Towards a Semiotic Communications Quality Model[1]

Aldo de Moor, Hans Weigand
Infolab, Tilburg University
P.O.Box 90153, 5000 LE Tilburg, The Netherlands
tel. +31-13-4663020, fax +31-13-4663069
e-mail: ademoor/weigand@kub.nl

Abstract

The quality of communication processes in networked organizations is difficult to evaluate and improve, because of the many parties involved in meaning construction and responsibility assignment. This paper presents an outline of a communications quality model grounded in semiotics that can be used to construct a quality management system. Key elements of any such system are quality perspectives, processes, and attributes. To construct a semiotic communications quality model, we apply the quality elements to a semiotic communication process model. We then use Stamper's norm classificiation of perceptual, cognitive, evaluative, and behavioral norms to guide the various quality management processes.

Keywords: quality management, information systems, communication processes, norms

1. Introduction

Information systems development has long been constrained to waterfall-like approaches aimed at producing large, transaction-based systems used for all kinds of computational and administrative purposes, such as payroll management, reservation systems, and so on (Brooks, 1995). The specification of those systems is quite straightforward: entities to represent in the databases and software programs are non-ambiguous and relatively easy to define, and responsibilities about who makes and owns the specifications are clear. However, information systems in the age of the Internet are much more communication than computation systems. They are a key part of the socio-technical system comprising the whole organization. Their applications to supporting complex communication processes, like discussion and group decision making, are manifold. Many have the uneasy intuition that such communication systems have great potential, which for some reason often fails to materialize, however. One main reason is that the semiotics of these systems are much more complex, particularly because the intended semantics and pragmatics are not under the control of one single organization, but negotiatable at best. This entails that often the meaning of information produced and responsibilities for system use and specification are not clear.

In order to deal with such problems, we need to move away from the traditional information flow paradigm, in which positivistic modelling of symbol manipulating functions aimed at producing automated solutions is central. Instead, an *information field* paradigm is needed (Stamper, 2000). At the core of this paradigm are fields of norms, binding together groups of people. The norms allow meaning and responsibilities to be clearly specified, thus fostering the active construction of social reality, shared understanding and mutual commitments. The information systems built on the information field paradigm do not produce sterile data, but aim to generate and communicate information that can lead to true knowledge that helps people to perceive, understand, value, and act in the world. To test and improve the quality of information systems in this sense, Stamper (2000) proposes meta-norms, grounded in a variety

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of disciplines. In our interpretation, operational norms guide the communication processes themselves, whereas the meta-norms guide their improvement through quality management processes.

In this paper, we investigate how such a quality management system could be constructed. We focus on the quality of communication processes, using examples from negotiation process support in a European B2B e-commerce project. In Sect.2, we examine the concept of quality as it is currently treated in the information systems literature. In Sect. 3, we outline a semiotic communications quality model consisting of a basic semiotic communication model and norm-governed quality management processes. Sect. 4 concludes the paper.

2. Quality & Information Systems Development

Now that much of the basic technological infrastructure such as PCs, software packages, and electronic networks have become widely available, the concept of quality is becoming increasingly important in the field. Comprehensive methods and philosophies like ISO9001 and Total Quality Management are used to standardize and certify information systems development practices, in order to improve their quality. However, such approaches, popular and useful as they may be, are no panaceas. They lead to much bureaucracy and many ill-understood documents, often do not end up in results that are directly useful for system developers, and do not deal with different perspectives and conflicts of interest (Braa, 1995). Moreover, such approaches are grounded in the information *flow* paradigm. Alternatively, a quality management approach grounded in the information *field* paradigm can help to optimize the information systems development process. Such an approach clarifies exactly who should be involved in which stage of the process and with what responsibility, thus leading to more involvement and better use of human expertise. We next distill some universal building blocks that should be present in any quality approach: quality perspectives, attributes, and processes.

- *Quality perspectives*

There are many different perspectives on information systems quality, leading to different sets of quality processes and attributes. Many approaches are grounded in the software engineering tradition, and focus on optimizing technical quality. Others concentrate on improving use quality, focusing on how well applications fit the needs of individual users. However, not much attention has so far been paid to improving organizational (i.e. semiotic) quality (Braa, 1995).

