

## **A Sociological Framework for Information Quality in Virtual Knowledge Communities<sup>1</sup>**

**Daniel Diemers**

University of St. Gallen  
daniel@diemers.net

### **Abstract**

This paper discusses the social dimension of information quality in the context of knowledge management in the eEconomy, based on the epistemological concepts of the newer sociology of knowledge. Witnessing a new level playing field influenced by eBusiness and eCommerce, corporate practices of knowledge exchange and transfer are increasingly becoming critical success factors. Accordingly, the duality of knowledge management, which differentiates personalized and codified knowledge management, is taken as an argument in favor of a sociologically influenced conceptualization of virtual knowledge communities (VKC), which form a primary organizational resource towards efficient practices of exchange of personalized knowledge. This shift from traditional IT-based knowledge management to more socially conceptions of community-based knowledge requires a very distinct framework on how to measure, assess, and identify information quality (IQ). Thus, the primary focus of this contribution is to develop such a framework, which nevertheless remains compatible and relates itself to established conceptualizations of information quality.

### **1 Introduction**

At the last year's IQ'99 conference I've presented my work on "*the social dimension of information quality and knowledge*" (Diemers 1999b, see also Diemers 2000a). Therein, the interpretative paradigm of the newer sociology of knowledge has been introduced within the context of information quality and knowledge management. Based on the works of Alfred Schutz, Peter L. Berger, and Thomas Luckmann, I've proposed a model of the basic transformational process in knowledge management. The model tried to conceptualize the culturally influenced cognitive processes of internalizing externalized information, a process which stands at the heart of various concepts and theories on knowledge management.

For the presentation at the conference I've extended the paper's results with a more detailed and elaborate confrontation of currently available frameworks of information quality. The specific slide that aroused interesting discussions has now been included in this paper with some minor modifications. During last year's conference I've also taken the opportunity to address several questions and issues concerning my specific sociological approach. All these points have now been included in this paper. Furthermore, I'm presenting now results of more research on that topic and I'm making a new proposal of a sociologically influenced framework for information quality.

As a new perspective, I'm including the notion and concept of virtual communities in the context of information quality and knowledge management. This conceptualization of community-

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based exchange and management of knowledge in firms, which I call virtual knowledge communities (VKC), is also based on strong sociological foundation. This sociological perspective includes classic works by Ferdinand Toennies and Max Weber, the renowned community studies of the Chicago School in the 60s, and recent research and ethnographies within the increasingly popular discourse around virtual communities.

Being completely aware of the fact that I once again submit a slightly “exotic” contribution to the field of information quality by taking an admittedly marginalized – but surely not marginal – perspective. Nevertheless, I hope to be able to combine knowledge from two distinct, but related disciplines, and to identify some of the manifold challenges that have become relevant in new business models for a knowledge-based eEconomy.

## **2 New Challenges of the eBusiness Environment**

The new eBusiness environment can be characterized by high market volatility and an increasing uncertainty of decision makers about key market drivers. From a management perspective we have two important contingencies that will influence the performance of global companies over the next decades. The first is the evolution of Internet-based commerce and business, the second is the shift of negotiation and market power from producer to consumer. Both tendencies are obviously triggered by the development of virtual spaces, and both tendencies will definitely have a substantial impact on the way we will be doing business in the future.

The first contingency correlates to the emergence of virtual spaces. These spaces have evolved into a new interaction media to share information, communicate, express one's opinion, or settle contracts. As a very low-cost, time-effective communication platform, the Internet has become a major facilitator for shareholders, stakeholders, market makers, analysts, and contractors. But this development also includes specific dangers, e.g. business misinformation or harmful rumors that may eventually spread and impact on exchange markets and markets. A second issue is the challenge of information quality on the internet in general or within a corporate intranet in particular, the third issue is the problem of information overload.

The second contingency is related to the shift of market power and the emergence of global virtual communities. Due to an increasing amount of available market information and the possibility to compare market prices, consumers have more options to choose from. This development is even more relevant within the eEconomy, witnessing the fact that virtual communities are increasingly becoming new patterns of social practice. Virtual communities allow people to team up with likely minded consociates independently from time and place. Members of virtual communities share a common interest and use virtual spaces as a media platform, which is very low cost, may potentially have a broad impact, allows for anonymity, and is in many aspects uncharted territory from a legal point of view.

