



# User-centered evaluation of information: a research challenge

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## Abstract

**Purpose** – This paper sets out to present the concept of the value of information, review the descriptive, rational, social and behavioral approaches for assessing the value of information, and explain why user-centered rather than information-centered evaluations are the most relevant.

**Design/methodology/approach** – The paper starts by highlighting the main facets and market characteristics which influence the value of information. Next, four approaches to assessing the value of information are explained, including a discussion of advantages and limitations of each approach. The approaches reviewed include descriptive, rational, social and behavioral research. Finally, an information value assessment recommendation is given and a theoretical framework is offered.

**Findings** – The descriptive approach is useful in raising new angles for theory development. The rational approach assumes that the value is inherent in information and offers models that describe how information should be valued. The social perspective suggests that markets are enhanced by social activity. The behavioral aspect teaches that value perception changes by person and circumstance and is a key influence on information markets.

**Originality/value** – This paper offers a concentrated multi-dimensional theoretical basis on a topic of central importance to anyone interested in Internet research, information consumption and production. Theory offered here constitutes a basis for a large number of potential empirical research endeavors.

**Keywords** Information retrieval, Information theory, Internet

**Paper type** General review

## Introduction

The business environment surrounding us has long been recognized as the “information economy” (Porat, 1977), an economy where information is a central input, activity, and output of organizations. The “information economy” concept led much of the academic research to focus on information as a good or service to be transferred by market transactions governed by the pricing mechanism (Benkler, 2006). The development of the web and easy web writing and publishing technologies enabled every individual to take part in the information economy, diminishing some of the dominance of traditional publishing and media corporations. The introduction of decentralized, distributed, user-generated content to the information market raises new questions regarding the value of information. Specifically, how is the value of information perceived by users who can now be found on both sides of the fence: producers and consumers of information.

The quantity of available information and the freedom for anyone to publish place the burden of monitoring the value of information on the user or consumer of information. While information may carry an intrinsic, objective, value, the perception of value by the user determines acquisition and application. The main claim of this review is that the value of information is in the eyes of the beholder, it is user-centered



and therefore it is dynamic: the value of information perceived by the user may be changed with changing market or social influences, it may change over time or due to the accumulation of experience. After presenting the concept of the value of information, this paper will review the descriptive, rational, social and behavioral approaches for assessing the value of information and explain why user-centered (subjective) rather than information-centered evaluations are the most relevant. This paper presents a quest for a theory-based, practical, way to assess the value of information and concludes with a convergence of theories into one framework.

**The value of information**

The value of information is confusing even to the most well-educated people because it is so multi-faceted. Like other goods, the value of information is influenced both by characteristics of information itself and by market characteristics. However, those different characteristics are mostly unique to information and are unlike the attributes of most market goods. For example, information may be a private good or a public good, a raw “material”, intermediate or final product, it may be tangible or intangible, it may be confused with code or data or the systems delivering it, and the same information can be presented or versioned differently. Table I lists the various characteristics of information itself and provides examples for each characteristic or facet. Most of these facets are discussed in various parts of this review. The table is followed by an explanation of the market characteristics which are unique to information.

Each facet listed in Table I can influence the intrinsic value of information as well as the perception of value by consumers of information. Moreover, it is safe to assume that some of these facets interact. The perceived and intrinsic values do not necessarily align. Value perception in itself is fairly volatile as it changes between people and by

Facet of information	Forms	Example	Reference
Authorship	Single expert or group collaboration	Authored book or wiki project	Benkler (2006)
Tangibility	Tangible or intangible	Book or electronic file	Cleveland (1982)
Transparency	Experience good	Most types of information	Shapiro and Varian (1999)
Degree of processing	Raw, intermediate, final product	Raw data, management report, market research report	
Degree of reuse	Primary, secondary, tertiary etc.	Scientific article, abstracting service, review article	
Exclusivity	Original or copy	Exclusive tailored report or shelf study	Raban and Rafaeli (2006)
Confidentiality	Internal document or public domain	Corporate documents or government publications	
Application	Use or exchange	Management report or music album	Bates (1989); Repo (1986, 1989)
Transfer	Sell/buy or share	Consulting or advice	Benkler (2006)
Presentation	Text, audio, video, graphics	Transcript, sound track, film, photos and charts	Tufte (1986, 1990)

**Table I.**  
A summary of characteristics/facets of information itself influencing its value

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circumstances. For example, values assigned by seller and buyer to the same item of information may be considerably disparate (Rafaeli and Raban, 2003).

