INCREDIBLE INFORMATION ON THE INTERNET: BIASED INFORMATION PROVISION AND A LACK OF CREDIBILITY AS A CAUSE OF INSUFFICIENT INFORMATION QUALITY

(Complete Paper)

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Abstract: In the literature, several statements can be found that predict a development towards complete market transparency through the usage of information available on the Internet. This would put individuals, who need to make decisions in such markets, in a better position. However, market transparency is closely connected to the quality of information available. Consequently only if the information on the Internet is of high quality, will a rise in market transparency be observed. The aim of this paper is to contribute to the understanding of information quality in decision processes. Eight criteria of information quality can be derived from the semiotic concept of information. In order to address their roles in the information exchange process, the criteria are split into two groups: one, which is influenced by information providers, and one, which is influenced by information recipients. Moreover, this paper develops two arguments against the development of complete market transparency. The first argument is that information providers may strive to avoid market transparency as they are actually not interested in complete market transparency. The second argument explains insufficient market transparency by the characteristics of how information is presented on the Internet and suggests that particular information suffers a lack of credibility. Both arguments are based on the eight criteria of information quality.

Key Words: Information Quality, Semiotics, Decision Making, Economics of Information, Internet

INTRODUCTION

The Internet is an important source of information. Some individuals provide information while others seek information. For instance, suppliers and customers exchange information via the Internet. Suppliers present information describing their products, while potential customers search for information. The exchange of information becomes necessary because of an existing information asymmetry between these two parties. While suppliers know their products very well, potential customers often face an information deficit. Deliberate customer purchasing decisions require knowledge on suppliers, their products, prices, and other trading terms. Accordingly market transparency questions whether market participants know vital market processes and structures. However, to define the degree of market transparency from the customers' point of view, the quality of the available information on products has to be taken into account, as information of inferior quality has adverse effects on decisions [12], namely customers' purchasing decisions. The aim of this paper is to show how the information quality on the Internet is influenced by the behavior of information suppliers and recipients.

Different definitions of data and information quality have been discussed in the literature. As definitions should be related and applicable to a specific context, this paper suggests a definition of information quality tailored to the context of decision making. The analysis is organized as follows. First, the semiotic concept of information and its relatedness to the process of decision making is introduced. Second, based on the semiotic concept and its relation to decision processes, eight criteria of information quality are derived and illustrated. Subsequently, these are applied to the exchange of information between suppliers and customers on the Internet. Some of the criteria explain how information providers influence information quality. The remaining criteria are assigned to information recipients. These criteria guide the information recipients' assessment of information quality. With respect to these criteria and the economics of information, I explore how the characteristics of information presentation on the Internet account for insufficient information quality. Finally, the paper concludes with a summary of the main results and a description of promising areas of future research.

A SEMIOTIC CONCEPT OF INFORMATION AND KNOWLEDGE

The following characterization of information is based on the definition and the function of signs and sign combinations (semiosis). This concept is useful in this context because of its similarity to information and decision processes. Syntactics, sigmatics, semantics, and pragmatics can be distinguished as the four semiotic branches [6, 18, 32, 37]:

1. *Signs*, especially letters and figures are at the lowest semiotic level. As they are assigned to entities, characteristics, relations, and issues, signs can be described as symbols. In order to arrange signs, predetermined rules for their interrelationship exist. They are called *syntactics*.
2. *Data* is illustrated via signs. In other words, data is a collection or sequence of signs. Data has a relationship to the object, which it denotes (designata). This branch is called *sigmatics* [37].[1]
3. The meaning of data is identifiable via *semantics*, so that data turns into *information* through a process of interpretation. Thus, information can be regarded as interpreted data. Through individual interpretation, objective facts turn into subjective information [1]. From this point of view, it is important to distinguish between data and information.
4. *Pragmatics*, the fourth semiotic branch, examines the relationship of pieces of information to their holders and interpreters for whom the information becomes part of their *knowledge*.

[1] Charles Morris, who forwarded basic studies on semiosis, described only three semiotic branches and looked at the relationship of signs to their designata as an integral part of semantics [18].