As a consequence, new modes of organizing have evolved, which allow companies to decentralize, to share resources, or work on joint projects for a limited period of time. These new organizational forms are commonly referred to as virtual organizations, or virtual corporations. They have changed the level playing field in such a significant way that large firms are no longer in the position to dominate markets, but are increasingly being challenged by smaller, more agile firms. These small virtual organizations are able to easily adapt their structure to a specific project and change their market focus quicker than their large counterparts (Davidow/Malone 1994, Nohria/Berkeley 1994).

Within this paper one important feature of the new eEconomy is the rising importance of knowledge as a primary resource in firms, both in large, traditional firms and in small eBusiness firms. This argument is supported by three observations: first, the transformation of the industrial economy to a service sector, where immaterial resources are the most important assets of a firm. Second, generally accelerating innovation cycles, which can also be observed in traditional industry segments. Third, the rising importance of business intelligence systems, IT-based knowledge repositories, and knowledge management practices for successful market activity.

### 3 The Role of Knowledge Management and Information Quality

In the context of the eEconomy we currently observe a very wide scope of different business models. In most of them, practices of knowledge creation, processing, sharing, and distribution play a significant role. In general it can be said that an added value for customers within the eEconomy can be offered either through eBusiness service solutions, or through an exchange of physical goods over virtual eCommerce platforms. Both types of business activity rely heavily on institutionalized processes of knowledge transfer and exchange.

An interesting point here is the observation that issues of information quality (IQ) are rarely conceptualized or included in new business models for the eEconomy. This is even more astonishing given the fact that the epistemic dimension of such new business models is typically conceptualized by knowledge management infrastructures and tools, which are in most cases very technical in nature.

In this context, we take a closer look at the implicit duality of knowledge management theory and practice, which differentiates a technical, IT-based approach to knowledge management (*processing & distribution perspective*), and a social, community-based approach to knowledge management (*sharing & socialization perspective*), see accordingly table 1. Within this duality, we can generally divide activities under the notion of knowledge management into management of personalized and codified knowledge. While the first is a soft-skill, social approach to generate and distribute knowledge within knowledge communities, the latter is clearly an issue of sound IT and database infrastructures. Traditional knowledge management theories are, from that perspective, more concerned with codified, externalized knowledge than with personalized, implicit forms of knowledge.

<b>personalized knowledge</b>	<b>codified knowledge</b>
implicit / tacit knowledge	explicit knowledge
stored in cognitive brain structures stored in personal notes, reminders, symbols etc.	stored / visualized / externalized on paper, in knowledge repositories, etc.
personal networks, communities, experts	hierarchies, libraries, IT infrastructures,
knowledge transfer by interaction	knowledge transfer by media transfer
sharing and socialization	processing and distribution
contextualized interpretation	decontextualized interpretation
remembering	accessing/retrieving data
forgetting	loss of data, loss of index structure

*Table 1: The Duality of Knowledge Management*

While early conceptualizations of knowledge management both in theory and practice have been focusing heavily on IT-based knowledge repositories and systems to manage codified knowledge,

we currently observe a certain growth in interest in and popularity of approaches that focus or include sociologically influenced, community-based methodologies for management of personalized knowledge (see Von Krogh/Ichijo/Nonaka 2000, Nonaka/Konno 1998, Von Krogh 1998, Huemer/Von Krogh/Roos 1998). This general tendency is in line with several experiences within contemporary knowledge management practice, where well designed, technical knowledge management systems often failed to achieve the expected benefits. Most of these soft-factor impediments to knowledge management can be subsumed under four main paragraphs.

First, in almost all business activities, there is some specific knowledge that cannot be made explicit for a wide range of reasons, e.g. high complexity, high degrees of automatization, strong habitualization of practices, conflicts in time and priority, inapt instruments for knowledge externalization.

Second, experience shows that in many cases there is no intrinsic willingness to externalize knowledge in the most adequate and optimal way. Typical reasons for this are often individual strategic thinking, power relationships, lack of trust, or lack of emotional bonds.

Third, people have only partial capabilities to interpret decontextualized external knowledge, e.g. because of cross-cultural differences, semantic incongruencies, misinterpretations, and misunderstandings (Diemers 1999a).