The value of information as an economic entity is characterized by additional peculiarities summarized in the following points. Some of these unusual attributes may seem contradictory, but in fact they are not. Information comes in various forms, physical and digital, proprietary and public, formal and personal, and so on. Each form may be influenced by some of the attributes listed below, not necessarily by all:

- Information is costly to produce but very cheap to reproduce. It is therefore difficult to assess its value using conventional economic methods such as calculating marginal cost (Barlow, 1993; Shapiro and Varian, 1999).
- The cost structure of information production makes information markets susceptible to the development of natural monopolies due to economies of scale, the need for very high initial investment coupled with a marginal cost of virtually zero (Levitan, 1982).
- Despite the high production costs information is often given away for free, more so in the web environment than ever before. This fairly new tradition has been well received by users who are now expecting free information as a norm (Kaser, 2000).
- Information can be a private good, a public good, or a hybrid good (Bates, 1989; Connolly and Thorn, 1990; Fulk *et al.*, 1996).
- Despite the enhanced freedom to publish and collaborate, studies of collaborative information spaces indicate that they are far from symmetrical (Barabasi *et al.*, 2002; Jones *et al.*, 2004; Ravid and Rafaeli, 2004). Market asymmetry is likely to have a significant impact on value perception.
- Unlike the production of physical market goods, information production is circular: information is its own raw material (Benkler, 2006). This form of production can result in adding value as well as the degradation of information during the process. Caveat lector.
- In contrast to other goods, the quantity of information does not affect its price or value (Ahituv, 1989; Van Alstyne, 1999).
- The transfer of information occurs both via market and non-market mechanisms: information is bought, sold, and given away (Bates, 1989). These activities can be performed in separate loci or in one environment concurrently.
- Absolute or marginal utility does not offer a solution either since information affords indirect utility in support of decisions, consequently direct utility measurement is inappropriate (Van Alstyne, 1999).
- Many goods offer variety. Take, for example, the variety of shoes offered on the market. Information takes variety to an extreme and offers virtually infinite variety. Infinite variety may indicate high substitution and low substitution costs. Conversely, it can also point to specialization and personalization leading to enhanced value (Shapiro and Varian, 1999).

The points raised here can be summarized into a few major aspects of the market that influence the value of information: production, distribution, access, and market structure. So while there is much enthusiasm about socially-motivated information

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production (Benkler, 2006; Surowiecki, 2004), commercial markets for information continue to develop and offer new value propositions. The effect of each aspect can be analyzed separately, however, it seems more productive to try and develop an integrated picture. User-centered value assessment is proposed here as the reflection of the integrated picture of the value of information.

Several frameworks for assessing the value of information can be found in academic literature. Broadly, this literature can be divided into four major streams: descriptive, rational, behavioral, and social. Although there may be some overlap between the four lines of literature, each offers original insight into the issue of value, adding more and more dimensions to consider when trying to develop a holistic theoretical model. The following sections discuss each of the four approaches to assessing the value of information, include a discussion of advantages and limitations of each approach, and show similarities and overlap between the four streams. Finally, a user-centered information value assessment recommendation is given and a theoretical framework is offered including a roster of possible research directions.

### **Descriptive evaluation of information**

Various articles and books described the enigmatic nature of the value of information (Ahituv, 1989; Bates, 1989; Cleveland, 1982; Hilton, 1981; Levitan, 1982; Shapiro and Varian, 1999). Levitan (1982) distinguished between information sources and resources explaining that the latter are constructed so they will not be depleted, in contrast to other economic goods. In the digital environment where information is transferred mostly by copying, the concept of depletion sounds obsolete. Still, this distinction highlights the changing cost structure of producing both the sources and the resources. Most objects of digital production and distribution, such as computers, cameras, servers, networks, are readily available to all knowledge workers, people whose jobs are dependent on the use of information. Development of the so-called “web 2.0” transpired the slogan “anyone can be a publisher” which materialized in outlets such as wiki projects, blogs, resources of homemade media productions and so on.

