) and blogs (M=3.81). These findings indicate that credibility constructs which have been emerged from more traditional information use contexts such as information searching and newspaper reading are not necessarily directly applicable to new forms in the Web 2.0 environment, such as blogs, wikis, forums, and social networking sites.

Table 2
Credibility constructs in participatory information activities

Credibility construct	Comment (n=190)	Create (n=18)	Tag (n=8)	Vote/rate (n=7)
Current	5.92 (1.64)	6.13 (1.92)	6.14 (1.21)	5.75 (0.5)
Truthful	5.73 (1.82)	5.83 (1.90)	6.00 (1.73)	5.75 (1.26)
Trustworthy	5.60 (1.91)	5.40 (1.96)	6.40 (0.89)	6.60 (0.55)
Accurate	5.53 (2.04)	6.38 (1.50)	6.00 (1.55)	6.25 (0.50)
Reliable	5.58 (2.05)	6.36 (1.39)	6.20 (1.30)	6.50 (0.58)
Complete	5.23 (2.17)	6.13 (1.46)	5.67 (1.97)	6.00 (0.82)
Official	4.76 (2.43)	5.73 (2.00)	4.80 (3.03)	6.20 (0.84)
Unbiased	3.87 (2.34)	4.20 (2.49)	5.00(2.74)	5.00 (1.00)
Authoritative	3.88 (2.43)	5.10 (2.13)	5.40 (2.19)	5.00 (1.00)
Expert	3.91 (2.53)	5.45 (2.02)	5.20 (2.49)	5.00 (1.15)
Scholarly	3.54 (2.44)	5.00 (2.33)	4.50 (2.81)	5.00 (1.00)

Note: Mean (S.D.); Scale: 1=Not at all important, 4=somewhat important, 7=very important

Table 3
Credibility constructs in traditional information activities

Credibility construct	Search (n=887)	Read (n=732)	Monitor (n=320)	Listen/Watch/View (n=229)
Current	6.31 (1.45)	6.39 (1.25)	6.47 (1.18)	5.84 (1.71)
Truthful	6.37 (1.29)	6.19 (1.43)	6.11 (1.48)	5.53 (1.90)
Trustworthy	6.32 (1.31)	6.08 (1.54)	6.06 (1.48)	5.56 (1.90)
Accurate	6.52 (1.11)	6.21 (1.45)	6.11(1.56)	5.90 (1.66)
Reliable	6.43 (1.26)	6.11 (1.54)	6.09 (1.55)	5.91 (1.70)
Complete	6.36 (1.26)	5.85 (1.65)	5.88 (1.69)	5.86 (1.70)
Official	6.01 (1.70)	5.67 (1.90)	5.72 (1.87)	5.34 (2.06)
Unbiased	4.93 (2.25)	5.00 (2.12)	4.59 (2.25)	4.25 (2.31)
Authoritative	5.31 (2.09)	4.89 (2.15)	4.65 (2.20)	4.55 (2.24)
Expert	5.61 (1.91)	5.24 (2.08)	4.87 (2.26)	4.60 (2.27)
Scholarly	4.68 (2.27)	4.38 (2.20)	3.72 (2.25)	4.05 (2.44)

Note: Mean (S.D.); Scale: 1=Not at all important, 4=somewhat important, 7=very important

In Table 2 and Table 3, the analysis of credibility constructs across the various types of information activities yielded interesting findings. I looked at how respondents rated the importance of each credibility construct when they are engaging in different types of information activities. Table 2 summarizes the credibility constructs with respect to Web 2.0-related participatory information activities (commenting, creating, tagging, and voting or rating), while Table 3 presents the constructs for more traditional (and more frequently done) activities on the

Web (searching, reading, monitoring something new, and viewing or listening to multimedia content). The comparison of the results from Table 2 and Table 3 reveal that overall when respondents participated in Web 2.0-like content contribution activities, they rated the importance of the11 credibility constructs consistently lower than when they engaged in more traditional Web information activities. This indicates that people tend to be a little bit more critical when they are assuming the role of an information consumer rather than that of an information producer.