Fourth, externalized knowledge is too quickly becoming unusable, as too little context information is being included, or classifications and indexes are misconceived.

Point 3 and 4 are obviously interesting issues within the context of information quality. The now following conceptualization of community-based knowledge management shall address these impediments. While a solid IT-based knowledge repository and corresponding knowledge management tools are important components of this distinct approach to knowledge management, the community-based model is an attempt to conceptualize the social aspects of knowledge exchange. It is clear from a perspective of information quality that such a twofold model requires a very elaborate framework on how to measure, assess, and identify quality information within such an environment. Before we turn to that main issue in section 5, we will now introduce the concept of virtual knowledge communities.

#### **4 Virtual Knowledge Communities**

Our approach to community-based knowledge management is based on three theoretical discourses: the interpretative paradigm of the newer sociology of knowledge, the sociological understanding of and theory about communities in general, and the heterogeneous discourses around virtual communities, both from a sociological and business administration perspective.

The typical notion of community usually opens large patterns of diffuse associations, which might include social networks, family, neighborhood, clans, emotional bonds, and several more. Ferdinand Toennies (1922) was the first to approach the term community from a scientific, namely sociological, perspective. To Toennies a community was the *nucleus* of social life, the very essence of living together with our consociates. He accordingly differentiated three types of communities:

First, communities of blood that comprise very close, family relationships over a long period of time, with high levels of intimacy, trust, and emotional bonds.

Second, communities of place and proximity that constitute themselves voluntarily or involuntarily as soon as people are sharing the same physical space. This type includes for

example neighborhood communities, street gangs, cell mates in prison, campus communities, which evolve as a result of shared resources, repeated interaction and processes of habitualization that facilitate and structure our daily interactions.

Third, communities of mind that are formed voluntarily on the basis of shared interests, common practices, intellectual exchange, likeliness, and friendship.

This basic typology was later enhanced by Max Weber (1914) and others, but may still serve as a basic differentiation scheme today. In the first half of the last century, the scientific discourse around communities was often accompanied by a morally biased critique of modern society. That discourse, by the way, regained recently new attention as a result of the technologically induced transformation of society. In the sixties, however, the community studies of the Chicago School were a remarkable turning point, in that scientists started to research communities based on a purely ethnographic, descriptive empirical methodology (Bell/Newby 1971, Foster 1997, see also Hannerz 1992, Cohen 1985, LeVine 1984, Cole et al. 1971, Geertz 1973).

During the early years of the Internet a wide variety of virtual communities evolved in MUDs, chat rooms, and discussion boards. In this context, detailed ethnographic community studies became popular, but attracted only a small group of anthropologists, sociologists and psychologists (see for example Baym 1995; 1998). After several years, however, the social phenomenon of virtual communities gained a certain level of popularity in broader media, a development which can be related to certain authors like Howard Rheingold (1993; 1995) or Sherry Turkle (1994; 1995; 1996). Fueled by the euphoria about eCommerce, the discourse around virtual communities entered a new field, namely management practice and business administration theory, and the term became lately a popular buzz-word in business models for the new eEconomy (see Hagel/Armstrong 1997, Pinchot 1998).

In our understanding, a virtual community is basically a community that constitutes itself fully or to a major part in virtualized interaction spaces. Looking at it from a sociological perspective we can identify seven different factors of cohesion that characterize a the social phenomena of community: shared interests, shared norms and values, common interaction platform, emotional bonds, continuity, reciprocity, and identity construction (Eppler/Diemers 2000). Accordingly, we can use the following definition for communities:

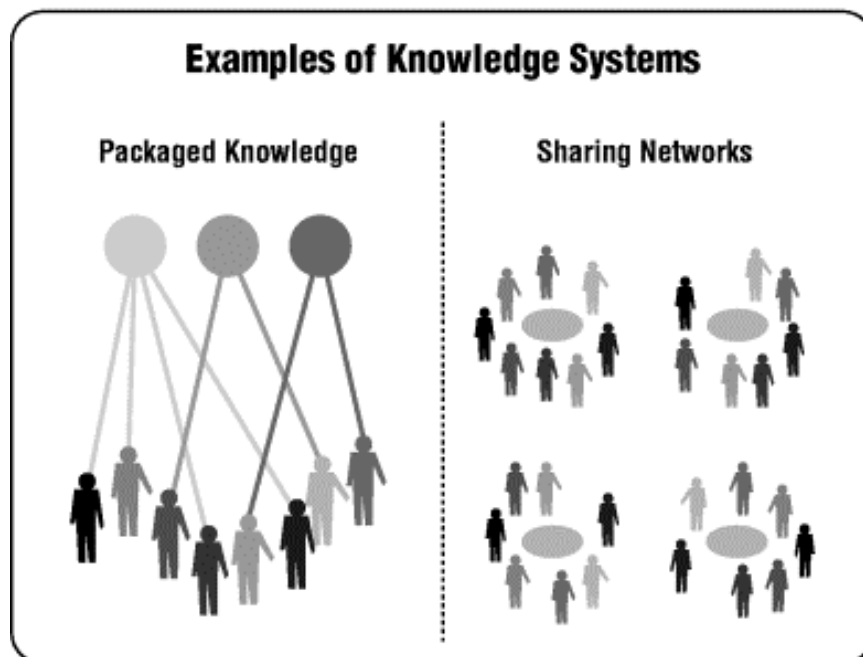
*Communities are specific social networks of participants who share common interests, an interaction platform, and some common values and norms. In addition, a sustainable community requires a minimal degree of reciprocity among the participants, continuity, and emotional bonds.*

A virtual community, then, is a community that uses primarily virtual interaction platforms for communication. Of course, this also implies that members of a virtual community share a virtual space, but not necessarily a physical space. Within the scope of virtual communities, different spatial configurations may evolve, from hybrid forms, where community members meet regularly face-to-face, to completely virtual communities, where members have never met each other in physical space.

Komito (1998) made a distinct analysis of different facets of communities in the context of virtual modes of social interaction. Her basic distinction is between *proximate communities*, where a common interpretative space is constructed on the grounds of proximity in virtual spaces and involuntary membership, *moral communities*, where a common interpretative space is based

on moral bonds, communal solidarity and a sense of common purpose and commitment, and *normative communities*, such as communities of practice or communities of interest, which are usually directed towards economic or scientific goals, and share corresponding values and norms (see also Diemers 2000b).

Virtual knowledge communities (VKC), then, are normative virtual communities that have been formed with the purpose of facilitating knowledge management in a business context (see Brown/Duguid 1991). Such forms of VKC are typical for large consulting firms, where communities of practice exchange *best practice* and *lessons learned* in order to leverage knowledge across the firm. Traditionally such forms of knowledge management have relied on IT-based systems for collection and distribution of packaged knowledge. Surprisingly, such systems often reveal very low performance and effectiveness, a fact which can be attributed to the above mentioned soft-factor impediments to knowledge management. As a consequence, a second, complementary approach has been undertaken with sharing networks, which in fact constitute forms of virtual knowledge communities. These two different models of knowledge management are depicted in table 2.



*Table 2: Example of a Conceptualization of the Duality in KM Practice (source: Harvard Conference 1996)*

While these social forms of community-based knowledge management have proved to be very effective in business practice, only little scientific research has been carried out on that topic so far. What is even more striking is the fact that very few authors attempt a transfer of sociological knowledge on communities and virtual communities into this field.

From both an epistemological and practical perspective virtual knowledge communities offer several interesting fields of research: How do these communities store, share, and refine their knowledge base? Which epistemologically relevant patterns of interaction have been established over time? How can we identify and observe social processes within virtual knowledge

