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Interactivity and contextuality in organizational semiosis

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Abstract. In this paper we investigate how organizational semiosis may be advanced by the principles of interactivity and contextuality. These principles have been operationalized in a semiosis construction strategy which has been applied in the coordination of the development of the 3rd generation of mobile systems at Ericsson. The results show that interactivity and contextuality are powerful enablers of organizational semiosis. However, without a balancing control mechanism the approach may result in the construction of semiotically incompatible domains within the organization.

1 Introduction

Organizations today are facing a turbulent reality due to increased product complexity, frequent re-organizations and an ever increasing rate of change. Actors are constantly struggling to make sense of ongoing changes. In order to act in concert they must acquire some shared meaning about the social reality in their organizations. Artifacts such as information systems (IS), process models, etc. should be apprehended as meaningful assets providing action potentialities. However, the sense making process requires a certain degree of stability which is counteracted by the current trends. The more explicit these trends become, the higher the need will be to manage and support this process.

The purpose of this paper is to investigate how shared meaning in organizations can be advanced by utilizing the principles of *interactivity* and *contextuality*. These principles have been operationalized in a *semiosis construction strategy*. The target of the strategy is the construction of *activity domains* where individual meaning, shared meaning and meaning ascription to artifacts such as models and ISs are achieved simultaneously (Taxén, 2003).

Shared meaning implies that both individual and social aspects must be considered. When reflecting over these matters, usually an individual or systemic perspective is taken as the Unit of Analysis. However, as a long discourse has shown, neither of these approaches is entirely satisfactory (e.g. Vološinov, 1986/1929). The individual perspective tends to ignore trans-individual phenomena such as social institutions and the structural properties of language. On the other hand, the systemic perspective easily downplays individual phenomena such as cognition and utterances. In linguistics these two perspectives are called *langue* (social) and *parole* (individual) by de Saussure (1960).

A number of theories have been proposed to reconcile these two perspectives, for example, Activity Theory (e.g. Engeström, 1999), Actor Network theory (e.g. Latour, 1991), Structuration theory (Giddens, 1984) and Language Action Theory (e.g. Winograd & Flores, 1986; Dietz, 1994). Ontologically and epistemologically these theories take a middle position between positivism and anti-positivism as expressed by the pragmatist philosophy (Dewey, 1931; Wicks & Freeman, 1998; Goldkuhl, 2004).

Organisational Semiotics (e.g. Stamper, 2001; Liu, 2000) is an approach which emphasizes signs as fundamental in organizational studies. Meaning is regarded as the relationship between signs and affordances – “those invariant repertoires of behavior that actual agents can recognize and take responsibility for” (Stamper, 2001:141). In this sense it aligns well with the stance taken in this paper. However, the constructive aspect of representation is not elaborated in detail. Rather, the focus is on invariant action potentials.

The outline of the paper is as follows. After an illustrative example of the difficulties in achieving shared meaning, we discuss the role of interaction and contextuality in the areas of *representations*, *practices* and *signs*. The motivation behind focusing on these areas is that we consider representations and practices as suitable analysis units for the individual and social perspectives respectively, while signs are regarded as mediators between these perspectives. We argue that interaction and contextuality are organizing principles in all these areas. Thus, they should be considered in strategies for advancing organizational semiosis. We also discuss *experiential learning* as a particular form of interactivity.

Next, an account of the research design is given. This is followed by a description of the proposed strategy. Some results are reported from applying the strategy in the coordination of the development of the 3rd generation of mobile systems at Ericsson, a major provider of telecommunication systems world-wide. The results show that the strategy is one way of making organizational semiosis more efficient. However, without a balancing control mechanism the approach may result in the construction of semiotically incompatible domains within the organization.

2 The agony of achieving shared meaning – an example

In order to illustrate the complexity of the semiosis process we will use an example from the Ericsson development practice. The diagram in Fig. 1 shows the context of requirement management as it was conceived of at one development unit at Ericsson.