Table 2 shows that the perceptions of the importance of credibility constructs differ among the various Web 2.0-related information activities as well. Respondents' most popular Web 2.0-related activity was commenting. When they made comments online, however, the credibility constructs did not appear to be as important compared to when they were creating, tagging, and voting or rating. Across all 11 credibility constructs, importance ratings for commenting activities were consistently lower than for the other Web 2.0 activities. When the respondents reported on their content creation activities, they rated accuracy (M=6.38) and reliability (M=6.36) as the most important credibility constructs. When they tagged, voted, and rated on the Web, the information being trustworthy (M=6.40 for tagging and M=6.60 for voting/rating) was rated as the most important construct. When they engaged in voting and rating activity, they perceived that being reliable (M=6.50) and official (M=6.20) were the most important constructs.

Table 3 reveals the results of credibility constructs with respect to more traditional information activities, which were much more prevalent in the diaries. In general the respondents rated the importance of each construct higher for searching activities than for reading and monitoring activities. In listening, watching, and viewing multimedia content, all of the constructs were less important to them, with consistent ratings lower than six. In instances of searching for information, they perceived that accuracy (M=6.52) and reliability (6.43) were the most important constructs. When they reported on reading activities, currency (M=6.39) and accuracy (6.21) stood out as important constructs. Not surprisingly, currency (M=6.47) emerged as the most important construct when they monitor news, stocks, weather, or any other updated information. In sum, the results in Tables 2 and 3 indicate that these 11 constructs appear more salient to people's searching, reading, and monitoring activities; whereas they may not be strong indicators for people's constructs of credibility regarding multimedia use and the various content contribution activities.

4.2. Credibility Heuristics in the Participatory Web Environment

Table 4 below shows how the credibility heuristics employed by respondents varied depending on the type of Web 2.0 site they were using (social networking, forums, blogs, or wikis). When respondents used wiki sites, they were more likely to report using any of the various types of credibility heuristics provided in the survey. The heuristics used most frequently across the four types of Web 2.0 sites was familiarity with a site. 83.3% of diary entries regarding wikis and 72.6% of entries regarding forums indicated that respondents selected the information because it was from a site that they were familiar with. The second most frequently mentioned heuristics was the popularity of a site in the case of social networking sites (30.2%) and wikis (54.1%). However, in using forums and blogs, the second most frequently mentioned heuristics was that the site was recommended to them by individuals they know (21.4% and 22.4% respectively).

The heuristics "It was provided by organizations I know" mattered slightly more when respondents used forum sites (19.1%) than when they used blogs (16.4%) or wikis (16.7%), and hardly at all when they used social networking sites (3.1%). Among the four types of Web 2.0 sites, website design was slightly more likely to be considered by respondents who were using blogs (11.9%). For all other types of Web 2.0 sites, the design or appearance of the Website was rarely taken into account. On the other hand, the clarity of the writing mattered more to respondents using blogs and wikis, whereas it was not as critical of a concern to those using social networking sites or forums.

Table 4
Credibility heuristics in Web 2.0 sites

I selected the information because:	Social networking sites (n=255)	Forums (n=84)	Blogs (n=67)	Wikis (n=24)
It was from a site that I am familiar with	163 (63.9%)	61 (72.6%)	39 (58.2%)	20 (83.3%)
It was from a popular site	77 (30.2%)	11 (13.1%)	12 (17.9%)	13 (54.1%)
It was recommended by individuals I know	49 (19.2%)	18 (21.4%)	15 (22.4%)	6 (25.0%)
It was recommended by experts	6 (2.4%)	11 (13.1%)	3 (4.5%)	2 (8.3%)
It was provided by organizations I know	8 (3.1%)	16 (19.1%)	11 (16.4%)	4 (16.7%)
It was from a site that appeared to be well-designed	15 (5.9%)	7 (8.3%)	8 (11.9%)	2 (8.3%)
The writing was easy to understand	16 (6.3%)	10 (11.9%)	13 (19.4%)	4 (16.7%)
I paid no attention to any of these aspects	14 (5.5%)	6 (7.1%)	5 (7.5%)	0 (0.0%)
I decided not to use the information because it came from a site that I could not trust	0 (0.0%)	1 (1.2%)	0 (0.0%)	0 (0.0%)
Other	11 (4.3%)	6 (7.1%)	11 (16.4%)	1 (4.2%)
None of the above	47 (18.4%)	6 (7.1%)	3 (4.5%)	0 (0.0%)