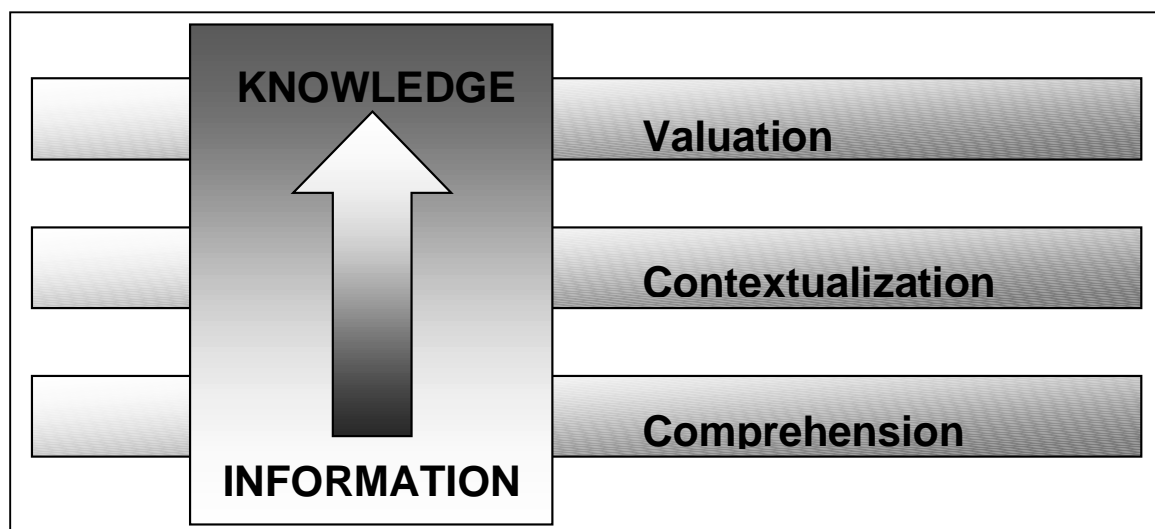
communities? What are typical roles that evolve over time? Which roles can be institutionalized within VKC from a functional perspective? Which tools can be implemented to support members of a VKC? How can such communities actually leverage knowledge, and how are they able to solve complex, multi-dimensional issues? How can we measure the performance and quality of interaction within a virtual knowledge community?

While all of these research questions are important for a conceptualization of virtual knowledge communities, the issue of performance and quality measurement is nevertheless of substantial relevance for managing VKC in a business context. This is why I'd like to focus now on a framework for information quality in virtual knowledge communities, which may serve as a starting point to develop tools and procedures for measuring and assessing performance and quality within a VKC.

## 5 A Framework for Information Quality in Virtual Knowledge Communities

Social interaction and exchange of knowledge are by definition key activities in virtual knowledge communities. From a general management or knowledge management perspective the idea of measuring the quality of an information exchange process is crucial. This is obviously the point, where the field of information quality becomes of primary relevance. In order to assess and value internal processes in virtual knowledge communities, we need a framework and respective criteria to measure information quality.

Recalling the duality of knowledge management, which is also reflected within VKC, a framework for information quality has to include both the technical, IT-based level, and the community-oriented, social interaction level of knowledge exchange and transfer. A good starting point for such a framework is the basic model of the transformational process, which focuses on the cognitive processes that turn information into knowledge, as presented at the last year's conference (Diemers 1999b, Diemers 2000a).



*Table 3: The Transformational Process of Knowledge Management*

That model tried to conceptualize the basic, but complex question of how contextualized information is actually transformed into personalized, situated knowledge and vice-versa, a question which has to be answered by any methodology on knowledge management. According to the epistemological foundations of Schutz, Berger, and Luckmann, information may or may not be sedimented in our cognitive structures during any interaction, but if it is, we can speak of an internalization of information. The chance of successful internalization depends on how a certain information corresponds to our system of relevancies, i.e. our prioritization and plans within the daily life-world, and to our already internalized typifications and objectivations, i.e. the information's degree of connectivity to other, sedimented epistemic structures (Schutz/Luckmann 1974; 1983, Schutz 1982, Berger/Luckmann 1966, Hall 1997).

This actionable component is important, because generally an internalization of information will only take place if there is a possible and intended future action of the internalizing subject related to it. In this theoretical perspective such individually internalized, actionable information is finally what we refer to as personalized knowledge. The introduced model then conceptualizes the stages from information to knowledge along the processes of comprehension, contextualization, and valuation.

Generally it can be said that the transformational process stands at the heart of a framework for information quality in VKC. Accordingly, we need for every stage of the process appropriate criteria, which allow for measurement and assessment of the quality of information exchanged. In Table 4 different scientific conceptualizations of information quality have been assembled and integrated, namely the models and contributions of Kahn, Strong, and Wang (1997; 1998), Wand/Wang (1996), and Shanks/Darke (1998). The information quality goals and criteria have then been related to the respective levels of the 4x4 PSP IQ model by Kahn/Strong/Wang, the respective levels of information quality in Shanks/Darke's contribution, and my own sociologically influenced conceptualization.