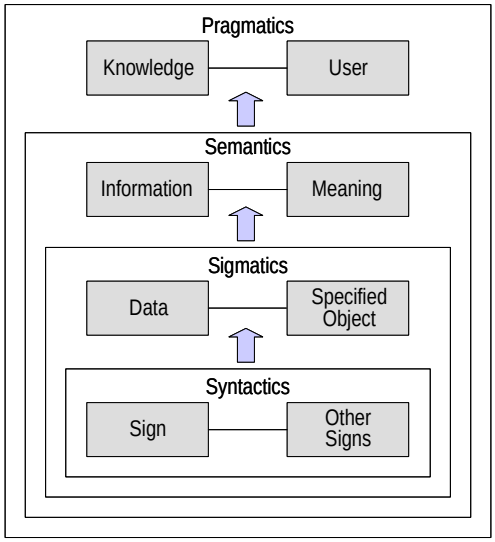

Figure 1: The Semiotic Concept of Information

Figure 1 illustrates the semiotic concept of information, where each branch of the hierarchy includes the levels below. According to the semiotic understanding, knowledge follows from and incorporates information. Knowledge evolves through the interpretation and the simultaneous integration of information and context (pragmatics). Insofar as knowledge is gained by, consists of, and is developed through a multitude of selected, assessed, and critically reviewed information [32]. This leads to an understanding of knowledge as a mental structure of all subjective perceptions, that individuals hold and accept as true about themselves and their environment [3, 25]. In other words, knowledge is regarded as the subjective perceptions of an individual on which all decisions about future activities are based.

A decision is a choice from several alternatives, resulting in a particular consequence. Following the economic principle, economic agents aim to make the best choice to maximize their profits in terms of utility. These decisions are influenced by the information that is available to decision makers and affects their knowledge. Considering the interrelation of information and decisions, decision theory extends the understanding of information by the aspect of its purpose. In this context, the purpose of information is to improve decisions, i.e. to lead to decisions that result in a higher (expected) utility for the decision maker. This requires information to be specific to a problem and to be able to contribute to the realization of a goal. Information is of high quality for a particular decision, if its usage improves this specific decision. In order to link this insight to the semiotic concept of information, the hierarchy of semiotic levels mentioned previously is supplemented by the dimensions decision and utility (Figure 2).

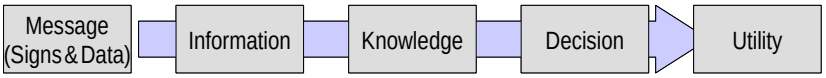

Figure 2: Information Usage and the Decision Process

Figure 2 describes the process of information usage and decision making. By interpreting signs and data a message becomes a piece of information. Through integration of information into a situational context, information becomes a part of knowledge. Based on this knowledge, individuals make decisions which result in certain utilities.[2] An increase in utility serves as an indicator of information quality. The quality

[2] Similarly, Taylor describes a hierarchy of data, information, informational knowledge, productive knowledge and

of a piece of information determines whether additional profit can be achieved through its consideration.

CRITERIA OF INFORMATION QUALITY IN DECISION PROCESSES

From the semiotic concept of information, with its inherent understanding of information and decision processes, we can derive information quality characteristics. An increase in the decision maker's utility is based on how the message proceeds through the process depicted in Figure 2. Thus, indicators of an efficient process need to be identified at each step of the process in order to determine the criteria influencing information quality. This leads to eight intrinsic criteria that characterize information quality (Figure 3).[3] All intrinsic information quality criteria are derived endogenously from the previously introduced information usage and decision process. Information will be of high quality, if all criteria are fulfilled.

