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Judging the quality and credibility of information in internet discussion forums

Abstract

This explorative study contributes to research on relevance assessment by specifying criteria that are used in the judgment of information quality and credibility in internet discussion forums. To this end, 4739 messages posted to 160 Finnish discussion threads were analyzed. Of the messages, 20.5% contained explicit judgments of the quality of information and credibility in other messages. In the judgments, the forum participants employed both positive criteria such as validity of information, and negative criteria such as dishonesty in argumentation. In the evaluation of the quality of the message´s information content, the most frequently used criteria pertained to the usefulness, correctness and specificity of information. In the judgment of information credibility, the main criteria included the reputation, expertise, and honesty of the author of the message. Since the internet discussion forums tend to emphasize the role of disputational discourse questioning rather than accepting the views presented by others, mainly negative criteria were used in the judgments. Due to particular features of the disputational environment focusing on sensitive topics, the findings cannot be generalized into all discussion forums judging the quality and credibility of information.

Introduction

The issues of information quality and credibility are gaining importance particularly in the Web context. The Web provides a unique information-seeking environment but it often lacks quality control mechanisms. For example, online discussion forums tend to provide messages that draw on vague and conflicting information sources.

The questions of information quality and credibility are often examined in the context of user-generated relevance criteria. In a major review of relevance studies, Saracevic (2007, p. 2141) recently emphasized the significance of research that would focus on "real users, in real situations, dealing with real issues of relevance". The present article contributes to the contextualist relevance research by focusing on judgments of information quality and credibility made in an internet discussion forum. This context is interesting since the judgments of information quality and credibility are made in naturalistic settings. Many of the earlier studies on this topic draw on assigned search tasks (see, for example, Rieh, 2002). The present study is unique since so far no corresponding investigations have been made in the context of open online discussion forums. However, the variety of internet discussion forums defies all attempts to draw a statistically representative picture of information behavior at such arenas. Therefore,

explorative approach focusing on specific online forums is justified at the current state of research on information quality and credibility in the internet.

The present article builds on the solid ground provided by studies on information quality and credibility (Hilligoss & Rieh, 2008; Metzger *et al*., 2003; Rieh, 2002; Rieh, 2010; Rieh & Danielson, 2007). The main research goal of this study is to find out what kind of criteria are used while judging the information quality and credibility of messages posted to online discussion forums. To this end, an empirical study was conducted by focusing on messages available in a Finnish discussion board. The criteria of information quality and credibility were examined by concentrating on two discussion topics, i.e., the use of natural products (or health food), and the issues of racism. In these areas, altogether 160 discussion threads containing 4739 messages were analyzed. Since the primary interest lies in the analysis of the criteria used in the judgment of information quality and credibility, the issues debated in these two discussion threads are of secondary importance. Even though the study focuses on a specific context, i.e., online discussion forums, the findings also serve a more general purpose: to clarify the complex relationships between information quality and credibility. However, due to particular features of the disputational environment focusing on sensitive topics such as racism, the findings cannot be generalized into all discussion forums judging the quality and credibility of information.

Background

A review of earlier research will place the present study in a broader context. Studies characterizing user-generated relevance criteria will be briefly discussed first, followed by the review of studies on information quality and credibility.

User-generated Relevance Criteria

The first empirical studies on relevance assessment in real-life settings were made in the 1990s. Barry (1994) pioneered in this field by exploring the criteria mentioned by users evaluating the information within documents as it related to the users' information need situations. She identified 23 categories of relevance criteria, including, for example, depth/scope, recency, and subjective accuracy/validity. Schamber examined criteria mentioned by occupational users of weather information sources in real-life information seeking and use situations (for the main findings of the study, see Barry and Schamber, 1998, pp. 224-225). Ten summary categories of criteria were identified, including, for example, currency and specificity of information; and the reliability or reputation of the source of information. The pioneering studies demonstrated that even though the number of criterion categories is rather high, they can be crystallized into a finite range of user-generated relevance criteria that are shared across users and situations. Schamber and Bateman (1996) identified five major categories of this kind: clarity, currency, credibility, availability and aboutness. Later studies have provided support for this conclusion (see, for example, Crystal & Greenberg, 2006; Maglaughlin & Sonnenwald, 2002).

Since the late 1990s, the user-generated relevance criteria have primarily been explored in the context of Web searching. These studies have focused on diverse groups such as children (Hirsh, 1999), scholars (Rieh, 2002), and university students (Tombros *et al*., 2005). For example, Hirsh (1999, p. 1273) found that the majority of

relevance decisions on textual material were based on topicality (49 percent of all mentions), followed by criteria such as novelty, quality, convenience/accessibility and authority. Savolainen and Kari (2006) examined criteria by which the searchers judge the relevance of hyperlinks and Web pages. Altogether 18 user-generated relevance criteria were identified. Web searchers favored relevance criteria that pertain to information content: Specificity and Topicality exemplify most strongly criteria of this kind. Also criteria pertaining to information access and organization of information appeared to be significant. Importantly, these findings also provided support to Schamber and Bateman´s (1996) conclusion about the finite list of frequently used relevance criteria.

Conceptualizations of Information Quality and Information Credibility

The issues of information quality and information credibility are multi-faceted, and so far, there is no consensus among the researchers about the scope and meaning of these concepts. Information science researchers often use the term *quality* to denote the concept of credibility (Rieh & Danielson, 2007, p. 317). On the other hand, the category of *credibility* may be used to denote the aspects of information quality. For example, Metzger (2007, p. 2078) has pointed out that reliability of a message is a receiver-based judgment which involves both objective judgments of information quality and subjective perceptions of the source's credibility.

Despite this contingency, information quality can be defined as a category of its own. Drawing on Taylor´s (1986) ideas, Rieh (2002, p. 146) specified information quality as "a user criterion which has to do with excellence or in some cases truthfulness in labeling*"*. At an operational level, information quality was identified as "the extent to which users think that the information is useful, good, current, and accurate" (Rieh, 2002, p. 146). However, the aspects of information quality are not necessarily consistent. For example, information may appear to be accurate but not useful, and current but inaccurate. Therefore, it may be a need to support the judgment of information quality by assessing the credibility of information. The individual judging the quality of information can ask herself whether the information is believable or may it be taken seriously. From this perspective, the judgment or information quality and credibility are closely related. For example, Rieh and Danielson (2007, p. 345) suggest that credibility is a principal component of information quality.