The development of user-generated content (UGC) constitutes a shift in the way we think about sources and resources. In collaborative environments such as wiki projects the high cost of producing information is moderated by the intensive contributions of numerous individuals, as opposed to the previous model of a long and careful review process by experts and publishers (Benkler, 2006). This resembles the open source model of software development where a “bazaar” operates alongside the traditional “cathedral” (Raymond, 2001). Yet in content production, despite the recent interest in UGC, the gatekeeping publishing model is still very relevant. Since the inception of the web, which provided new opportunities for anyone to be a publisher, there have been concerns about the quality of unstructured web sources as compared to structured library repositories (Schwartz, 1997). The proliferation of UGC raises many questions, even doubts, about the quality and reliability of such information for professional applications. We may thus witness a renaissance of traditional publishing, perhaps with a new twist, such as editing and publishing UGC.

While UGC is likely to affect economic models in the information market, another compelling concept which has yet to be fully explored is the concept of experience, described in the next section. Experience as well as service are offered as value propositions for information that “wants to be free”.

*Information as experience versus experiencing information*

In an article and later in a book Pine and Gilmore (1998, 1999) describe the progression of economic value with commodities having the lowest value, followed by products and then by services. They asserted that experiences are a fourth, and highest, source of value for any economic offering, information included. In this context, an experience is what engages people and creates memorable events and must be accompanied by a price tag. Benkler (2006) explains how services add value to information citing support and training services offered by software companies for open source software. Geri (2006) shows how a newspaper can develop value on Pine and Gilmore's continuum. A newspaper contains commodity information such as yesterday's stock quotes; it becomes a product by including specialized content such as special columns and commentary; a digital newspaper can be personalized thus providing a service. Staging an experience by a newspaper is not easy to envisage. Touring the Guinness Brewery or Universal Studios or similar landmarks are examples of information as experience good where the creative presentation of information is for sale.

Experiences are inherently personal and thus are perceived differently from person to person. This special quality makes them similar to the concept of "subjective value" introduced later in this paper.

In contrast to experience as a source of value, experience goods are items of commerce that can be fully evaluated by the consumer only after purchase and use (Nelson, 1970). Information is an experience good, the full value of which is revealed only after use (Shapiro and Varian, 1999). One must experience information personally in order to form a value judgment of it. The limited transparency of information necessitates inspection in order to formulate a value judgment. This is also known as the "Inspection Paradox", a user cannot inspect information and, in good faith, return it claiming to know nothing (Van Alstyne, 1999).

While value is created by staging an information experience, a memorable information-based event, "experience" also has a more parsimonious meaning: the act of reading and absorbing the new knowledge gained from the piece of information consumed. The question is: what is known about the value of information a priori and what is known about it a posteriori? The difference between these two values is explained by experience, using the information. The effect of experience on the value of information has yet to be explored by academic research.

*Summary of descriptive information evaluation*

Descriptions of the value of information provide accessible depictions of fairly volatile concepts. They provide a framework for further thought, however, they lack positive research evidence. Such evidence is offered by rational, social and behavioral evaluations of information, explained in the following.

**Rational evaluation of information**

Hilton (1981) identified four determinants of the value of information:

- (1) action flexibility;
- (2) payoff;
- (3) initial uncertainty; and
- (4) information system (IS).

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Hilton asserted that the first three determinants hold in particular decision making cases but cannot be generalized to predict the value of information because they are all affected by the setting or environment rather than by the system itself. The fourth criterion, information system attributes such as timeliness and accuracy, was found to be instrumental for the determination of information system value. Ahituv (1989) also explained the limited usefulness of accounting and economic approaches. However, he went on to claim that “it is almost impossible to separate the information from the system processing it. Therefore, the major concern of IS theory is how to evaluate information systems”. Current information systems, and more so web-based information technologies, split data and process, so it is more relevant to discuss the value of content separately from the systems conveying it. Ahituv (1989) recommended the subjective value of information, discussed later in this paper, as the most useful approach.

In a comprehensive review of the economic value of information Repo (1989) also explains why early theories, such as Shannon’s information theory (which deals with probabilities but not with meaning) and some further developments of it dealing with reduction of uncertainty, provide a fragmented view of the concept of “value” and thus are unable to yield a satisfactory practical definition for the value of information. In contrast to Ahituv and Hilton, Repo clarifies a distinction between information (content) and the system (a product) storing and delivering it by acknowledging the intellectual side of information use and assimilation.