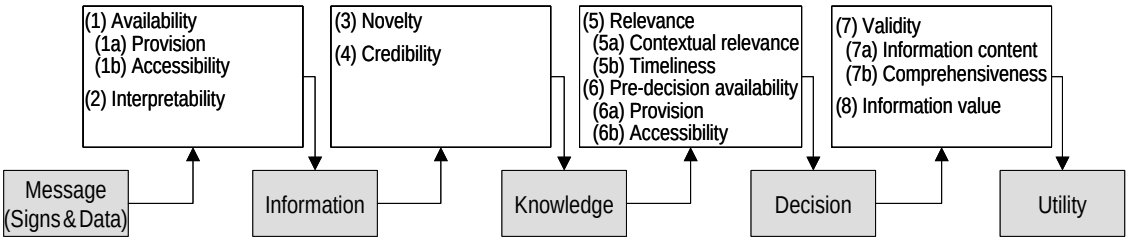

Figure 3: Criteria of Information Quality in the Decision Process

1. Availability: Provision and Accessibility: A message has to be available to the decision maker, in order to become a piece of information. This implies two aspects: *(1a) Provision:* As information needs to be available, holders of information are required to provide it. However, it is possible that there is sometimes no incentive to provide information and therefore information holders would either withhold information or restrict its usage to certain users. *(1b) Accessibility:* Furthermore, the message has to be accessible to the decision maker [23, 34].

2. Interpretation: A message needs to be understood by the decision maker to turn into a piece of information [23]. Individual interpretation processes result in different conclusions [33]. Depending on the users' needs and abilities, information users will interpret the information properly, falsely or not at all. In the first case, decision makers can enhance their personal information set and supplement their knowledge. However, this does not necessarily signify a qualitative improvement of an information set, as the information can be incorrect. If decision makers interpret a piece of information incorrectly or if they do not interpret it at all, their information set either deteriorates or remains unchanged. Accordingly, valuable messages must correspond to the users' needs and abilities.

3. Novelty: Only new messages can influence existing knowledge and upcoming decisions. A piece of information concerning an already known fact cannot contribute to better decision making. Therefore, the novelty of information results from the difference of what was formerly known and what is new. If an individual receives a piece of information, three situations can be distinguished: (1) The individual

activity [34].

[3] Intrinsic criteria are direct characteristics of information. Extrinsic criteria, though not discussed in this paper, become important in situations where intrinsic criteria are unperceivable. For instance, an individual uses the source of information, which is an extrinsic criterion, to assess the credibility of a piece of information, if the intrinsic credibility of that information is unobservable.

already knows this information. Without any novelty, the particular piece of information has no influence on future decisions. (2) Conversely, information is extremely novel, if the decision maker had no knowledge of it beforehand. (3) Between these two extremes, a multitude of intermediate levels of novelty are possible. A piece of information that confirms previously noted but uncertain knowledge is confirmative and may reduce uncertainty. Information can also conflict with an individual's existing knowledge. A conflicting piece of information can affect decision makers if they allow a change in their existing knowledge. Such a change, initiated by a message, is called reorganization [3]. But the chance of reorganization is considerably influenced by the credibility of the new information.

4. Credibility: Credibility is important in situations of information asymmetry. This means that individuals are sometimes unable to verify the validity of information given to them by other individuals, who are better informed. Credibility relates to the validity of a piece of information from a recipient's point of view. It refers to the perceived validity in terms of trustworthiness rather than to truth or correctness. A piece of information has to be seemingly credible to an individual, in order to be considered in the decision making process [38]. Examples of extrinsic quality criteria for judging the credibility of information are the expertise and the trustworthiness of the information source or personal contact with the sender [21, 23, 35]. Other criteria are the design and content of a message. Furthermore, it is more likely that a message will be regarded as credible, if it is consistent with the individual's existing knowledge [3, 23]. If an information recipient judges a piece of information to be credible, this information could potentially be used in decision making; otherwise, it will not be considered. Invalid information, which is nonetheless credible in the recipient's view, can lead to worse decisions. If a piece of information is not considered, information recipients might prevent their decisions from being influenced by incorrect information. At the same time, a piece of information, which could have contributed to better decision making, is discounted.[4]

5. Relevance: Contextual relevance and Timeliness: Information needs to be relevant in the decision situation, in order to influence the decision [30]. This comprises two aspects: *(5a) Contextual relevance:* Contextually relevant are those messages which are of importance in the decision situation. This has to be judged from the decision maker's point of view. *(5b) Timeliness:* Timeliness refers to the difference between what is described by the information and the point in time when the information is available. The bigger the temporal difference is, the less suitable is the information in a decision making process.

6. Pre-decision availability: Provision and Accessibility: If information is to be considered for decision making, the particular piece of information needs to be available prior to the decision. Thus, criterion 6 is merely a specification of the first criterion and considers time as an additional aspect. *(6a) Provision:* The holder of information has to provide the information prior to the decision maker's decision. *(6b) Accessibility:* The decision maker must be able to access the information prior to the decision.