Credibility can also been defined as a concept in its own right. To this end, credibility is often characterized by equating it with *believability* (Wathen & Burkell, 2002, p. 135). Hilligoss and Rieh (2008, p. 1468) demonstrated that credibility is a multifaceted concept that has also been defined in terms of trust, reliability, accuracy, fairness, and objectivity. According to Rieh (2010, pp. 1337-1338), trustworthiness is a core dimension in credibility because it captures the perceived goodness and morality of the source. A person is trustworthy for being honest, careful in choice of words, and disinclined to deceive (Hilligoss & Rieh, 2008, p. 1469). Information is trustworthy when it appears to be reliable, unbiased, and fair.

Communication researchers have differentiated between three kinds of credibility (Metzger *et al*., 2003). M*essage credibility* examines how message characteristics impact perceptions of believability, either of the source or the source´s message. Dimensions of message credibility include, for example, message structure and

message content. Unorganized messages are perceived as less credible than well-organized messages. Message content is important since credibility judgments are influenced by message content characteristics such as message discrepancy. It can be generally defined as "the distance between the perceived position of the source and the premessage position of the receiver" (Metzger *et al*., 2003, p. 303). *Source credibility* usually refers to judgments made by a perceiver concerning the believability of a communicator or the author of the message. Finally, *media credibility* focuses on the relative credibility of various media channels such as television and the Internet through which a message is sent.

Cognitive authority is one of the most significant constructs associated with the concept of information credibility. According to Wilson (1983, p. 15), cognitive authority has two major components, namely competence and trustworthiness. Only those who are deemed to be individuals who *"know something we do not know"* and who "know what they are talking about" are recognized as cognitive authorities, at least to some degree (Wilson, 1983, p. 10; pp. 13-14). This is because they are thought to be intrinsically plausible, convincing, and thus credible and worthy of belief; they are also perceived to be potentially able to influence one's thinking in a specific sphere of interest. According to Rieh (2002, p. 153), cognitive authority can be characterized as having six facets; trustworthiness, reliability, scholarliness, credibility, officialness and authoritativeness; of these, trustworthiness may be perceived as the primary facet.

Empirical Studies of Information Quality and Credibility

Empirical studies focusing on media or source credibility have been conducted in communication research since the 1950s. These investigations have examined, for example, how modifications in source characteristics influence people's willingness to alter their attitudes to certain topics (Metzger *et al*., 2003). Within information science, Barry (1994) was one of the pioneers discussing information quality and credibility in the context of user-generated relevance criteria. Bateman (1999) explored information credibility in the context of information seeking. Based on a survey of more than 200 graduate students, she developed a three-dimensional model of relevance: information quality, information credibility, and information completeness. Together, these three factors explained a significant part, that is, 48 percent of the respondents' concepts of relevance. The students preferred information that is accurate, credible, well written, focused, understandable, and consistent.

Rieh (2002) introduced an influential model explicating the factors by which people judge information quality and cognitive authority on the web. She showed that during the search process the users make two distinct kinds of judgment with regard to information quality and cognitive authority: *predictive judgment* and *evaluative judgment*. The former refers to what the searchers expect to happen when they move on the web, for example, by making decisions concerning the activation of alternative hyperlinks. Evaluative judgment denotes the values by which they express preferences, for example, when assessing the degree to which an activated web page is useful. The study demonstrated that in the case of predictive judgment, the criteria of topical interest (43 percent of mentions), information quality (33 percent), and cognitive authority (18 percent) were employed most frequently (Rieh, 2002, p. 151). When making evaluative judgments, the most frequently mentioned criterion was

information quality (46 percent), followed by cognitive authority (20 percent) and topical interest (13 percent).

Recently, there is a growing interest in the credibility issues in the context of learning (Sundin & Francke, 2009). Hilligoss and Rieh (2008, pp. 1474-1475) analyzed the ways in which undergraduate students characterize the issues of information credibility. It was conceptualized with respect to five different aspects: truthfulness, believability, trustworthiness, objectivity, and reliability. The students conceptualized credibility in diverse ways and they often held multiple concepts of credibility. They drew on certain aspects of credibility depending on the situation or type of information encountered.

Finally, Kim (2010) examined questioners´ credibility judgments of answers in a social question and answer (Q&A) site. Twenty-two criteria used in the judgment of the credibility of information were identified. The criteria were collapsed into three categories: message criteria, source criteria, and others. The questioners used each criterion either positively or negatively or both in credibility judgments. For example, a factual assertion made in the answer to a discussion question positively impacted credibility judgment, while a lack of fact-based information resulted in a negative credibility judgment. While judging message criteria, logic or plausibility of arguments was the most frequently used criterion. The questioners also evaluated source credibility. In the absence of institutional-level sources and author affiliation information, an answerer's profile turned out to be the most frequently consulted information about one's credentials because it provides the history of answers including the best answer rating. Answerers who proved themselves knowledgeable and competent in a specific topic category over time earned the perception of strong credibility among the questioners. In addition, a reference citation was an important clue in judging the credibility of information. Honesty was also treated as an essential component of credibility constructs together with expertise.