Another interesting finding that can be seen in Table 4 is that the percentage of people responding "None of the above" was much higher among respondents using social networking sites. This suggests that the current set of heuristics derived from the existing literature may not apply to social media websites, and that there is a need to develop new sets of heuristics that are more applicable within specific instantiations of the Web 2.0 environment. A number of interesting heuristics emerged from an analysis of these open-ended comments respondents provided when they selected "Other:"

1. Knowing a site owner personally: Knowing a creator or author of information is not necessarily new heuristics adopted for Web 2.0 applications; it emerged as a user criterion for relevance studies in previous work (e.g., Barry, 1994). What is new is the way that this conception encompasses the "owner" of a site as well as "the people posting [the information]." The range of information producers has been expanded beyond the author of specific content. For instance, one respondent wrote, "I read this site regularly because I know the owners and how much care they take to make sure the information is accurate." Another respondent wrote, "I trust the people who run the site."

2. Linking patterns: The respondents recognized linking patterns and used them as heuristics of credibility when making decisions about "what to post" as well as "what to use." For instance, in using a blog one respondent simply recognized that "the article itself" was from ABC news based on the link. Another wrote that when using a blog, she noticed that "it also posts links to political websites that I am already familiar with."
3. Value-added features: The respondents of this study sometimes mentioned the presence of user comments or other value added to content as their credibility heuristics. In general, there were a number of descriptions about the value associated with user comments. One participant wrote, "I selected freep.com over other news sites because it includes user comments." Another mentioned, "Comments made on site by others who had made the dishes were very informative."

4.3. Credibility Interaction

Credibility judgments tend to not always be easy for people; sometimes they need to invest time and effort to ensure that the information that they use or post is credible. A question in the diary asked respondents what actions they took to make sure they could trust the information.

Table 5
Credibility interaction in Web 2.0 sites

Which actions did you take to make sure whether you could trust the information	Social networking sites (n=255)	Forums (n=84)	Blogs (n=67)	Wikis (n=24)
I looked at who was responsible for this information	109 (42.7%)	43 (51.2%)	26 (38.8%)	10 (41.7%)
I looked at the author's qualifications or credentials	10 (3.9%)	17 (20.2%)	14 (20.9%)	6 (25.0%)
I tracked down the original source	6 (2.4%)	7 (8.3%)	4 (6.0%)	6 (25.0%)
I looked at who linked to the information	34 (13.3%)	5 (6.0%)	5 (7.5%)	4 (12.5%)
I consulted other sources to validate the information	5 (2.0%)	18 (21.4%)	13 (19.4%)	11 (45.8%)
I examined the design of the website	10 (3.9%)	2 (2.4%)	0 (0%)	0 (0%)
I made sure that the information was well written	12 (4.7%)	10 (11.9%)	5(7.5%)	9 (37.5%)
I looked at the content, paying no attention to attributes described above	53 (20.8%)	17 (20.2%)	23 (34.3%)	5 (20.8%)
Other	11 (4.3%)	3 (3.6%)	6(9.0%)	2 (8.3%)
None of the above	76 (29.8%)	17 (20.2%)	11 (16.4%)	1 (4.2%)

Table 5 shows that in general respondents consciously identified specific actions taken to ascertain credibility most when they used wikis. Only one wiki respondent said that he/she did not do anything to ensure information credibility. The most frequent credibility interaction in using wikis was consulting other sources to validate the information (45.8%), whereas respondents only reported doing so in 2% of the instances of using social networking sites. In addition, respondents were more likely to look at the author's qualifications when using wikis—