- *Quality attributes*

Quality has both holistic and reductionistic aspects. On the one hand, quality is something that must be comprehensive, a system “has a good look and feel”. However, for practical analysis and discussion purposes, more manageable quality constructs are needed. These constructs are called quality attributes. They describe aspects of the information system and its operational and development processes that are of relevance from the viewpoint of a certain quality domain. Examples of attributes are efficiency, integrity, and continuity, among many others. Single attributes can and should be the initial focus of attention. However, afterwards, there should always be a “common-sense” evaluation process to see if the results agree with the whole, intuitive picture. This is in line with the observation that tacit knowledge possessed by organizational subjects can never be completely formalized (Weigand and Dignum, 1997).

Quality attributes are either product or process attributes, as overall quality can only be accomplished when the quality is improved of both the outputs and the processes in which they are produced. *Product* attributes describe aspects of the deliverables or intermediate objects produced during system operations and development, whereas *process* attributes capture characteristics of these processes themselves. Furthermore, quality information is partially provided by the operational system, i.e. usage metrics, and is partially captured in the form of specific quality meta-information, such as results from interviews between auditors and users.

To illustrate, the well known TAME software engineering quality approach distinguishes between quality information stored in its (operational) Software Engineering Models and the information stored in the (meta) Goal Question Metric Models (Oivo and Basili, 1992).

Quality attributes are often organized in quality trees. These organize the attributes in different dimensions that reflect the different perspectives on the information system. For example, one typical such tree, much used in Dutch systems development projects, is that of Delen and Rijsenbrij (1990). It organizes 41 attributes in four dimensions: the *process* dimension concerns the development of the information system, the *static* dimension the intrinsic aspects of the system and documentation, the *dynamic* dimension the operations of the working system, and the *information* dimension the information produced by the system as output.

- *Quality processes*

Quality improvement is not a one-time event, but a continuous organizational learning process. Quality management aims to define quality procedures and standards and checks that they are used. These management processes include quality assurance, quality planning, and quality control (Sommerville, 2001). Quality assurance entails the establishment of a framework of organizational quality procedures and standards, quality planning is their selection and adaptation for specific projects, while quality control makes sure that the selected procedures and standards are performed correctly. One important subprocess of quality control is quality measurement.

When looking at this current state of affairs, what do we need to construct a true semiotic approach to communications quality management? First, our main interest should be the organizational perspective, focusing on how organizational communication can be improved. Second, useful quality attributes must be selected for optimizing organizational communication processes. Current attributes at most focus on the development of the information system and the qualities of the information per se (e.g. the process and information dimensions of Delen and Rijsenbrij), not on the role that this information plays in pragmatic communication processes. Third, we need to define practical quality management processes, including the definition, selection, and measurement of quality attributes.

3. An Outline of the Semiotic Communication Quality Model

To pay explicit attention to communication processes, we use a basic semiotic communication process model. To this model, we apply the quality perspectives, attributes, and processes discussed in the previous section. We then illustrate the use of Stamper's norm classification to guide the various quality management processes, so that responsibilities become clear.

3.1 A Basic Semiotic Communication Process Model

The communication process model that we adopt makes a distinction between three levels of abstraction in the communication process: the media level, the information level, and the communication level. The model is similar to the distinction made in DEMO between the documentary level, the information level, and the essential level of messages (Dietz, 1994). At each level, quality attributes can be provided. The *media* level of communication describes the physical characteristics of the communication process. The question is: how? How are messages put across? Quality attributes at this level include media richness, interactivity, reliability and efficiency. The *information* level of communication has to with the data contents. It is not about *how* messages are transported, but *which* messages are transported. Information quality attributes are for instance integrity, completeness, precision, and timeliness. Integrity constraints in the communication system can be used to enforce some of these qualities. The *communication* level is about what people do with messages. The

communication level is specified using the Language/Action Perspective and Habermas' theory of communicative action. Two examples of quality dimensions (collections of related quality attributes) are the *rationality* and the *task fit* of the communication process.
Traditional quality management systems mainly focus on the two lower levels. In reaction to that, the Language/Action Perspective has emphasized the importance of the third level. A comprehensive approach is needed that accounts for all levels and their dependencies.