Another important distinction made by Repo is in two approaches to the measurement of information value: value-in-use and exchange value. Briefly, value-in-use means the degree to which information was instrumental for a decision or a task. This value should be studied using a cognitive approach according to Repo. An interesting refinement Repo offers is between the expected and perceived value-in-use, referring to the value assigned to information before and after use, respectively. This is a reminder for the concept of “experience good” explained earlier. The value-in-use approach seems to suggest user-centered value assignment. Exchange value refers to the monetary value ascribed to information and, according to Repo, should be studied with classical economic methods. Later in this paper the section on subjective value cites work on monetary (i.e. exchange) value which is user-centered, or subjective. Repo concludes his review by asserting that the two types of value were researched separately but should be studied in one, unified, model using the case study method. The section on social evaluation of information (below) offers an alternative method for obtaining insight into the relationship between economic and non-economic information exchanges.

#### *Summary of rational information evaluation*

The rational approach to the value of information assumes that the value is inherent in the information, the message, itself. Developing normative or realistic (Ahituv, 1989) methodologies to calculate the value inherent in information, assuming that users are rational and are able to see and assess a complete picture of any given decision situation, is probably somewhat deficient.

The strength of economic analysis is in the provision of theoretical tools and models that describe how information should be valued. Their limited applicability to real-life

evaluation of information combined with little empirical evidence diminishes the external validity of economic approaches.

One more potential drawback of economic analysis is that items of information that have no economic value are deemed worthless, yet, intuition and current web practices tell us that when users or circumstances change information can have value. Further, valuable information may gain some of its value by comparison to “worthless” information, so the latter’s value is as a benchmark.

An important theoretical and practical facet of information is its definition as a good in trading. Earlier in this paper information was described as an experience good. This definition should not be confused with definitions of private and public goods given below. Definitions of information goods will lead to a description of information markets and the social aspect of information evaluation.

### **Social evaluation of information**

By definition, human networks are socially-constructed and are created as a result of patterns of information flow between participants (Brown and Duguid, 2000; Rafaeli *et al.*, 2005). Online social cognition, the perception of ourselves and of others online, as well as social interactions influence the perception of information and its value in networked environments. Since this article focuses on information markets, the discussion of social evaluation is preceded by an explanation on information goods found and types of information markets.

#### *Information goods*

A private good is a good that is both excludable and rival. A good is excludable if it is possible to prevent someone from consuming that good once it has been made available to the public. A good is rival if one person’s consumption of that good reduces the quantity available for consumption by someone else. A book or tailored market research report are examples information as private good.

A public good is a good that is both non-excludable and non-rival. One person’s use of a public good does not deprive others from using it and if one person consumes it others cannot be restricted from consuming it too. Public television broadcasts or online discussion forums are examples of information as public good.

Information is unique in appearing both as public and private good. Parker and Houghton (1994) contend that information is mostly viewed as a private good when analyzed by economists. Repo (1989) and Benkler (2006) maintain that as a matter of fact most information is of the public good type.

Information can be either a private or a public good. As private good, naturally, the value of information may increase as a function of scarcity and demand. Many other factors can influence the value of information as private good, such as reputation of the author, relevance, validity, reliability (Parker and Houghton, 1994). When information is a public good, its value increases as the number of users increases. Some authors (Kelly, 1998) described this as a new economy but it is actually an intensive manifestation of known economic rules about various types of goods (Shapiro and Varian, 1999).

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*Information markets*

Information is unique in enabling the formation of mixed markets where public and private information goods co-exist. The web is a natural place for developing information markets and since these markets form in a social network environment they are likely to be influenced simultaneously by economic and social incentives. Researching information markets using unobtrusive methods is a golden opportunity for field research on human preferences and behavior. Mixed markets give rise to challenging research questions, for example: what is the incentive structure in such markets? Does co-existence generate healthy, long-term, activity or is the market cannibalized by the free activity? One such market was the fee-based Google Answers (GA) service described by Google as: “a way to get help from Researchers with expertise in online searching” (<http://answers.google.com> – the service was discontinued by Google as of 1 December, 2006). GA Researchers provided answers for a fee and at the same time the system enabled any registered user to send comments freely without a charge. Little academic research is available on active mixed information markets.