7. Validity: Information content and Comprehensiveness: The validity of a piece of information is important, because false information can possibly lead to incorrect decisions. As shown earlier, a message has to be credible, but not necessarily correct, in order to become a part of an individual's knowledge. The individual only has to believe something to be true [25]. Ergo, the tendency to relate the meaning of truth to 'knowledge' is according to Boulding inadequate [4]. In order to describe the characteristics of validity in more detail, two aspects can be distinguished. *(7a) Information content:* The criterion validity of information content can be viewed from the perspective of the philosophical correspondence theory. According to this perspective, the truth of propositions depends upon their relation to some occurrence [29], i.e. a true conclusion corresponds to the object of the conclusion. This definition correlates with the second branch of semiotics. Sigmatics describes the temporal and spatial relation of information to reality

[4] Nikander discusses possibilities to represent credibility and trustworthiness digitally [21].

and thus, the fact that certain facts actually exist in a certain period [32]. However, an objective judgment of information content might be impossible, as all individuals have different subjective perspectives of the world. In particular, information recipients may face this problem due to the information asymmetry. Therefore, the information recipients assess the credibility of information instead of the subjective or even objective validity of information content. For the providers of information it can be assumed that they are able to subjectively judge the validity of information. Considering the information asymmetry between suppliers and their potential customers, the former are the better informed concerning their products. They know their products, it is their decision to provide information, and they do so in order to attract customers. This could mean that suppliers might deliberately lie in order to attract customers. *(7b) Comprehensiveness:* Comprehensiveness is the second criterion of validity [34]. Suppliers either intend to inform comprehensively or not. Intending to inform comprehensively means to aim at informing about all presumably relevant issues. In contrast, informing non-comprehensively means informing generally but concealing information about deficiencies deliberately. Research on comprehensiveness has been shown that less comprehensive information, especially the withholding of particular information, can lead to worse consumer decisions and create benefits for the information supplier [15].

8. Information value: The literature presents at least two meanings of 'information value'. On the one hand, information value is the cost, and on the other hand, it is the benefit of a piece of information. This ambiguous application is explained by the fact that, following economic theory, the utility of a piece of information equals the maximum that will be paid for this information [9, 17]. In this paper, information value is defined as the difference between the two, i.e. information utility minus the cost of information. The cost of information arises from the search for and use of information. The utility of a piece of information can be seen, when through its consideration a different decision is made or if uncertainty is reduced. According to the Bayesian approach of decision making, the utility of information equals the modified expected value of the best decision [10, 14]. It is assumed that the consideration of an additional piece of information leads to a different level of utility. This effect has to be determined by a static and retrospective comparison. Therefore, the outcome of decisions implying and omitting a specific piece of information have to be compared, ceteris paribus [11, 16, 17, 34]. In the case of positive information value, the information utility is larger than the cost of information. Conversely, if the cost is higher than the information utility, a negative information value results.

In order to support the appropriateness and comprehensiveness of the discussed criteria of information quality, these criteria are compared with other criteria found in empirical studies on information quality. Table 1 gives an overview of the criteria derived from the semiotic description of information usage and decision processes in this paper and compares them to empirically obtained criteria of information quality. Additional information on the aims and methods of the empirical studies are given in Table 2.

Quality criteria obtained from the semiotic view of information usage and decision processes	Empirically obtained information quality criteria			
	Olaisen 1990	Wang/Strong 1996	Wilkinson/Bennett/ Oliver 1997	Rieh 2002
(1) Availability (1a) Provision	-	-	-	-
(1b) Accessibility	Accessibility	Accessibility DQ (access security, accessibility)	Site access & usability, navigation within document	-
(2) Interpretability	Form	Representational DQ (interpretability, ease of understanding, representational consistency, concise representation)	Resource identification & documentation, information structure & design	-
(3) Novelty	Actual value & novelty	-	-	-
(4) Credibility	Credibility (i.e. trustworthiness, competence)	Intrinsic DQ (believability, reputation)	Author identification, authority of author	Trustworthy (CA), credible (CA)
(5) Relevance (5a) Contextual relevance	Relevance, validity	Contextual DQ (relevancy)	Relevance & scope of content; accuracy & balance of content	Topical interest
(5b) Timeliness	Actual value & novelty, meaning over time	Contextual DQ (timeliness)	-	Current (IQ)
(6) Pre-decision availability (6a) Provision	-	-	-	-
(6b) Accessibility	-	-	-	-
(7) Validity (7a) Information content	Reliability	Intrinsic DQ (accuracy, objectivity)	Validity of content, accuracy & balance of content	Accurate (IQ),reliable (CA), authoritative (CA)
(7b) Comprehensiveness	Completeness	Contextual DQ (completeness, appropriate amount of data)	-	-
(8) Information value	-	Contextual DQ (value-added)	-	Useful (IQ), important (IQ)
Additional criteria from the empirical studies	Flexibility, selectivity	-	Quality of links, aesthetic & affective aspects	Good (IQ), scholarly (CA), official (CA), aesthetic & affective aspects, general expectation