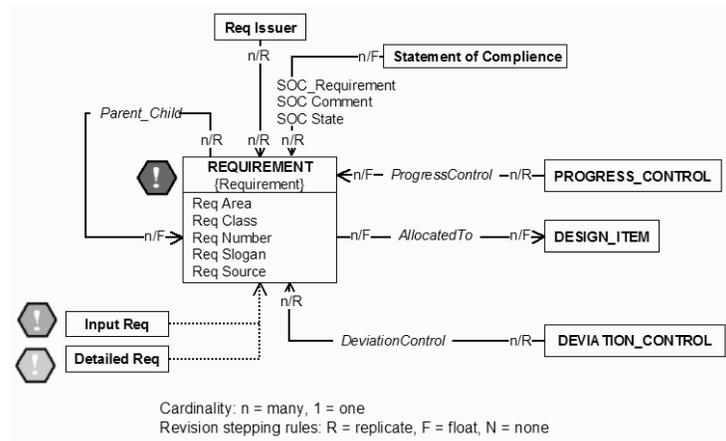


Fig. 1. A context for requirement management

During the process of achieving a shared meaning about the context in Fig. 1, at least the following issues need be considered:

- Which entities should be visible in the context (the boxes in Fig. 1)?
- How are these related (the lines in Fig. 1)?
- What names should be allocated to the entities and the relations?
- What cues, icons, forms, nomenclatures, etc. should be used to signify the context?
- Are there different types of requirements?
- Which is the life cycle of requirements?
- Which attributes do requirements have?
- Which attributes should be placed on relations?
- Which cardinalities do relations have?
- What revision stepping rules should be applied, i.e. what will happen when a revision of an instance of an entity is made?
- Which type of actors is involved in requirement management?
- What rights do actors have to manipulate the model or instances created from it?

It can easily be imagined that achieving even a limited amount of shared meaning about all these issues is an awkward task, to say the least. Considering that 'requirement' is only one type of coordination entity among many others, the need for measures which advance the semiosis process is apparent.

3 Interaction and contextuality in semiosis

In this section we will shortly analyze the role of interaction and contextuality in the areas of representations, practices and signs.

3.1 Representations – the individual perspective

A fundamental problem in cognitive sciences is to understand how representations manage to acquire genuine content, pointing beyond themselves. According Bickhard & Terveen (1995) the emergence of representation must be some non-representational phenomena which are grounded in action (ibid:41). Bickhard & Terveen suggest an interactive conception of representation which they call *interactivism*. In this approach a representation for an epistemic system, say a human, becomes a representation only insofar as it functions appropriately for that system. In other words, representations are interaction potentials which need to be constructed within the system.

Representations as functions are similar to the notion of ‘meaning as use’ suggested by the later Wittgenstein (e.g. Wittgenstein, 1958) and the pragmatists (e.g. Dewey, 1931). Securing the usefulness inevitably leads to a constructivist view on representation:

“Interactive representations must be constructed within the epistemic system, and then tried out for their interactive functional properties in a variation and selection process. (...) Interactivism logically forces a constructivism of learning and development” (Bickhard & Terveen, 1995:69)

Moreover, interactivity is intrinsically bounded to contextuality:

“Context dependence is an intrinsic characteristic of the interactive model. Interactivism, in fact, manifests two senses in which utterances are intrinsically context dependent, and, thus, subject to contextual variation. First, utterances are contextually interpreted operations on their social reality contexts, and, therefore, their results depend as much on that context as they do on the operations engaged in. Second, those social realities are themselves constituted out of the participants’ representations, and those representations are contextually open, deictic, interactive differentiations.” (ibid:186)

This means that individual representations presume social contexts. Although the human cognitive system is a prerequisite for the emergence of representations, individual representations are in essence socially conditioned.

3.2 Practices – the social perspective

It is possible to conceive of organizations as formalized contexts. In order to articulate the action character of such contexts the practice has been suggested as a proper Unit of Analysis. The practice is considered to be the primary generical social thing (Schatzki, 2001:1). This reflects an ontology where the “social is a field of embodied, materially interwoven practices centrally organized around shared practical understandings.” (ibid.3). Practices are apprehended as materially mediated nexuses of activity where the “forms of individual activity depend on the practices in which

people participate.” (ibid.11). Thus, both the individual human mind and social order are to a significant extent considered to be constituted within practices.