*Social and economic incentives in information markets*

Two empirical projects focused on GA (Edelman, 2004; Regner, 2005). In both cases, the theoretical orientation stressed the view of information as a private good and to varying degrees studied the behavior of actors on GA as an instance of labor economics. The guiding question driving those studies was an attempt to explain information economics in either labor or behavioral terms. The focus was on monetary incentives for providing answers. Another line of research, unrelated to GA or to information markets, examined the relationship between social and economic incentives in markets for private goods (Heyman and Ariely, 2004). Social incentives are non-monetary benefits that arise from social activity. They may include things like reputation, trust or reciprocity. Heyman and Ariely’s research showed experimentally that effort increases with payment in economic markets but is independent of compensation in social markets. Further, social markets were corrupted when monetary incentives were introduced. This experimental finding was supported by empirical research on the GA information market (Rafaeli *et al.*, 2007).

Rafaeli *et al.*’s research diverged from pure rationality and offered an examination of the value of information from a social and communication perspective (Rafaeli *et al.*, 2007). Analysis suggested that, beyond economics and pricing, social incentives played an important role in generating market activity. GA Researchers were more likely to answer questions that generated much discussion in the form of (free) comments. In this case public goods (comments) enhanced market activity around the private information goods (answers). The link between these different two types of goods is, apparently, social. The development of the GA market over a period of 29 months indicated that economic activity increased and that some of the motivation for this increase was social. In line with Heyman and Ariely (2004) the rise in activity was linear suggesting that despite the contribution of social incentives, economic incentives dominate: social markets tend to develop exponentially rather than linearly. Yahoo Answers is an example of a purely social information market as all activity there is free of charge and the rise in activity is exponential. Further research is needed on the social network structure of mixed markets in order to highlight the relation between social

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and economic participation. A comparison to purely economic and purely social markets would also be of great value and interest.

In summary, the effect of social incentives in information markets suggests further exploring the individual behavioral decision making process. Possibly, understanding individual behavior may evoke new thinking regarding social processes. The next section describes research on behavioral decision making in information consumption and raises some suggestions for further research.

### **Behavioral evaluation of information**

Earlier it was claimed that various facets listed in Table I as well as additional economic traits may influence the value of information. A rational actor would develop methodology to weigh the contribution of each facet, calculate a score for each attribute and make a decision based on the weighted outcome. Research suggests otherwise. Herbert Simon's pioneering research on bounded rationality (Simon, 1955) paved the way for subsequent behavioral decision making research (Kahneman, 2003). This line of user-centered research suggested that people often skip the cognitive aspect of evaluation and make intuitive judgments also known as heuristics. Repo (1989) suggested using cognitive methods for the study of expected and perceived value-in-use. However, the rich tradition of behavioral research seems more promising regarding the value of information. Various behavioral biases have been identified which may lead to errors in judgment, sometimes referred to as "blindspots", implying a problematic individual decision making process which in business contexts may lead to loss of business or even the demise of companies (Fleisher and Bensoussan, 2002).

The tradition of studying decision-making under uncertainty has addressed patterns of information use and the value assigned to information. The heuristics experiments (Tversky and Kahneman, 1982) as well as later studies (Kahneman and Lovallo, 1993) demonstrated that people tend to ignore available information such as prior probabilities, sample size and the like. Instead, decisions are based on shortcut heuristic methods such as representativeness, availability, and adjustment and anchoring. Early experiments have also shown that people tend to be conservative and undervalue information available for the revision of a prior opinion (Branthwaite, 1975). Later experiments showed that participants preferred to seek information and to base their choices on (objectively) non-instrumental information (Bastardi and Shafir, 1998). A similar effect was shown in judgment tasks (Gaeth and Shanteau, 1999). In other words, people assign positive value to objectively worthless information. Theory also suggests that people seek information because it seems the right thing to do (Feldman and March, 1981), implying over-demand for information and a high perceived value. People tend to accumulate information "just in case" they may need it in the future, again leading to excessive demand (Van Alstyne, 1999). The theoretical tension is, therefore, between studies indicating that information is under-valued and research showing information to be over-valued. In all these cases the value of information is determined by the user, it is subjective.