Conceptual Framework

The studies reviewed above provided a solid foundation for the present study, although none of them discuss relevance judgment in the context of internet discussion forums. Following Bateman (1999), quality of information and credibility of information were defined as sub-categories of relevance. The empirical study was focused on these two categories. Rieh´s (2002; 2010) investigations were of particular importance because she provides empirically validated foundation to the elaboration of the concepts of information quality and credibility. Drawing on Rieh (2002, p. 146), information quality was generally defined as "the extent to which users think that the information is useful, good, current, and accurate". Information credibility was understood as "people's assessment of whether information is trustworthy based on their own expertise and knowledge" (Rieh 2010, p. 1338). In order to sharpen the focus of the empirical study, the issues of information *quality* were approached by focusing on the aspects of the *message*, while the questions of information *credibility* were examined by centering on the aspects of the *source* of the message. More precisely, with regard to the message, the focus was directed to criteria which are used in the judgment of the quality of information available in a message. In other words, the focus was placed on the *quality of the message´s information content*. Henceforth, it is referred to as information quality for short. With regard to the source

of the message, the focus was placed on criteria by which the *credibility of the author of the message* is assessed. Henceforth, this aspect will be referred to more briefly as information credibility. Figure 1 specifies the conceptual framework of the study.
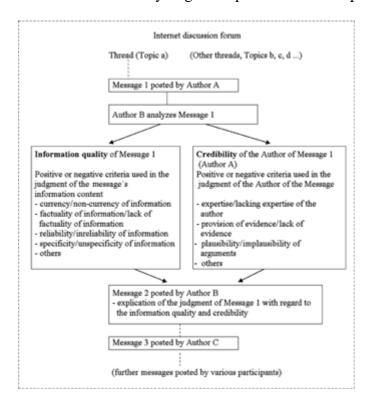

FIG. 1. The framework of the study

Figure 1 illustrates how the judgments of information quality and credibility are made in internet forums constituted by various discussion threads. Figure 1 is schematic in that all messages posted to the threads are not necessarily evaluated from the viewpoint of information quality and credibility. However, such judgments can be made by devoting attention to (i) the quality of the message´s information content, (ii) the credibility of the author of the message or (iii) both aspects. In the judgment, both positive and negative criteria may be used. Positive criteria such as Currency and Expertise indicate the strengths of the message or its author while negative criteria such as Non-currency and Lack of expertise indicate their weaknesses. The judgment process goes on when the messages posted by other participants become subject to evaluation.

Research Questions

By drawing on the above framework, the present study examines the following research questions:

- What percentage of the messages posted to the internet discussion forums does contain explicit judgments of the quality of the message´s information content (i.e., information quality) and credibility of the author of the message (i.e., information credibility) in other messages?

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- What criteria are used in the judgment of the information quality and information credibility in this context?
- In which ways, if any, are the criteria of information quality related to the criteria used in the judgment of information credibility?

To sharpen the focus of the study, a few limitations appeared to be necessary. First, the study does not review how the criteria used in the judgment varied among the forum participants. This is because the study centers on the messages, not the evaluators of the messages. Second, no attempt will be made to examine how the positive or negative judgments affected the discourse taking place in the discussion threads (for example, encouraging the provision of factual evidence to support one´s claims or giving rise to abusive expressions). Third, no attention will be paid to how the participants assessed the aspects of cognitive authority while judging the credibility of the authors. Apparently, addressing questions such as these would have required a separate study.

Empirical Data

The empirical data of the study were downloaded in August 2010 from a Finnish discussion forum entitled *Suomi24* (Finland24) (http://www.suomi24.fi/). It is the largest and most popular online forum in Finland containing 22 subject areas such as family, health, hobbies, and traveling. Within these areas there are about 2000 sub-areas focusing on specific topics like consumer issues, dieting, and pets. The discussion forum is freely available to all readers interested to participate in public discussion. The forum has published "rules of discussion" that specify the netiquette. The writers are expected to present their views in a constructive way and avoid the use of derogatory language. Writers using defamatory expressions may be prosecuted for libel. The advertisement of products and services is not allowed in the Forum. All discussion areas are moderated. In some areas, voluntary moderators known as "sheriffs" may delete inappropriate messages or transfer individual messages to other discussion areas that are considered as more relevant. The moderators may also participate in the discussion in the role of "sheriff". This practice has been adopted in the discussion area focusing on the issues of racism, for example.

In order to obtain an overall picture of how the judgments of information quality and credibility are made in this forum, several subject areas such as climate change and health were browsed and their discussion threads were read tentatively. The main intent was to identify topics that would be fruitful from the viewpoint of the research questions specified above. Finally, two subject areas, i.e., the use of natural products (or health food), and issues of racism were selected for this purpose. These topics were chosen because they tend to give rise to debates about the correctness of information and believability of the claims presented by the authors of the messages. It is evident that such topics are particularly relevant from the perspective of research on information quality and credibility. The debate around natural products often deals with their health effects, as well as their efficacy and safety (Kelly *et al*., 2005). Issues of racism are often elicited while debating about the pros and cons of immigration, for example (Fekete, 2009). On the other hand, the issues of racism are often even more sensitive than those related to natural products. The discussions about racism tend to be polarizing and contentious, drawing on deeply held opinions of the participants. Thus, given the sensitivity of issues of racism in particular, the social interactions in

that context is not necessarily representative of discussions on many other topics such as hobbies that are politically more neutral and less aggresive in tone.

The sampling criteria were specified in that the threads should contain a sufficient number of messages potentially subject to judgment of information quality and credibility. On the basis of reading of 50 threads with the newest updates, a working solution was found for the problem related to the specification of the sampling criteria: threads containing at least 10 messages are sufficient to meet the above requirement. It appeared that such threads are long enough to give rise to interaction between the participants commenting on previous messages. The list of threads focusing on the above topics was then checked by starting from those with the newest updates (31 July 2010 or before). Finally, altogether 80 threads for both topics, that is, in total 160 threads containing ten or more messages were selected for the analysis. Since the present study is explorative and it does not aim at producing statistically representative generalizations, the above sample appeared to be a sufficient for the needs of the present study. It is evident that the inclusion of additional threads would not have essentially changed the quantitative and qualitative picture of the criteria used in the judgment of information quality and credibility.

The length of discussion threads varied considerably. The longest period covered over 6 years (4 February 2003 – 30 July 2010), while the shortest period entailed only one day. Overall, the threads discussing the use of natural products were longer; some of them covered 4-5 years. In contrast, many of the threads addressing the issues of racism covered only 2-3 days. Table 1 provides a quantitative overview of the threads. Henceforth, threads discussing the use of natural products are referred to as *NP threads* for short, while those focusing on the issues of racism are identified as *R threads*.