Table 1: Comparison of Information Quality Criteria

Empirical studies on information quality	Olaisen 1990	Wang/Strong 1996	Wilkinson/Bennett/ Oliver 1997	Rieh 2002
Aims and methods	Examination of managers' perceived quality of electronic information in banks and insurances with interviews and a postal questionnaire. Results show 5 cognitive authority factors and 6 technical user-friendliness factors.	Development of a framework for data quality (DQ) from the data users' perspective. Empirical approach to determine data quality attributes and assess their importance. Factor analysis yielded 20 dimensions which were grouped into four families.	Exploration of information quality criteria for Internet resources. Explorative collection of 509 criteria which were combined to 125 indicators and afterwards arranged into 11 major categories. Importance of items were rated by a panel of experts.	Judgment of facets of information quality (IQ) and cognitive authority (CA), derived by observing individuals' search behavior on the web via verbal protocols during the search, search logs and post-search interviews.

Table 2: Aims and Methods of the Empirical Studies on Information Quality

ROOTS OF INSUFFICIENT INFORMATION QUALITY ON THE INTERNET

Having presented the characteristics of information quality, it is possible to identify the reasons causing insufficient information quality on the Internet. Accordingly, the criteria of information quality will be presented with respect to the communication processes between the providers and recipients of information. The criteria are divided into two groups: one group of criteria is influenced by the information providers, whereas the second group of criteria takes information quality from the recipients' point of view into account. The latter approach is similar to the 'fitness for use' concept, where information quality is defined as information that is fit for use by the information recipients [12]. I continue to refer to the exchange of information between suppliers of goods and their potential customers, who need to make buying decisions based on available information.

Information Providers' Information Quality Criteria

When focusing on the suppliers' information provision, their motives and incentives for supplying information need to be considered. In the competitive environment of a market, suppliers try to conclude profitable transactions. To sell their products, they need to make themselves and their offers recognizable [20, 30]. By signals, suppliers try to point out favorable aspects of their goods in order to influence consumer behavior. Those suppliers who offer inferior goods are not interested in high information quality as an improvement in market transparency would drive them out of the market. Due to information asymmetry, opportunistic behavior may occur. To be more specific, opportunistic behavior signifies that some suppliers may lie in order to mislead customers and gain competitive advantages [8]. With this kind of deceptive behavior, they will deter high information quality when it is advantageous to them. With respect to information quality on the Internet, it is necessary to explore whether such advantages and incentives occur frequently on the Internet.

Table 3 summarizes the criteria that are the behavioral options of an information provider. Subsequently, I discuss their importance to information quality on the Internet. The *provision (1a)* of information on the Internet is inexpensive and poses few technical problems. However, providers can decide whether or not to publish information. They can intentionally restrict access to certain information to a particular group of Internet users. Considering the pace of information dissemination on the Internet, the above statements also hold for the criterion *provision (6a)* of information prior to a decision. The speed of information circulation on the Internet, permits increased *timeliness (5b)* of available information. It is obvious that information providers affect the timeliness of information, since they are able to replace obsolete information with updated information. Actually, there is much outdated information to be found. This may be intentional, if the providers see a chance to influence information seekers by outdated information. For information recipients, it is often difficult to observe the timeliness of a piece of information or even the date of publication. For them, only timely information is contextually relevant as obsolete information will not be considered in decision making.