### **The subjective value of information**

Social and behavioral influences are at the heart of individuals' use of information and information systems (Rafaeli *et al.*, 2005). People's biases and reactions to their social environment form their subjective evaluation of information. Previous research

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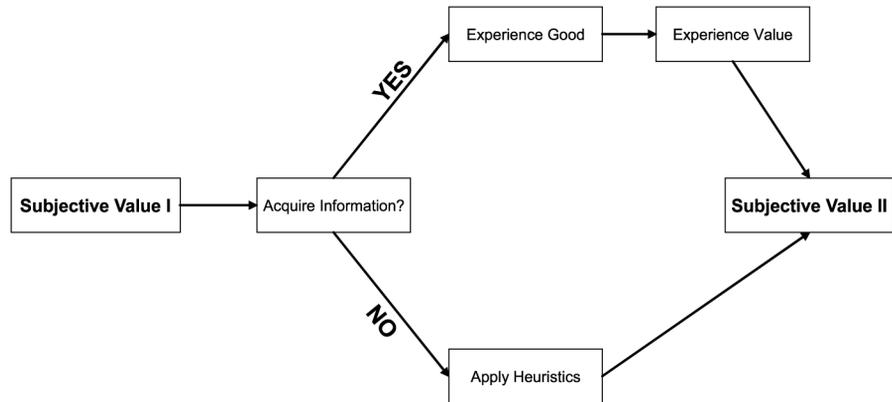
described behavioral biases concerning the evaluation and consumption of information. For example, findings suggest that people still handle information as if it is a scarce commodity, hoarding information and misevaluating its usefulness (Raban and Rafaeli, 2006). An important bias identified was the presence of an endowment effect concerning the consumption of information whereby willingness to sell information as demonstrated by a high asking price (WTA) was considerably higher than willingness to pay (WTP) for the same information under the same conditions except for the locus of ownership (Rafaeli and Raban, 2003).

The main implication of the endowment effect is under-trading. The disparity between buying and selling price bids leads to a diminished rate of trade compared to the theoretically-expected 50 per cent rate (Kahneman *et al.*, 1990; Thaler, 1980). Under-trading is known to occur in markets for most types of goods (Horowitz and McConnell, 2002) and was observed for information goods in laboratory experiments. Interestingly, a separate analysis of the buying and selling bids for information showed that buying trades occurred more often than selling trades. Close to 40 per cent of the buying trades occurred whereas only about 19 per cent of the selling trades materialized. Under-trading happens when pricing is done by the seller, but when value assignment is done by the buyer, the user, the rate of trade is accelerated.

Returning now to the Google Answers information market (mentioned earlier in the section: "Information markets"). That market rested on user-based pricing and developed well over its four-year existence with market prices increasing from a mean of about \$16 per answer to about \$33 per answer in a period of less than four years. Tips per answer increased from a mean of about \$7 to \$11. These changes suggest that user-centered value assignment can result in a vibrant market for information goods, in this case search questions.

The outcome of the research on subjective value of information using endowment effect methodology is its advantage and also its limitation. The advantage is the novel experimental elicitation of the subjective value of information in monetary terms. Subjective value is the value perceived and assigned by the user prior to purchase and/or use of the information. Subjective value is elicited by an incentive-compatible bidding mechanism. The limitation is that we are uncertain about the post-use subjective value or experience value, or perceived value according to Repo (1989), of the information to the same user after use.

It is of high theoretical and applied interest to investigate whether the post-use, experience, value is similar to or considerably different than the subjective value. Assuming that bounded rationality remains constant, eliciting subjective and experience values will provide a measure for the extent of the inspection paradox associated with the consumption of information in various circumstances. "Experience value" corresponds with the well-known term that characterizes information as an economic good, experience good (Nelson, 1970; Shapiro and Varian, 1999). Experience value refers to the value of information revealed to the user after use. Experience value is believed to be an important antecedent in the formation, and possibly the moderation, of the subjective value of information in subsequent decision points. Figure 1 depicts the possible relationship between the subjective and experience values.



**Figure 1.**  
Subjective and experience  
values in  
information-related  
decision making

While subjective value is about a priori value assignment, experience value may affect subsequent decisions regarding the purchase of information and thus become part of the user's mind-set (or bias-set) for future decisions and formation of subjective value in ensuing events requiring information.