	Thread topic		
	NP	R	In total
Number of messages	2190	2549	4739
Messages per thread on average	27	32	30
Range of number of messages	10 - 220	11 - 148	
Number of authors	685	313	997
Average number of messages per author in a thread	3.2	8.1	4.8

TABLE 1. Quantitative overview of the discussion threads.

The 160 threads contained in total 4739 messages. There were fewer authors in R threads but on average they were more active in writing messages. This is partly explained by the fact that R threads attracted six extremely productive authors who wrote 50 messages or more. In both topical areas, the distribution of messages written by individual authors was highly skewed. 80.4% of the authors in NP threads and 75.3% of the contributors to R threads wrote only one message. This suggests that the

participation in online discussion is occasional and that a relatively small number of authors produce the main part of messages.

Data Analysis

The messages written by the forum participants were first downloaded in separate files. In the development of the coding scheme, the point of departure was the set of criterion categories identified by Rieh (2002; 2010), Rieh and Danielson (2007), Hilligoss and Rieh (2008), and Kim (2010). In addition, findings of Metzger (2007), and Wathen and Burkell (2002) were used to complement the list of potential criteria. The preliminary list thus compiled entailed 38 individual criteria. The data were coded by using this list. Even though the coding scheme was kept open for new categories to be developed from the data, there was no need for the inclusion of additional criteria. On the contrary, the original list of 38 criteria was shortened by excluding criteria that were not referred to in the judgments made by the online participants. The final set of criteria employed in the empirical analysis is specified in Tables 2 and 3 below. Since the judgments of information quality and credibility were qualified both positively and negatively, Tables 2 and 3 indicate both aspects, for example, currency and non-currency of information.

Criterion (positive – negative)	Short definition
Comprehensiveness - Narrowness of information	The extent to which information covers a broad range of facts and opinions
Correctness - Falseness of information	The extent to which information provides a true description of reality
Currency - Non-currency of information	The extent to which information is timely, recent or up-to-date
Factuality of information - Lack of factuality of information	The extent to which a piece of information is presented as an objective description of reality
Novelty of information - Lack of novelty of information	The extent to which information provides something really new
Objectivity of information - Bias of information	The extent to which information provides an impartial and unbiased description of reality
Official - Unofficial nature of information	The extent to which information is presented in authorized forums
Reliability - Unreliability of information	The extent to which information is trustable, giving the same result on successive trials
Scholarliness - Non-scholarliness of information	The extent to which information is based on the findings of scientific research
Specificity - Unspecificity of information	The extent to which information is focused enough to match the needs of a person or a group
Usefulness - Uselessness of information	The extent to which information is considered as helpful to meet the need of a person or a group
Validity - Invalidity of information	The extent to which information is able to accurately describe reality
Variety of information - Lack of variety of information	The extent to which the information provides a multifaceted picture of reality

TABLE 2. Criteria used in the judgment of the quality of the message´s information content.

In the judgment of the information quality, the participants employed altogether 13 criteria. Similarly, in the judgment of the credibility of the author, 13 individual criteria were used (see Table 3).

Criterion (positive – negative)	Short definition
Author identification - Lack of author identification	The extent to which the identity of the author can be ascertained from the information provided by the message
Author reputation	The extent to which the author is generally evaluated positively or negatively in a community
Expertise - Lack of expertise of the author	The extent to which the author is considered as competent in a specific area
Fairness - Unfairness in the interpretation of an issue	The extent to which the author is able to consider the pros and cons of an issue in a balanced way
Honesty - Dishonesty in argumentation	The extent to which the author is able to consider an issue in a sincere way
Non-persuasive - Persuasive intent	The extent to which the author is able to express his or her views without a intent to induce others to behave in a particular manner
Plausibility - Implausibility of arguments	The extent to which the author is able to express his or her ideas in an apparently valid manner
Presentation qualities, positive - negative	The extent to which the author is able to communicate his or her ideas clearly and using appropriate language
Provision of evidence - Lack of provision of evidence	The extent to which the author is able to support his or her views by offering facts or relevant information of some kind
Reference to external sources - Lack of reference to external sources	The extent to which the author is able to support his or her views by demonstrating the availability of relevant documents used as evidence
Similarity - Dissimilarity to receiver beliefs	The degree to which the ideas presented by the author are found as acceptable due to compatibility with one´s own views
Trustworthiness - Lack of trustworthiness of information	The degree to which the information provided by the author is considered as believable in general
Unbiased - Biased approach to an issue	The extent to which the author is considered able to express his or her views in an impartial way

TABLE 3. Criteria used in the judgment of the credibility of the author.

The coding was an iterative process in which the data were scrutinized several times by the present author. This strategy was chosen because the present study is explorative. The study makes use of descriptive statistics, without aiming at correlation analysis that would produce statistically representative generalizations of the internet discussion forums. Thus, the requirement for the consensus on coding decisions can be compromised, without endangering the validity of the explorative study, however. To strengthen the validity of the study, only explicit judgments

concerning information quality and the credibility were coded by using the categories specified in Tables 2 and 3 above. The threads were first read several times by identifying messages explicating such judgments. This procedure was repeated and the preliminary coding was carefully refined until it was found that the codes describe the data appropriately and that there are no anomalies.

Drawing on the research framework depicted in in Figure 1 above, the codes assigned to the messages always refer to judgments of information quality and credibility in other messages, not self-praising statements defending the quality or credibility of "own" information provided by the evaluator. To avoid ambiguity, information quality and credibility were coded by including information that the author of a previous message presented in his/ her own name. Thus, if he or she provided opinions about the credibility of other sources such as medical doctors, drawing on a newspaper article, for example, such judgments were excluded because they do not deal with credibility of the author of the message. A message was coded only once for a criterion category, for example, Usefulness of information, once it was identified for the first time in the message. In long messages in particular, it was not unusual that the same criterion was identified in several segments of the same message. In these cases, once a message was coded for a criterion category, other instances were simply ignored. Importantly, a message could be assigned with several criteria that were qualified positively, negatively or exhibiting both aspects. No specific problems were faced in this regard since the judgments were expressed clearly while drawing on negative criteria in particular.