Information quality criteria which are influenced by the information providers	Specifications of the information quality criteria, according to their impact on the information quality Information provider Intends to inform ◄——► Information provider intends to misinform			
(1) Availability (1a) Provision	General provision	Restricted provision	No provision	
(5) Relevance (5b) Timeliness	Up to date	Out of date		
(6) Pre-decision availability (6a) Provision	General provision	Restricted provision	No provision	
(7) Validity (7a) Information content	True with the intent to allow interpretation	True without the intent to allow interpretation	True with intented misinterpretation	False
(7b) Comprehensiveness	Comprehensive and balanced		Non-comprehensive and biased	

Table 3: Criteria of Information Provision

With respect to the *validity* of information on the Internet, information providers can either inform truly or falsely *(7a Information content)*. In between the two extremes, there are additional possibilities for suppliers to influence the individual's information interpretation. The information holders can try to influence the recipient's interpretation by the way they provide information. The information provider has four behavioral options. First, information providers can present information correctly and as interpretable as possible. Second, they can try to prevent an interpretation of true information by the decision maker. This aspect is important, if a supplier is legally obliged to provide certain information and there are disadvantages to displaying this information. Such information can be found for instance in the fine print. Although the respective information is available, decision makers may not consider it because they fail to notice the information. Third, suppliers can try to lead to a misinterpretation by the decision maker through deceptive presentation of information. For example, suppliers of inferior products provide information, where they try to create an improved appearance of their products through mistakable verbalizations. The provision of false information is the fourth behavior option. The criterion of *comprehensiveness (7b)* accounts for the option that suppliers may seek competitive advantages by deliberately omitting information on particular aspects of their offers. Informing non-comprehensively means providing some information but concealing particular information about deficiencies deliberately. Earlier research indicates that less comprehensive information provision, especially the withholding of specific information, can lead to incorrect consumer decisions. In doing so, information suppliers can create benefits for themselves [15].

To sum up, suppliers have incentives to deter high information quality in certain situations. This conclusion does not solely affect the Internet. On the Internet, however, opportunistic tendencies are more likely due to insufficient legal regulations. Just consider the problem of proving the display of false information if providers update their sites in the meantime or the easiness of creating and using a faked identity on the Internet. Also the possibility to track customer behavior on the Internet opens a window of opportunity for information suppliers. For instance, suppliers search for clues on their customers' price sensitivity in order to adjust their prices accordingly [31]. Personalized pricing thereby aims at maximizing the seller's profit by selling goods to each customer at an individual price that exactly reflects his/her individual maximum willingness to pay. More important reasons for insufficient information quality on the Internet are derived from the recipients' perspective in the next section.

Information Recipients' Information Quality Criteria

Table 4 presents the information quality criteria that can be influenced by information recipients.

Subsequently, these criteria are discussed from an information recipient's point of view.

Information recipients' information quality criteria	Specifications of the information quality criteria, according to their influence on the perceived information quality		
	High perception of information quality ◄		► Low perception of information quality
(1) Availability (1b) Accessibility	Access		No access
(2) Interpretability	Right interpretation	Misinterpretation	No interpretation
(3) Novelty	Completely new	Confirmative or conflictive	Previously known
(4) Credibility	Believable		Unbelievable
(5) Relevance (5a) Contextual relevance	Relevance		Irrelevance
(6) Pre-decision availability (6b) Accessibility	Accessible		Inaccessible
(8) Information value	Positive information value (utility > cost)		Negative information value (utility < cost)