Experience value may affect subsequent subjective value either positively or negatively due to different reactions to the confirmation bias (Jonas *et al.*, 2001). Some people may value information highly when their expectations have been confirmed while others may view confirmation as redundant and assign it lower value. Research is needed to show whether a preference for confirmation also leads to higher assignment of subjective value. Recent research on insurance services as experience goods did, in fact, show a learning effect regarding the evaluation of the experience goods (Israel, 2005). Consumers who experienced the service were initially more likely to switch insurers but later, consumers who stayed were more likely to continue consuming services from the same insurance company. This study indicates that there is a time-dependent relationship between experience value and subjective value. This relationship has not been studied for information goods and it is not obvious that it should be similar to the findings in the case of insurance services, since other effects (information hoarding, confirmation bias to name a few) may influence value formation.

#### *Summary of behavioral information evaluation*

Prospect theory taught us that people tend to be less than rational in decision making and mis-evaluate information available to them. Information systems research identified the concept of subjective value as central to the evaluation of information. This paper proposes that subjective value is not static, it may change with experience gained, it may be affected by a variety of behavioral biases, and it may change over time. These various possibilities must be researched and supported with experimental and empirical work. Research should cover the effect of many variables from the personal-affective realm to the external market environment. User-centered evaluation of information should be used both as a diagnostic of people's information literacy and as the focus of development of information markets.

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### Information value assessment

Early research cited previously advocated that the value of the system conveying information and the value of the content stored and transmitted within the system should be assessed as one since they are inseparable. In the current age of user-generated content systems and the content in them are separable. While system and content may be complementary the value of each should be studied separately with a focus on behavioral and social influences on subjective and experience values.

This focus places the main interest in the content and the user with the system being a “transparent given”, or regarded as infrastructure (Carr, 2003). Acquisition and use of content is done on a daily basis as part of the routine of knowledge workers. In fact, it is said to require about 30 per cent of their time according to some popular estimates by market research firms. We know very little about users’ information evaluation practices. Prior behavioral research teaches us that value is in the eye of the beholder, and is often different than objective value inherent in the content itself. Therefore, to inform daily information consumption patterns and possibly attenuate them, the focus of research should be on users’ subjective evaluation of information.

### Summary

The value assigned to information by the user is of critical importance in information consumption patterns by knowledge workers and a central element in information literacy. This paper is an attempt to shed light on how users perceive the multifaceted concept “value of information”.

The paper reviewed four main approaches to evaluating information:

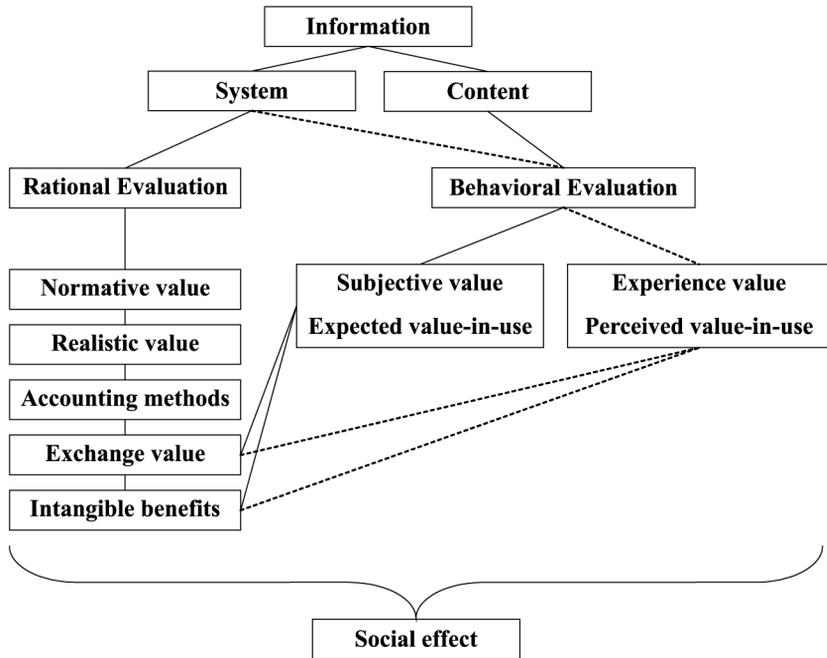
- (1) descriptive;
- (2) rational;
- (3) social; and
- (4) behavioral.

The theoretical progression and the links between different theories is depicted in Figure 2.