However, one of the problems of coding concerned the definition of information in the context of judging the quality of the message´s information content. In online discussion forums, information may not necessarily denote facts but opinion as well. This problem was solved by drawing on Wilson´s (1981, p. 3; p. 5) definition that includes facts, opinion and advice as forms of information. Facts are assumed to be free of value judgments, whereas such judgments affect advice and opinion. On this basis it was decided that *fact* is concerned only when an act focuses on reporting factual (not necessarily true) or potentially verifiable (testable) observations or experiences such as "this natural product contains Valerian Root". In turn, *opinion* referred to attitudes, beliefs and value-based judgments, for example, "In my view, this product does not provide much help for sleeping problems". Finally, the concept of *advice* - distinct from opinion - was understood as being neutral in emotional tone and it was confined to dealing with provision of guidance in the problem-solving process (for example, "please, avoid drinking coffee before going to sleep").

The data were analyzed by means of descriptive statistics. This approach was chosen because the present study is explorative and it does not aim at producing statistically representative generalizations about the criteria used in the judgment of information quality and credibility in various discussion areas. Therefore, no statistical tests were made. First, percentage distribution was calculated for the messages posted per thread and the number of the participants writing messages per thread. Second, and most importantly, percentage distribution was calculated for individual criteria used in the judgment of information quality and the credibility of the author. Third, the criteria that were used most frequently together in the judgment of both information quality and credibility were cross-tabulated in order to identify the co-occurrences of such criteria. The quantitative findings are illustrated qualitatively by providing a few

quotations taken from the messages. In the selection of quotations, extracts that describe the main content of the concept were preferred. Importantly, the sample of 160 discussion threads with 4739 messages appeared to be large enough for the drawing of an indicative quantitative picture of the nature of the judgments of information quality and credibility. Thus, it is evident that the analysis of additional discussion threads would not have essentially changed this picture.

Since the report of the empirical findings provides illustrative quotations taken from the messages, particular attention was devoted to the ethical concerns. Researchers debate whether informed consent is required if the data used in the study is regarded as public (see, e.g., Pfeil *et al.*, 2010, p. 344). However, it can be claimed that an internet discussion board is a public domain and that messages posted on such an arena can be read by a wide audience. Since the discussion forum studied in the present article is freely accessible to all readers, the messages posted by the participants can be seen as contributions which are intended to elicit public interest or to influence the views of other people. Due to their public nature, the messages mailed to online forums may also be utilized for research purposes, provided that the identity of an individual contributor is sufficiently protected.

Suomi24, the forum investigated in the present study explicates the criteria by which messages published in the discussion threads can be used for research purposes (http://www.suomi24.fi/opastus/keskustelu/ohjeet/#tutkimukset). Most importantly, direct quotations taken from the messages can be used, provided that the nickname of the participant is not published and or associated with the quotation taken from his or her message. In order to be on the safe side, I contacted *Suomi24* Forum and asked for permission to use the messages in the study. The forum granted the permission on 10 February 2011 on the condition that the requirements described above are met.

Even though no attempts were made to obtain consent from the forum contributors, their anonymity is protected carefully according to the criteria explicated by the Forum. First, the participants will not be identified by their nicknames. Instead, a contributor is only referred to by identifying the individual thread in which his or her message was published. For example, NP-36 stands for a message that appeared in thread 36 focusing on the use of natural products, while R-78 refers to thread 78 discussing the issues of racism. Second, all information about the submission dates for messages was deleted from the quotations. This procedure makes it unlikely that an individual message and its author could be identified from the text originally published in Finnish.

Empirical Findings

Quantitative Overview of the Use of the Criteria

Of the messages, altogether 971, that is, 20.5% contained explicit judgments of the quality of information and credibility in other messages. These messages entailed 1479 explicit mentions of individual criteria specified in Tables 2 and 3 above. Of the mentions, 27.2% focused on the judgment of information quality and 72.8% on the credibility of the author. Table 4 provides the quantitative overview of the use of the criteria.

| | Thread topic | | |
	NP (*n = 774*)	R (*n = 705*)	In total
Information Quality			
Positive criteria	2.8	2.6	2.7
Negative criteria	26.9	22.0	24.5
Credibility of the author			
Positive criteria	3.9	4.1	4.0
Negative criteria	66.4	71.3	68.8
In total	100.0	100.0	100.0

TABLE 4. Percentage distribution of the criteria used in the judgments.

In both NP and R threads, the participants mainly drew on negative criteria. The total share of positive criteria remained as low as 6.7%. This bias is due to the fact that most agreements probably do not get posted. The cultural norms of online discussion lead the participants to think that messages indicating "me toos" are unnecessary because they just waste bandwidth and attention.

Negative criteria were preferred somewhat more strongly in NP threads particularly when judging the quality of information. In R threads, the use of negative criteria was more frequent while assessing the credibility of the author. Of 971 messages containing judgments of information quality or credibility, 62.8% employed only one criterion. This approach was favored more strongly in R threads since 71.9% of the messages containing a judgment referred to one criterion only, while in NP threads the share was 51.5%. In NP threads, the employment of two criteria was more common than in R threads (33.6% vs. 22.8% of messages containing judgments). Three or more criteria were used seldom. Only NP threads contained messages that employed 5 criteria or more. At the highest, a judgment drew on 8 individual criteria.

The Judgment of Information Quality

We may elaborate the above picture by examining how positive and negative criteria were used while judging information quality (see Table 5).