about 25% of the wiki-related activities involved checking out the author's qualification or credentials. When using blogs, respondents reported that content itself mattered most in ensuring information credibility. In using blogs, 34.3% of respondents said that they looked only at the content of a blog to make sure they could trust its information, whereas for the other types of sites, only about 20% of respondents indicated that they relied exclusively on content. A related finding is that the respondents looked at "who was responsible for this information" the least when they used blogs and most frequently when they used forums. The respondents tend to "track down the original source" more often when they used wikis (25.0%) than when they used forums (8.3%) or blogs (6.0%). Respondents indicated that they "looked at who linked to the information" more often when using wikis (12.5%) than forums (6.0%) or blogs (7.5%); whereas they checked out the link patterns most often whey they used social networking sites (13.3%). Another interesting finding was that respondents across the board rarely reported that they "examined the design of the website" to make sure they could trust the information. Design was not considered at all in making credibility assessments about blogs and wikis, and respondents indicated they examined design for purposes of credibility assessment when using social networking sites 3.9% of the time and in 2.24% of the instances of forum use. This indicates that, to our diary respondents, design issues were either not directly related to credibility assessment or that looking at the design was not a conscious action. Overall, the respondents made the least effort to ensure information credibility when using social networking sites— 29.8% indicated they took "none of the above" actions.

The analysis of the descriptions the respondents provided for the "other" category in the credibility-related actions primarily identified two distinct themes. First, several respondents explicitly mentioned that customer reviews available on a website influenced their credibility judgments. Related quotes included: "I looked at customer reviews of purchases of instruments through the site"; "I looked at ratings other people posted for each recipe"; and "I looked at store reviews." These quotes indicate that respondents indeed relied on other users' assessments to make their own credibility judgments. The second theme that emerged was how respondents verified online information in a number of different ways: by using off-line information such as making a phone call or print sources; through consulting multiple online sources; and by aligning the information with what they already knew. Verification was mentioned most often in the context of news information. One respondent explained the reasons for using multiple sources of information associated with potentially biased information from news media: "I compared information from several websites because with the nature of news today I do not expect news to be objective and unbiased, so I always search the same story on several sites and draw my own conclusions after evaluating each site, source, potential bias, etc." Another respondent commented had a similar strategy when using news: "News/information on various topics and I understand that it WILL be biased, thus multiple references/sites/articles are typically visited" [emphasis original]. Apparently people bring what they already know about the topic when they make judgments of information. One respondent described checking it against what she already knew: "The article described and expanded on what I expected to see." Another respondent expressed an interaction strategy in terms of dealing with conflicting information: "I read and if the information is contrary to the truth as I know it, I don't use its content." Overall, the most interaction strategies most commonly used by respondents in verification of information can be summarized in two ways: implicit, that is, checking against their own knowledge; and explicit, checking against other online or offline information sources.

5. Discussion

Research Question 1: How do people perceive credibility concepts when they engage in participatory information activities using Web 2.0 tools and applications?

The role of users has been diversified in the contemporary digital environment. Today's Web users are not just information seekers, news readers, and media audiences; but also content creators, information mediators, and evaluators for other users. Given the new user roles emerging from Web 2.0 tools and applications, it was critical to examine how people construct credibility concepts when they engage in these diverse information activities.

The data analysis in terms of the relationship between credibility constructs and type of site and credibility assessment and information activities points to currency as the most important credibility construct in Web 2.0 environment. The next two most important constructs for Web 2.0 sites were accuracy and reliability. Respondents did not consider that the information was official, unbiased, authoritative, scholarly, or written by experts as important concepts when respondents constructed their credibility assessment. Trustworthiness, truthfulness, and completeness of information were constructs rated somewhere in between.

These findings may be related to the goals and intentions associated with the use of Web 2.0 sites. Web 2.0 tools and applications tend to be used for different purposes than general websites, news sites, and search engines. People often use Web 2.0 sites to keep up-to-date or share their knowledge with other people. Their long-term goals for the interaction might be about connecting with people, helping others, being entertained, or expressing themselves. In other words, the primary intentions associated with use of Web 2.0 sites are not necessarily about learning something new, making something new, or gathering information on specific tasks. The findings indicate that a unifying framework of credibility assessment needs to comprehend not only the type of website and the information behaviors taking place, but also users' goals and intentions relative to their information activities there.

Research Question 2: What sets of credibility heuristics have emerged in the participatory Web environment?