Table 4: Criteria for the assessment of information quality

The Internet has some disadvantages concerning the *credibility (4)* of available information. Therefore, this criterion is the main reason for insufficient information quality on the Internet and will be discussed first. Credibility is (only) a recipient's appraisal of the validity of information that cannot be surveyed by the recipient. Information that has been assessed as credible can affect decision making, whereas information that is not credible will be disregarded. Traditional print media such as newspapers, books and publishers have acquired either good or bad reputations for having quality controls [28]. This means that people are able to assign a certain degree of credibility because they have accumulated knowledge and experience with a particular resource beforehand. However, the Internet is a large uncontrolled and fast changing environment, which makes the judgment of information quality and authority difficult for most users [28]. It is often difficult to monitor who provides certain information, because information providers can easily remain anonymous. There are no general quality control mechanisms implemented on the Internet and anyone can easily publish information. Referring to the example of information given by suppliers to describe their products, the possibility to assess credibility varies according to the type of product quality that is described. Thereby, the distinctions between *search*, *experience*, and *credence qualities* of goods have to be considered [7, 19, 20]. These distinctions are based on the points in time, when a consumer can judge the quality of a product. *Search qualities* can be ascertained by an inspection during the search process, prior to purchase. Accordingly, a potential customer can verify the supplier's information on search qualities before making the decision. Each piece of false or misleading information will be discovered. Because false information will be detected, suppliers cannot expect to gain an advantage by posting false information. Ergo, whenever information on search qualities is published, high credibility can be expected. *Experience qualities* cannot be discovered until the product is used after the purchase decision. Therefore, a potential customer cannot verify information on experience qualities of a certain product prior to purchase. This information disadvantage for the potential customers, as compared to the suppliers who know their products very well, is termed information asymmetry. Information asymmetry leads to a lack of credibility from the consumers' perspective, as they have to assume opportunistic supplier behavior. The question emerges of how do consumers treat information whose verity is not transparent to them. Information from trusted third parties, former experiences with a comparable product, or with the same supplier may influence the credibility assessment. But still this sets up the chance for the success of suppliers' opportunistic behavior (i.e. providing misleading information). With experience qualities we can expect information quality to be worse compared to information on search qualities. While suppliers have to judge whether opportunistic behavior is advantageous they need to consider that, according to the definition of experience qualities, consumers will discover misleading

information during consumption. Even if it is assumed that suppliers intend to inform truly, the information quality is impaired from the customers' point of view because they cannot be sure about the suppliers intention. *Credence qualities* can neither be verified prior to nor after purchasing a good. Thus, consumers cannot verify information concerning these qualities. Suppliers can provide misleading information in the case of credence qualities whenever it is beneficial without having to fear discovery of their behavior.

With respect to information quality on the Internet, the criterion of credibility turns out to be very important. To be more specific, a lack of credibility can be observed because of the characteristics of information provision on the Internet. On the Internet, a product is described by information, while this information is separated from the product itself. Although this does not change the qualities of the product, the process of verification becomes more difficult or even impossible for a consumer. Search qualities are termed as such because they can be verified by inspection prior to purchase (e.g. the quality of a fabric). In contrast to the presentation of products in a store, presentation on the Internet is limited to audio-visual illustrations. Thus, other senses cannot be addressed and verifications of product qualities through 'smelling', 'feeling' and 'tasting' are not feasible. Even visual characteristics like an object's size and color are more difficult to evaluate. If a piece of information about a search quality is available on the Internet, but customers are unable to verify it because they are trading via the Internet, than the search quality takes the characteristics of an experience quality [27]. Accordingly, we can expect to find mainly goods with a high share of experience qualities on the Internet. Suppliers, especially those with inferior products, will try to take advantage of this effect and strive for profits by deliberately obstructing high information quality. Considering the lack of credibility concerning experience qualities, it becomes obvious that information on the Internet is insufficient or rather incredible due to the transformation from search to experience qualities. The transformation of product qualities detracts from information quality and hampers sales. The market mechanism will fail, if qualities of goods cannot be assessed before a purchase, because good qualities will drive bad qualities out of the market. This is the classical 'lemon market' as described by Akerlof [2]. However, in an empirical study Klein did not observe a lack of believability on the Internet. This is reasonable considering her research setting. Students were asked to assess the information quality of traditional text sources and Internet sources, which had been used in a previous MBA course [13]. Probably most of the information providers in this context, like researchers at universities, do not aim at selling something and cannot gain personal advantages by opportunistic behavior. The presented argumentation for incredible information quality does not hold for situations with homogenous products. In such markets, customers only consider prices when comparing different offers. Price is a search quality that does not change into an experience quality on the Internet. Furthermore, institutions emerged that aim to reduce information asymmetries. Popular ones are platforms for people to share their experiences, like Epinions.com or dooyoo.co.uk. These information pools are easy accessible and contain credible information, if it can be assured that suppliers are not able to exert influence on the displayed information. Institutions, like these platforms, can only be applied to standardized products. If you want to buy e.g. second-hand articles on the Internet, these institutions fail because independent information on the present shape of used goods cannot be provided. Because of this, eBay introduced seller feedback profiles. These record the feedback of former transaction partners on the execution of past transactions and give hints on the seller's credibility (extrinsic criterion) instead of the information credibility. Nevertheless, reports of deceptive transactions are frequently reported.