Criterion	Thread topic				In total
	NP (n = 230)		R (n = 173)		(n = 403)
Positive (+)/Negative (-)	+	-	+	-	
Usefulness of information	1.3	10.4	7.5	38.7	26.6
Correctness of information	0	27.4	0.6	10.4	20.3
Specificity of information	0.4	13.5	0	18.5	15.9
Objectivity of information	0	16.1	0	4.6	11.2
Validity of information	1.3	5.7	1.7	7.5	7.9
Factuality of information	4.3	4.8	0	1.7	6.0
Comprehensiveness of information	0.4	3.0	0	4.0	3.7
Currency of information	0	2.8	0	2.9	2.7
Scholarliness of information	0.9	3.0	0	0	2.2
Novelty of information	0	1.7	0	1.2	1.5
Reliability of information	0.4	2.2	0	0	1.5
Official nature of information	0.4	0	0	0	0.2
Variety of information	0	0	0.6	0	0.2
In total	9.4	90.6	10.4	89.5	99.9*

* *Note*. The percentage is 99.9 due to rounding

TABLE 5. The percentage distribution of the criteria used in the judgment of information quality.

Of 13 criteria used in the judgments, Usefulness/Uselessness of information was employed most frequently (26.6% of all mentions), followed by Correctness/ Falseness of information (20.3%), Specificity/Unspecificity of information (15.9%) and Objectivity/Bias of information (11.2%). The role of other criteria remained fairly marginal; some criteria such as Variety of information were used very seldom. This suggests that the judgment of the information quality draws on a few key criteria. In both NP and R threads, negative criteria were strongly preferred. Only about 10% of all criteria used in the judgments were qualified positively.

In NP threads, the most frequently used criterion was Uselessness of information (38.7% of all mentions within NP threads). In R threads, the evaluators most frequently drew on the criterion of Falseness of information (27.4% of all mentions within R threads). We may specify the quantitative picture by taking a few examples of the ways in which the most frequent criteria were used.

Usefulness of information appeared to be a significant criterion in R threads but it was also referred to often while discussing the use of natural products. Information was considered useful when it helped to solve a problem or introduced a helpful viewpoint.

> Your suggestion to try some linen groats appeared to be helpful. (NP-50)

However, more frequently, the quality of information was assessed negatively by referring to Uselessness of information. This approach was used when a message´s information content was found as unhelpful in problem-solving or nonsensical in general.

> What you offer as a solution in your newest message is just a childish banality. (R-52)

Falseness of information was widely referred to in NP threads in particular. In most cases, this criterion was employed to indicate that the messages provide misleading information about the health effects of natural products.

> I googled and found out that the salesman lied through his teeth. He claimed that the product has been tested and that it is effective in the treatment of pig influenza. However, in fact, no such tests have ever been made. (NP-17)

Specificity of information was a fairly frequently used criterion in both NP and R threads. Again, the main attention was directed to the negative dimension of this criterion, that is, unspecificity of information. It refers to cases in which the information content of a message is not considered focused enough to match the needs of a person.

> Next, you have to sharpen your picture about how the Canadian immigration policy differs from that applied in Finland. (R-63)

Low quality of information content was often criticized by referring to Bias of information. In particular, messages published in NP threads were subject to this criticism. It was claimed that information available in the message provides a partial description of reality.

> Pill sellers always market their products this way, trying to mislead people. (NP-45)

As Table 5 demonstrates, the role of other criteria remained fairly marginal. Of them, Invalidity of information was mentioned most frequently in R threads. Typically, this criterion was employed when the participants asserted that a message provides an inaccurate picture of reality or that a specific issue is out of the scope of the discussion thread. Sometimes, the contributors to NP threads employed Lack of factuality as a negatively oriented criterion of information quality. This criticism was most often directed towards the insufficient evidence employed in support for the arguments.

> You cannot provide any facts to strengthen your claims because you know nothing about this issue. (NP-70)

The Judgment of the Credibility of the Author

Similar to the judgment of information quality discussed above, the role of positive criteria remained fairly marginal in the assessment of the credibility of the author (see Table 6 below).

| Criterion | Thread topic | | | | In total |
| | NP (*n* = 544) | | R (*n* = 531) | | (*n* = 1075) |
Positive (+)/Negative (-)	+	-	+	-	
Author reputation	0.4	28.7	0	33.0	31.0
Expertise of the author	0.9	15.8	0.4	10.0	13.6
Honesty in argumentation	0	9.4	0	8.7	9.0
Fairness in interpretation	0	5.1	0	11.2	8.2
Provision of evidence	0.4	5.7	0.2	10.0	8.1
Unbiased approach to an issue	0	6.8	0	9.4	8.1
Presentation qualities	0.4	5.9	0	7.3	6.7
Similarity to receiver beliefs	3.1	2.0	4.7	1.8	5.9
Non-persuasive intent	0	8.1	0	0.2	4.2
Plausibility of arguments	0	3.1	0	2.1	2.6
Trustworthiness of information	0	2.6	0	0.4	1.5
Reference to external sources	0.3	0.7	0.2	0.4	0.8
Author identification	0	0.6	0	0	0.3
In total	5.5	94.5	5.5	94.5	100.0

TABLE 6. The percentage distribution criteria used in the judgment of the credibility of the author.

Of 13 criteria used in the credibility judgments, Author reputation occupied a central place. Almost every third judgment of credibility drew on this criterion. Expertise/ Lack of expertise of the author was also employed quite frequently as a criterion, similar to Honesty/Dishonesty in argumentation, and Fairness/Unfairness in interpretation. On the other hand, there were a number of criteria that were employed very seldom. Different from the judgment of information quality discussed above, the assessment of the credibility drew even more strongly on the negative criteria. In both NP and R threads, only 5.5% criteria used in the judgments were qualified positively. Again, there appeared to be no marked differences between NP and R threads. However, the criteria of Author reputation (negative) and Unfairness in interpretation of an issue were employed more frequently in R threads, while the participants in NP threads devoted more attention to the expertise of the author and the persuasive intent of the creator of the message. The above picture may be specified qualitatively by discussing the ways in which the most popular criteria were employed in the judgments.

In both NP and R threads, a message was most frequently considered as incredible due to the negative reputation of the author. In NP threads, negative features were particularly attributed to writers who attempted to market certain products.

> You are one of the peddlars spreading marketing material into all discussion boards. (NP-8)

In R threads, the critical evaluation of the author reputation most often drew on labels such as "spammer".