3.2 Governing Communications Quality Management Processes with Norms

The model should take an organizational semiotic perspective on information systems, including the three levels of the communication process model. The explicit attention given to the communication level distinguishes our model from perspectives focusing on the technical or use quality. For each layer, relevant quality attributes need to be selected. Then, for each attribute, a customized set of quality management processes needs to be defined.

Norms play a core role in a semiotic quality model in that they guide the quality management processes. The MEASUR approach provides us with an explicit operationalization and classification of norms (Stamper, 2000). All norms have the structure: IF condition THEN subject ADOPTS attitude TOWARD something. First, there are perceptual norms, which say how agents can identify entities in the world. Second, behavioral norms govern the actions of people, by making actions obliged, permitted, or forbidden. Third, cognitive norms represent who can have which beliefs (i.e. domain knowledge) about the world. Fourth, evaluative norms allow subjects to judge certain aspects.

Core to our approach is that for each *combination of quality attribute and management process*, a set of norms is defined. For example, take the *quality measurement process of the "availability" attribute* at the media level. A perceptual norm could say that a user can conclude that his mail inbox does not open anymore when a corresponding error message is received after starting the mail program. A cognitive norm could say that if a mail inbox does not open anymore, then the helpdesk expects that disk space is full. An evaluative norm can be used to conclude when the helpdesk thinks a mail service is faulty – for example, when the allocated disk space is less than 10 MB. Finally, behavioral norms represent the desired actions, for example, that the helpdesk should assign disk space for each new user within 1 day, or that users should clean up their mailbox when they receive a warning.

3.3. Example: Improving the quality of a B2B Negotiation Process

We apply the semiotic communication quality model to B2B negotiation, such as supported in the e-commerce MeMo project (see www.abnamro.com/memo). One of the negotiation protocols supported is a so-called tender-based negotiation protocol. This means that a buyer sends a request for bids to a open or closed set of potential sellers. The seller can reply using a bid message. This protocol is often used by contractors in the Dutch building sector.

The quality of the process can be managed at all three communication levels. The medium level quality is determined by attributes such as *reliability* of the medium (Internet vs. telephone) and *timeliness*. At the information level, the need for quality requires *clarity* of product identification terms. The use of standardized product identifications can contribute to this goal. Finally, at communication level, the protocol can be evaluated in the light of the organizational goals. One of the goals is to promote competition among sellers, to reduce prices and to comply with European laws. MEMO found that management sometimes complained about their purchasers not selecting enough potential sellers. Thus, one quality attribute at the communication level concerns *competitiveness*. There are several norms involved, for example with respect to the *quality control* process of this attribute. First, the manager apparently has an evaluative norm of what is the appropriate number of potential

suppliers to be involved in a tender (since he has the authority). This number can be fixed or depend on the amount or product category. To integrate the quality control process in the information system, and possible automate part of it, the manager should make this norm explicit. To improve the process, the manager can instruct the purchasers to increase the selection set – an example of a behavioral norm for the purchaser.

4. Conclusions

In this paper, we outlined the components of a quality management approach focused on the improvement of communication processes and grounded in organizational semiotics. Surveying the general quality of information systems literature, we identified quality perspectives, processes, and attributes as important elements of such an approach. To focus on the quality of communication processes, we started with a basic semiotic communication process model to which quality attributes are attached. The normative grounding of the related quality management processes was done by using the MEASUR classification of perceptual, cognitive, evaluative, and behavioral norms.

The novelty of this approach is its operationalization of general information systems quality theory in the organizational semiotics paradigm, as well as the explicit focus of quality management on communication processes, often neglected so far. Furthermore, we think it could be an interesting new application of the MEASUR methodology. Of course, in the limited space of this paper, we could only highlight some of the elements and applications of the methodology. In our LAP 2001 paper, we discuss the quality of communication processes in more depth. In future research, we intend to come up with a detailed typology of communication process attributes and the quality processes in which they are managed.

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