Taxén has suggested to structure practices as activity domains (Taxén, 2004). The activity domain is the central construct in a new theory for coordinating human activity – the Activity Domain Theory (ADT). The point of departure of the ADT is praxis defined as “... the arena for the metamorphosis of the objective into the subjective and of the subjective into the objective.” (Kosík, 1976:71). From this very general conception of a practice, the activity domain is constituted by a set of organizing principles. Two of these principles are interactivity and contextuality. This means that it is possible to include these in an integrating construct, the activity domain, which enables the conception of organizations as contextually bounded, sign-mediated constructed social realities including individual, social and technical aspects.

3.3 Signs – the mediators between the individual and social perspectives

Like Vološinov we emphasize the *mediating* role of signs:

“By its very existential nature, the subjective psyche is to be localized somewhere between the organism and the outside world, on the borderline separating these two spheres of reality. [...] the organism and the outside world meet here in the sign” (Vološinov, 1986/1929:26)

One quality of signs that makes this possible is that signs are material phenomenon:

“... any item of nature, technology or consumption can become a sign, acquiring in the process a meaning that goes beyond its given particularity...” (Vološinov, 1986/1929:10)

A sign always has a physical aspect, the signifier or sign vehicle, which is associated in the brain by some interaction potential, the signified aspect. Thus, signs are intrinsically related to the physical aspects of our environment. Moreover, signs mediate between the individual cognitive system and the outside world, regardless of whether the signified phenomena can be classified as natural in origin, a human artifact or an element of the social reality:

“Yet we know that every sign has a material phenomenon as its representamen (sign-vehicle, signifier, carrier), that every process of semiosis is not just a social and cultural practice, but also a material activity in which not just humans but also non-human elements of the ecosystem participate.” (Lemke, 2000)

In Activity Theory the concept of mediation plays a key role. Human activity is directed towards an object and mediated by signs (semiotic activity) and tools (instrumental activity) (e.g. Engeström, 1999:23 ff.). However, the distinction

between semiotic and instrumental activity is problematic (Bødker & Bøgh Andersen, 2004). Even if these two types of activities differ with respect to their material and social effects they should not be regarded as belonging to different realms of reality (ibid.:6). Bødker & Bøgh Andersen propose a model in which the semiotic triangle is combined with the Activity Theoretic triangle into a combined model where "... instrumental and semiotic activities are variants of the same pattern but with different kinds of emphasis. This predicts a smooth transition between the two." (ibid:10).

The construction of signs is inherently interactive:

"Every sign, as we know, is a construct between socially organized persons in the process of their interaction." (Vološinov, 1986/1929, p. 21)

Moreover, the construction of signs is contextually bounded:

"The meaning of a word is determined entirely by its context. In fact, there are as many meanings of a word as there are contexts of its usage."(Vološinov, 1986/1929:79)

In summary, signs as understood here mediate between the individual cognitive system and the social organization of human activity. The emergence of mediating signs, which are at the same time individual and shared, is conditioned by the principles of interaction and contextuality.

4 Experiential learning

A consequence of the interactive position is that passive systems cannot learn. "The only kind of representational content that is learnable is interactive representational content." (Bickhard & Terveen, 1995:262). Learning requires error. The system may take some action which may be wrong. This in turn leads to the construction of fundamentally new representations. Thus, "... knowledge is not fundamentally of actuality, but, rather, of potentiality – of what would happen if." (ibid:276).

This insight is reflected in various *experiential learning* approaches (e.g. Kolb, 1984; Piaget, 1977; Freire, 1996). Nonaka & Takeuchi (1995) propose a circular model for transforming tacit knowledge in an organization into explicit knowledge and vice versa. The Deming cycle of plan-do-check-act in total quality management (TQM) is another example. Kim (1993) describes a learning cycle consisting of the phases observe-assess-design-implement where people in organizations experience concrete events and actively observe what is going on. Their experiences are assessed (consciously or subconsciously) by reflecting on observations. An abstract concept that seems to be an appropriate response is designed and tested by implementing it in the concrete world. Based on new concrete experiences the cycle is started all over again.