Familiarity and popularity with the sites were primary reasons why respondents in this study selected the information they were using. They were also more likely to select the information when it was recommended by individuals they know rather than when it was recommended by experts. Three new heuristics emerged from the analysis of the open-ended question about heuristics: (1) I know a site owner personally; (2) The site is linked to or linked from another site that I know; (3) The site has value-added features. These six preferred old and new credibility heuristics indicate that credibility heuristics takes place on the level of website rather than on the level of content. When respondents talked about their selection of information, they mostly referred to their initial orientation toward a particular website. Therefore, credibility heuristics play a critical role in determining a site to start with based on a prediction of the website's credibility, and also a perception of the website as a source of information. It was noted that respondents rated both credibility constructs and heuristics distinctively for each of the Web 2.0 tools (social networking sites, blogs, forums, and wikis). This suggests that people may perceive each type of Web 2.0 site as a distinct source of information rather than as a singular online medium.

Research Question 3: To what extent do people make efforts in order to ensure the credibility of information?

In general, respondents have not fully developed solid and diverse ways of taking actions to ensure the information credibility. Out of 430 Web 2.0-related diary entries, 26% of the time respondents selected "None" as the action they took to ensure credibility. When respondents were asked to describe "other" actions, only 22 provided an explanation. One might simply assume that all of this means that people do not make much effort to ensure the credibility of information when using Web 2.0 sites. Instead, I would conclude that there are a number of unknown interactions in which people engage in Web 2.0 environments. The responses provided only a handful of actions taken, and the primary one was to look at who was responsible for the information. A small number of respondents actually tracked down the original source of the information when using Web 2.0 sites. Instead, respondents reported that they made sure that the information was well written or would look at the content itself rather than tracking down the original source.

Two interesting findings regarding this research question come from the analysis of respondents' descriptions of other actions taken to determine credibility. Other people's comments and reviews appear to directly influence respondents' credibility assessments. Also, respondents in this study engaged in active verification by double-checking and comparing the information from one site to other online sources as well as to information from traditional channels such as phone or print materials. These two findings appear to be related to each other. While people's first-hand previous experience (familiarity) and second-hand knowledge (popularity) are used as strong credibility heuristics, people also make efforts to connect to other people's first-hand knowledge in making predictive judgments about information selection as well as in sharing their first-hand experience more actively through various features available in these tools. In Web 2.0 environments, the credibility process of predictive judgment and evaluative judgment developed in Rieh's (2002) interaction-based credibility framework becomes a socially interactive process in which one person's evaluative judgments become another person's predictive judgment and one person's first-hand experience becomes another person's second-hand knowledge.

6. Conclusion

This paper examined constructs of credibility using a unifying framework that characterizes credibility concepts across various types of media, information objects, and content. The contribution of this empirical study is an expansion of the information activities involved in credibility assessment beyond searching and reading. The findings of this study indicate that in addition to the original three levels of credibility assessment (Hilligoss & Rieh, 2008), there are other important aspects that need to be taken into consideration. For instance, user goals and intentions related to information activities need to be considered in order to fully understand credibility constructs, heuristics, and interactions. Another important finding of this study is the role that heuristics play in the process of credibility assessment. Credibility heuristics were seen to relate more directly to predictive judgments that lead people to select a website initially. The heuristics also appear to play a more prominent role in the evaluation of the website itself rather than an evaluation of content specifically.

Future research can be designed to investigate the heuristic approach to credibility assessment more explicitly by collecting different kinds of research data through interviews and

experimental studies. While a diary study enabled to collect and analyze the rich data set from a broad everyday life context, it has a limitation in terms of collecting the data about respondents' activities and experiences beyond the provided response choices. Follow-up studies are needed to identify a more diverse set of heuristics and interaction patterns employed when people use Web 2.0 tools and applications as active participants; and to examine how particular features in each type of Web 2.0 sites influence the ways people construct their credibility assessments.

Acknowledgements

The author wishes to thank the members of the Credibility 2.0 research group - Beth St. Jean, Ji Yeon Yang, and Yong-Mi Kim – for providing invaluable research assistance for this project. The John D. and Catherine T. MacArthur Foundation support this project.

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