> This guy is incredibly childish. He harps on the same things over and over again. (R-50)

Lack of expertise of the author was frequently referred to in both NP and R threads. In most cases, the credibility of the author was questioned by criticizing his or her capabilities to evaluate the complex issues of racism or the insufficient knowledge about the health effects of natural products.

> I wonder what´s the use of that paper copy if you are unable to cite even a short part of it correctly. (R-42)

> It seems that you understood nothing about my previous message. Go back to school! We may return to this issue when you have made some progress in your studies. (NP-20)

The credibility of the author was often questioned by referring to Dishonesty in argumentation. This criterion was used to indicate the morally dubious aims of the writer.

> You tend to distort messages posted by other people by giving their texts an opposite meaning. (R-72)

Particularly in R threads, the critical assessment of the credibility of the author was directed towards unfairness in the interpretation of an issue. This criticism was often directed towards the moderator ("sheriff") of the R threads.

> Again, you are deciding on behalf of others and condemning my viewpoint. All relevant ideas are labeled as "racist" and killed off. (R-12

In NP threads, too, the criterion of Unfairness was mainly used in the contexts in which there appeared to be some doubt about the impartiality of the message creator. The writers were considered as unfair if they emphasized the negative side effects of the use of competing products distributed by individual enterprises, without devoting due attention to the fact that they meet the relevant laws, regulations and rules.

> It is pitiful that you resort to spreading flawed information about competing business enterprises. (NP-21)

In NP and R threads almost equally, there were occasions in which the credibility judgment drew on the criterion of Biased approach to an interpretation of an issue.

> You generalize by lumping together all foreigners who have immigrated to Finland, be they Estonians, Germans or people from the Near-East. (R-10)

In addition, Lack of evidence was drawn as a criterion particularly in R threads.

> Not only you ignored the issues of racism *per se* but also brought racist thoughts to the fore by talking about islamization, without showing any clear evidence where it appears. (R-72)

As Table 6 demonstrates, the credibility of the authors was also judged by drawing on a number of additional criteria such as Persuasive intent. However, due to space restrictions, the use of these criteria is not discussed here in more detail.

The Relationships between the Criteria of Information Quality and Credibility

The above sections provided a picture of the popularity of individual criteria used in the judgment of information quality and credibility. The analysis may be elaborated further by examining criteria that were used most frequently in connection with others. This question is relevant since the participants sometimes used multiple criteria in order to evaluate the diverse aspects of the quality and credibility of information. In particular, it is intriguing to find out how the criteria used in the evaluation of information quality co-occurred with those employed in the judgment of the credibility of the author. This question is relevant since information quality and credibility are closely related. Co-occurrence can be examined to connect credibility and information quality when appropriate and separate them in other places.

To examine the co-occurrences, a matrix of 13 criteria used in the judgment of information quality and 13 criteria employed in the evaluation of credibility of the author was created in the first phase of the analysis. To avoid an excessively fragmented picture, the criteria used in NP and R threads were not treated separately. It appeared that most of the criteria with a low frequency (for example, Variety of information, and Author identification) did not co-occur with other criteria. After having excluded such criteria from the matrix, altogether 218 pairs of individual criteria were identified. Most frequently, that is, 73 times, there were cases in which two individual criteria, for example, Novelty of information and Unbiased approach to an issue, co-occurred only once. The frequency of two co-occurrences between individual criteria was 29, while the number of three co-occurrences was 4. The highest number of co-occurrences between two individual criteria, i.e. Author reputation (negative), and Lack of expertise, was 25. In order to create a more focused picture, the analysis of the co-occurrences was restricted in cases in which a criterion of information quality and a criterion of credibility of the author co-occurred three times or more frequently (see Table 7).

		BIAS	FAC-	FAL	SPE-	USE-	In total
Criteria of credibility of the author	AUT-	10		5		13	28
	BIAP	6		4			10
	EVI-		7		4		11
	FAIR-	3		4	3		10
	HON-	6		8	3		17
	PER	11					
In total		36	7	21	10	13	87

TABLE 7. Co-occurrences of the criteria used in the judgment of the information quality and credibility. (Legend: BIAS = Bias of information; FAC- = Lack of factuality of information; FAL = Falseness of information; SPE- = Unspecificity of information; USE- = Uselessness of information; AUT- = Author reputation (negative), BIAP = Biased approach to an issue; EVI- = Lack of evidence; FAIR- = Unfairness in the interpretation of an issue; HON- = Dishonesty in argumentation; PER = Persuasive intent)

Table 7 presents the cross-tabulation of five criteria used in the judgment of information quality and six criteria employed in the evaluation of the credibility of the author. Altogether 87 individual pairs of criteria were identified. The numbers in Table 7 indicate the frequency of co-occurrence between individual criteria. For example, the pair of Bias of information, and Author reputation (negative) co-occurred 10 times. Since the majority of most frequently used criteria were negative (see Tables 5-6 above), it is not surprising that all criteria presented in Table 7 are qualified in this way.

The relationships between the criteria of information quality and credibility can be examined in more detail by focusing on most frequent co-occurrences. The sums of columns indicate that Bias of information (sum of column = 36) and Falseness of information (sum of column = 21) are particularly significant criteria when the credibility of the author is assessed in relation to the quality of the message´s information content. In turn, the sums of rows suggests that Negative author reputation (sum of row = 28) and Dishonesty in argumentation (sum of row = 17) are most important criteria when the quality of the message´s information content is judged in relation to the credibility of the author. The role of other criteria is less central, as indicated by the sums of columns and rows in Table 7 above. The picture of the relationships between the criteria can be elaborated by concentrating on the two main columns and rows discussed above.

In the judgment of information quality, Bias of information was most frequently associated with Persuasive intent of the author. Often, Bias of information was also related to Negative author reputation and unsurprisingly, Biased approach to an issue.

Sometimes, Bias of information was associated with Unfairness in the interpretation an issue. Falseness of information was also a major criterion of information quality that was used together with criteria for the judgment of the credibility of the author. Falseness of information was most often associated with Dishonesty in argumentation.