Please note a certain semantic incongruency within the useful/usable criteria. In the original 4x4 PSP IQ model usefulness stood conceptually above usability, which would correspond fully to the sociological conceptualization of the transformational process, where only useable (level of comprehension/contextualization) information can be useful (level of contextualization/valuation) for someone, but not vice-versa. The order of useful/usable was then, however, reversed as a result of empiric validation with information quality practitioners (Kahn/Strong 1998). This incongruency, thus, only reflects the diffuse modes of apperception of information quality among practitioners, and is not a substantial semantic difference between the different information quality models themselves.

<b>Levels of IQ</b> <i>Diemers 1999a</i> <i>Shanks/Darke 1998</i>	<b>Model Components</b> <i>Diemers 1999a</i>	<b>Goals</b> <i>Shanks/Darke 1998</i> <i>Kahn et al. 1997</i>	<b>Properties</b> <i>Shanks/Darke 1998</i> <i>Wand/Wang 1996</i>	<b>4x4 PSP IQ Model</b> <i>Kahn et al. 1997</i> <i>Kahn/Strong 1998</i>
Valuation (pragmatic level)	Belief, System of Relevance, Attributions, Labels	Usefulness (Usability)	reputable timely accessible concise	Usability
Contextualization (semantic level)	CIS, Social Context, synchronized Typifications and Representations	Usability Accuracy	understood  complete unambiguous correct	Usefulness Dependability



Comprehension (semantic/ syntactic level)	Signs, Meanings, Syntax, Language, Protocols	Comprehensiveness Consistency	meaningful well-defined Syntax	Soundness
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*Table 4: An Integrated View on Different Models of Information Quality*

Based on this integrated conceptualization on information quality let us now further operationalize the respective measurement and assessment criteria. From a management perspective it would also be interesting to identify opportunities for pro-active management of virtual knowledge communities based on the underlying conceptualization of information quality. This conceptualization may principally be differentiated into a technical and personalized view on knowledge, an issue which has already been discussed in section 3 as the inherent duality of knowledge management.

While this contribution addresses primarily the personalized dimension from a sociological perspective, the technical side is indisputably a necessary condition, a *conditio sine qua non*, for any conceptualization of information quality in the context of virtual knowledge communities. Several authors have elaborated various approaches to these prerequisites of data and information quality on the technical level (for an overview see Naumann/Rolker 1999). Typical criteria for such technically focused IQ measurement include accessibility, response time, latency, data integrity, and so forth.

In order to conceptualize IQ within management practices of personalized knowledge, I propose measurement criteria for each transformational level respectively. Then, some general opportunities for IQ management in the context of virtual knowledge communities are identified. The results of this conceptual framework are finally consolidated in table 5.

On the comprehension level quality information is related to correct syntax, which is meaningful to members of a specific culturally defined community in terms of individual socialization. Quality information, then, needs also to be concise and consistent over a longer period of time. Within virtual knowledge communities this level offers several opportunities for pro-active IQ management. First, we may establish standardized codes and symbols for interaction within the community. Second, commonly accepted interaction protocols, patterns, and codes of conduct allow for efficient and basically error-free interaction between community members. Third, we may eventually facilitate and improve the exchange of quality information by assuring interactional continuity and consistency within the community.

On the contextualization level quality information depends on the general usability and interpretability of information. Completeness and accuracy of information are also very important to this end. Finally, a strong semantic congruency and unambiguousness are necessary conditions for common interpretative spaces that are a prerequisite for interaction in communities. Opportunities for facilitating knowledge exchange on the contextual level are: first, capturing and delivering social context information that facilitates interpretational efforts. Second, by supporting correct and unambiguous interpretation the evolvement of common interpretative spaces is positively influenced. Third, differences in interpretation among community members are significantly reduced by installing semantic and interpretational standards, e.g. glossaries and commonly accepted definitions.