Regarding the remaining information quality criteria, I start with the *accessibility (1b)* of information via the Internet. Access is generally easy and inexpensive. The main access problems stem from information retrieval, if individuals do not know where to find certain information [26, 27]. Therefore, search engines are used. However, Internet users are not able to retrieve all available information. This problem is important as the quantity of available information continues to increase. Retrieval problems needs to be addressed by further research and development on search engines. Otherwise, problems such as long

loading times, server problems, and broken links may hamper access to certain information. Concerning *interpretability (2),* information on the Internet has the possibility to be more responsive to individual needs. An example is personalized information provision, according to the user's individual needs and abilities. This is reinforced by the fact that the Internet is able to integrate a multitude of design options in comparison to other media (e.g. graphic animations, movies, links to other pages). Referring to the *novelty (3)* of information, the Internet has a speed advantage in distributing information. Providing new information is simple and enables availability worldwide within seconds. But the huge amount of information makes it difficult to identify specifically information that is new to a user. Regarding *contextual relevance (5a),* customized information provision is much easier to realize on the Internet than in any other information channel. Often users are able to create their own profiles, where they can register their interests in order to receive personalized information. Moreover, users are able to skip irrelevant information and navigate the Internet following their own interests. Concerning the *Pre-decision availability (6b)* the Internet has an advantage in comparison with other media owing to the speed with which information is circulated and the availability of information 24 hours a day. With respect to the *information value (8),* the findings are ambiguous. The cost to access the Internet is comparatively low and a large amount of information is accessible for free. Nevertheless with the increasing amount of available information, search costs are rising. They vary, for example, with the quality of search engines. Consider how much time it would take to look at all of the hits a search engine provides after an ordinary search query. Consequently, further developments of search engines are exploring the possibility of offering automatically generated abstracts of the found documents.[5] Regarding information utility, information on the Internet can contribute to better decision making. If information is taken into consideration that would not have been available in other information channels, this information will generate a certain utility.

To summarize, the application of the quality criteria from the recipient's perspective to information on the Internet shows that the Internet generally fulfills the prerequisites for high information quality. However, because of the limits of information presentation on the Internet, credibility is the one information quality criterion that accounts for insufficient information quality. The insight, that *search qualities* frequently become *experience qualities* on the Internet, is the reason for biased information provision by suppliers and a lack of information credibility. This deficiency becomes even more important as the Internet is viewed not only as an information channel but as a virtual business platform, where traditional ways of improving credibility, such as personal contacts, are difficult to apply.

CONCLUSIONS

Stemming from the semiotic concept of information, this paper presents eight criteria of information quality relevant in decision processes. These criteria can be assigned to either information suppliers or recipients. By applying these criteria to information on the Internet, conclusions about information quality are derived. The analysis puts forward explanations of insufficient, especially incredible information quality on the Internet. Because of insufficient information quality, I argue that an information asymmetry between suppliers and customers will persist. Markets will not develop towards complete market transparency through information on the Internet as proposed in the literature. The reasons are twofold: On the one hand, certain providers of information are not interested in complete market transparency and deter high quality of information on the Internet. On the other hand, information on the Internet shows a lack of credibility. This is caused by the separation between the presentation of information and the described object, which impedes the immediate verification of information by inspection and leads to a

[5] Abstracts are meant to give users an overview and indicate if it is worthwhile to work through a specific document. Examples for summarizing algorithms are described by Brandow, Mitze, Rau [5] and Paice [24].

transformation of *search qualities* into *experience qualities*. The described findings are based theoretically on the economics of information. An interesting area of future research is the actual behavior of suppliers and customers in the context of their interdependent communication processes. The application of experimental economics would allow individual behavior to be observed in framed settings. This might lead to further insights on information quality criteria in communication and decision processes and give indications for designing rules and institutions to improve information quality on the Internet.

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