In the judgment of the credibility of the author, particular attention was devoted to the negative reputation of the creator of the message. Such features were associated most frequently with Uselessness of information. Falseness of information was also associated with negative characteristics of the author. Finally, Dishonesty in argumentation appeared to be a frequently used criterion of credibility while assessing the quality of the message´s information content. Dishonesty was most closely related to Falseness of information and Bias of information. Sometimes, Dishonesty was also referred to when the message´s information content was considered as unspesific.

All in all, the analysis of the co-occurrences suggests that while relating the judgments of information quality and credibility in online discussion about sensitive topics, particular attention is devoted to two criteria. First, the online participants assess the extent to which the information provides an impartial and unbiased description of reality. Second, they devote attention to the author reputation: the extent to which the author is generally evaluated positively or negatively in the online community. In addition, the participants may refine the picture by evaluating the honesty of the author. They may also assess the extent to which the information available in the message is able to provide a true description of the issue at hand. Largely, these findings support the results obtained from the analysis of the use of individual criteria with regard information credibility in particular. Author reputation and Honesty in argumentation are significant criteria, be they used individually or together with other criteria. While judging information quality, Correctness and Objectivity of information are particularly important, used either individually or in combination with other criteria.

Discussion

The main contribution of this study lies in the specification of criteria used in the judgment of information quality and credibility in online discussion forums. Second, the study clarifies the entangled relationships between information quality and information credibility. To this end, the issues of information quality were approached from the viewpoint of the message´s information content, while the questions of information credibility were examined by focusing on the qualities of the author of the message. Even though the constructs of information quality and credibility are closely related, they can be identified more clearly by focusing on the above aspects, i.e., the message´s information content and the author of the message. Third, the picture of the criteria was refined by examining the role of positive and negative criteria in the judgments.

The empirical findings indicate that explicit judgments of information quality and credibility are made quite frequently in online discussion forums: one message out of five contained such assessments. A fairly broad repertoire of criteria were employed in the judgments: 13 individual criteria for the assessment of information quality and 13 criteria for the evaluation of the credibility of the author. Of these, however, only a

few criteria were used frequently. This finding supports the conclusion drawn by Schamber and Bateman (1996) about the existence of a finite range of core relevance criteria. Negative criteria were strongly favored: 93.3% of mentions to diverse criteria were qualified in this way. This preference is mainly due to the specific nature of communication taking place in anonymous online forums focusing on sensitive topics such as racism. Given the specific characteristics of such issues, the above finding cannot be generalized into all online forums. This is because the main emphasis is often placed on disputational discourse that tends to question rather than accept the views presented by other participants. This finding receives support from Kim´s (2010) study of the users of a question and answer site. Critically oriented users were abundant particularly in politics, religion, and global warming categories where opinion was particularly divided. The threads analyzed in the present study can be characterized in a similar way since many of the messages contained harsh criticism directed to others. Hence, no wonder that in the credibility judgments in particular, the negative criteria surpassed the positive ones.

The empirical findings highlighted that in the judgment of information quality, the attention was most frequently directed to the extent to which the message´s information content was considered as useful. The quality of information was often assessed by considering the extent to which information content is correct and specific. In the judgment of credibility of the creator of the message, the main attention was directed to the extent to which the author reputation is perceived as positive. In addition, the credibility is assessed by devoting attention to the expertise of the author and honesty in argumentation.

Although the empirical findings are unique, some of them can be compared with the results of earlier studies. Rieh (2002, p. 154) found that among the academic participants, the subjects' evaluative judgments mainly drew on the characteristics of information objects, for example, their content, graphics, organization/structure. The participants also paid attention to the characteristics of sources, for example, source reputation and type of source to judge the quality and authority of information. In the present study, too, the judgments of information quality primarily drew on the message´s information content. Similar to Rieh´s (2002) findings, the credibility judgments strongly drew on the author reputation. Rieh (2002) also found that in the context of evaluative judgments, information quality (46 percent of mentions of criteria) was the most frequently mentioned criterion, followed by cognitive authority (20 percent). In the present study, 72.8 percent of mentions of criteria focused on the credibility of the author, while the rest of mentions (27.2 percent) concerned information quality. The differences between the findings are mainly due to the different research settings. Rieh´s (2002) academic informants assessed web pages resulting from the performance of assigned search tasks, while the present study examined messages posted to an online discussion forum. In addition, there were differences in the repertoire of criterion categories with regard to information credibility in particular. Rieh (2002) approached it from the perspective of cognitive authority while the present study employed a broader set of criteria to examine the aspects of information credibility.

The findings of the present study support the conclusions drawn by Kim (2010). Similar to the questioners of a Q&A site, the discussion forum participants did not always evaluate all given messages nor apply the same criteria to every message. Kim

(2010) found that while judging message criteria, logic or plausibility of arguments was the most frequently used criterion, followed by spelling/grammar. The online forum discussants also drew on these criteria, even though their role remained quite marginal. Interestingly, in both studies, the author´s perceived honesty appeared to be an essential component of credibility constructs together with expertise. Finally, the findings of the present study also confirmed the conclusion drawn by Flanagin and Metzger (2007, p. 332) about the low credibility of messages with a particular commercial interest. Both studies suggest that people tend to discount information from sources with obvious persuasive intent (cf. Flanagin & Metzger, 2000).

Conclusion

This study highlights the complex nature of relevance judgment in real-life settings. A particular characteristic of judgments made in open online discussion forums is the preference for the use of negative criteria. This is partly due to that positive judgments tend to be silent in because the participants are not expected to crowd the discussion with comments indicating "me toos". On the other hand, the role of negative comments is emphasized when the topics of discussion are sensitive and subject to conflicting views. Since the present study focused only on two topics discussed in a Finnish forum, the findings cannot be generalized to concern all online discussion boards. Future studies should broaden the repertoire of discussion topics and compare positive and negative criteria used in the judgment of information quality and credibility. Intriguing tasks of further research include a detailed comparison of judgment criteria used in diverse online environments such as blogs, Facebook, and question & answer sites. The findings could be elaborated by interviewing the users of diverse online forums. Contextualist studies of these kinds are important since they could also refine the conceptualizations of information quality, information credibility and cognitive authority.

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