On the valuation level, finally, the subjective quality of information depends on the following criteria: usefulness, relevance, timeliness, reputability, trustfulness, and verifiability. The criteria usefulness and relevance point at the pragmatic aspect of knowledge, i.e. we internalize

knowledge always in relation to a possible, future action. In that sense our set of intended, projected action and our systems of relevance determine how we actually value certain information. The aspect of timeliness is related to this pragmatic element of knowledge in that only information that is made available to us in time may eventually lead to action. The probably most important differentiation of information is made along the subjective valuation of correct/incorrect, right/wrong, and appropriate/inappropriate. Accordingly, the trustfulness of information, the reputability of its source, and the verifiability of information make up very important criteria within virtual knowledge communities, which usually determine whether an information is internalized during transformational process or not.

Pro-active management of the valuation level within virtual knowledge communities is generally possible, but requires a very sensitive, soft-factor based approach from a sociological and psychological perspective. First, inductive assessment methodologies can be applied within virtual knowledge communities that measure the subjectively perceived relevance and usefulness of information. Second, planning and evaluation tools may support the measurement of timeliness of information in knowledge exchange. Third, we can attempt to measure action outcomes or team and individual performance related to transferred knowledge by qualitative and quantitative social research. Here the primary question should be: how do we attribute a certain performance or outcome to the exchange of information within a virtual knowledge community. Fourth, the installment of common standards for reputation and trustfulness support the respective criteria at the valuation level of knowledge exchange, e.g. by establishing commonly accepted labels, ratings, and benchmarks. Fifth, by means of coaching and organizational development initiatives we may eventually support the emergence of emotional bonds and trust among community members, which in turn influence the valuation level in a positive way.

Levels of IQ	Assessment Criteria	Opportunities for IQ Management in VKC
Comprehension	correct syntax meaningful concise consistent	→ establishing standardized codes and symbols → agreement on common interaction protocols → assuring interactional continuity and consistency
Contextualization	usability interpretability semantic congruency unambiguous complete accuracy	→ capturing and delivering social context information → supporting correct, unambiguous interpretations → agreement on semantic standards, e.g. glossary, definitions, "native terms", etc.
Valuation	usefulness relevance timeliness reputable trustful verifiable	→ establishing common standards for reputation, e.g. labels, benchmarks, → supporting the emergence of emotional bonds and trust → assessing relevance and usefulness of information → ensuring timeliness of information → measuring outcomes and performance of transferred knowledge

*Table 5: A Conceptualization of Information Quality in VKC*

## 5 Conclusion

This paper elaborated the social dimension of information quality in the context of knowledge management in the eEconomy, based on the epistemological concepts of the newer sociology of knowledge, as represented by Schutz, Berger and Luckmann.

Witnessing a new level playing field influenced by eBusiness and eCommerce, corporate practices of knowledge exchange and transfer are increasingly becoming critical success factors. In this paper the inherent duality of knowledge management, which differentiates personalized and codified knowledge management, is taken as an argument in favor of a sociologically influenced conceptualization of virtual knowledge communities (VKC), which form a primary organizational resource towards efficient exchange practices of personalized knowledge.

This shift from traditional IT-based knowledge management to more socially conceptions of community-based knowledge requires a very distinct framework on how to measure, assess, and identify information quality. To develop such a framework that nevertheless remains compatible and relates itself to established conceptualizations of IQ, namely by Kahn, Strong, Wang, and Shanks/Darke was the primary focus of this paper.

The herein presented framework is oriented along the three analytic levels of the transformational process, comprehension, contextualization, and valuation. At each level, respective assessment criteria are identified, and a first set of opportunities for pro-active IQ management in virtual knowledge communities are proposed. Based on this initial conceptualization more elaborate tools and procedures can be developed in a second step. Accordingly, this paper opened a new, fresh look on information quality in the context of community-based knowledge management practices, and there obviously remains ample space for further research within this new field at the borderzone between business administration theory for the eEconomy and the newer sociology of knowledge.

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### *About the Author*

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Mr lic.oec. Daniel Diemers CEMS has an academic background in sociology, economics and business administration. He is currently writing his Ph.D. thesis on community-based knowledge management at the chairs of Prof. Dr. P. Gross and Prof. Dr. G. Von Krogh. To complement this activity, he works as a research assistant at the Research Institute for Sociology at the University of St. Gallen, Switzerland and as consultant with Unicorn Consultants, a renowned strategy consulting based in Dusseldorf, Germany.

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*For contact e-mail to: [daniel@diemers.net](mailto:daniel@diemers.net)  
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