Figure 2 shows the conceptual links between information-centered and user-centered approaches and points areas for future research. The behavioral as well as some of the rational methods provide empirical ways of discovering value. Social effects also show promise: Beside the Google Answers research findings studies on social facilitation provide additional hints in this direction (Rafaeli and Noy, 2002, 2005) but much research is needed to establish social effects as the third leg in the quantitative assessment of the notion of value, in addition to behavioral and rational considerations. Table II summarizes the areas identified here for further research.

The topics suggested in Table II invite research in several levels: conceptual, experimental, and field work.

A comprehensive theoretical framework for the value of information is one that will combine economic, behavioral and social approaches and provide a theoretical basis as well as a practical assessment method. Currently, research on social effects on information evaluation is in its infancy and its place in a larger theoretical framework is not well understood. Social effects may be direct or they may be mediated through individual behavior.



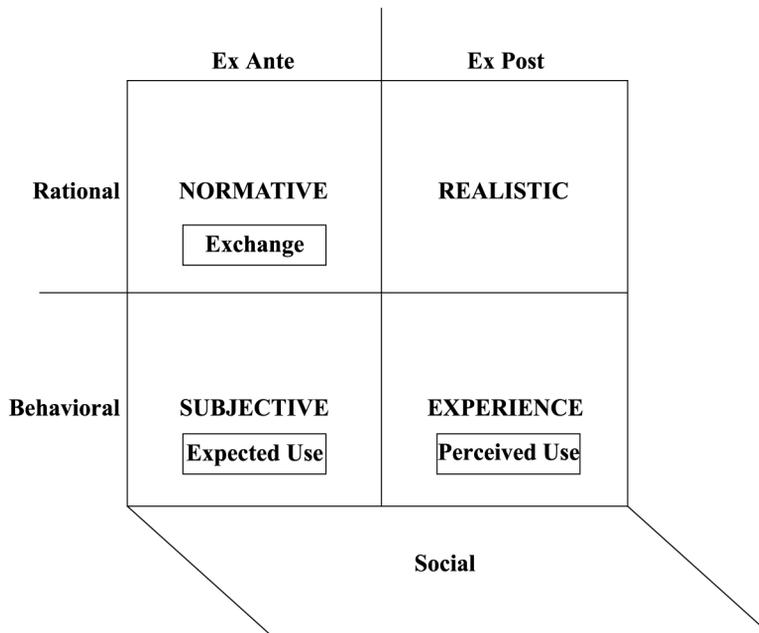
**Note:** Dashed lines denote future research proposed

**Figure 2.** Summary of theoretical progression and links between theories

Approach	Suggested research
Behavioral	Establish conceptual and quantitative differences between subjective and experience values Quantify the inspection paradox Investigate the effect of the confirmation bias on experience value Explore whether experience value changes with time Introduction of voluntary payments in information markets
Social	Conceptualize and test social motivations for economic activity in information markets Social facilitation in information markets

**Table II.** Summary of main research topics suggested in this review for studying user-centered evaluation of information

Ahituv (1989) explained that there are three ways to assess the value of information: normative, realistic, and subjective. The first two belong to the rational methods of evaluation and offer either *ex ante* or *ex post* evaluations. Subjective assessment belongs to the behavioral methods of evaluation and expresses perceptions which are *ex ante* evaluations. Repo (1989) acknowledged the interplay between the exchange (economic) and use value of information and mentioned the expected and perceived values in relation to value-in-use. This paper described methodology for assessing the subjective value of information which puts a monetary value on the concept of value-in-use. Similar methodology may be employed for establishing the experience



**Figure 3.**  
Theoretical framework for the value of information

value of information, ex post subjective value. To simplify this explanation the major approaches to combining all theories into one framework describing the various theoretical approaches to the value of information. Figure 3 depicts the convergence of the different theoretical approaches into one framework.

Figure 3 shows that experience value is a natural development of Ahituv's (1989) and Repo's (1989) frameworks as well as of experimental work by Raban and Rafaeli (2006). Figure 3 also suggests that social effects are important because they may influence every kind of information value assessment method. More empirical research on the value of information is needed to expand on subjective value at the individual and group levels. Experience value has yet to be investigated empirically. Finally, social effects on the subjective and experience value of information invite theory development as well as empirical research.

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