In system design experiential learning can be found in the concept of 'daily build', where software code is developed and tested in short and frequent development cycles. Gilb has proposed an evolutionary programming methodology (Gilb, 1988).

Earl reports that an evolutionary approach seems to be superior to other approaches when implementing an IS strategy in an organization (Earl, 1996). Recently Kristensen described an evolutionary IS development methodology (Kristensen, 2001).

5 Research design

The ADT was elaborated during a long period in the Ericsson practice by the author (Taxén, 2003). The research design can be classified as a longitudinal, action research case study (Yin, 1989) stretching from the early 1990s until 2003. Action research has been characterized as "[the] continuous interaction of theory and practice." (Baskerville & Wood-Harper, 1996:240). The ADT remained vague and unarticulated until a more conscious interaction between theory and practice took place as a result of the authors' Ph.D. studies between 1998 and 2003. Thus the 'action' side of the action research was dominant until 1998 when the 'research' side became more prominent.

Concerning the impacts of the ADT altogether 18 interviews were performed with different stake-holders such as project managers, method developers, configuration managers, IS developers, etc. These interviews were recorded, transcribed and analyzed with a slightly modified Grounded Theory approach (Strauss & Corbin, 1998). The empirical data consisted of internal documents, personal notes and artifacts developed.

6 A strategy for achieving organizational semiosis

The principles of interactivity and contextuality have been utilized in a strategy for advancing organizational semiosis (Taxén, 2003). The purpose of the strategy is to construct an activity domain with a particular purpose such as coordinating projects developing complex systems. The strategy builds on a continuous interaction between a *group of actors*, a *context model* and an *information system (IS)*. The group consists of representatives from major stakeholders in the projects. The context model and its implementation in the IS are conceived of as interaction potentials which need to acquire shared meaning among the actors (Fig. 2).

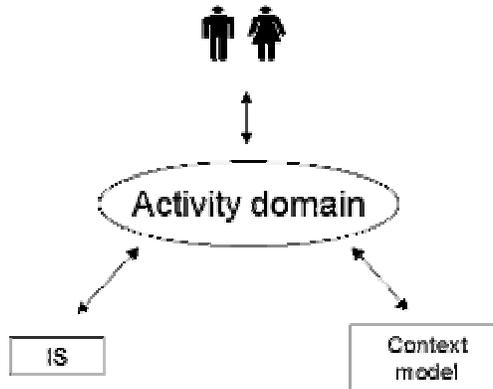


Fig. 2. The domain construction strategy

The strategy can be separated into three phases: exploration, trust boosting and expansion:

- **Exploration:** In this phase the initial construction of the domain is carried out. The main purpose is to achieve shared meaning. The work is carried out in a ‘daily build’ manner in close interaction among the actors. Requirements on the domain are specified on an overall level. The work is financed on a risk capital basis. Detailed return on investment analysis is not required since the reliability of such analysis will be low.
- **Trust boosting:** The purpose of this phase is to boost the trust about the feasibility of the domain as constructed in the exploration phase. Key issues are getting all actors involved to trust the data in the IS and to make sure that the performance of the IS is acceptable at all units world-wide. This is done in one sharp project, that is, a project which develops a commercial product. All user roles around the project are involved and immediate, personalized support is provided. The evolution of the domain is done by controlled changes and consists of fine tuning steps. No major reconstruction of the domain is done in this phase. Reference groups and steering boards are consulted and the financing is done on a project basis.
- **Expansion:** In this phase several projects are included in the domain. As in the trust boosting phase, the evolution is done by controlled changes. The financing is done by the line organization rather than on a project basis to keep the domain intact between projects.

This means that the gist of the strategy is to quickly establish a core semiosis in a small group of actors which is then diffused to other actors in an ongoing semiosis process.

7 Results

The semiosis construction strategy as outlined above grew out of experiences in the Ericsson development practice. Four different activity domains were constructed. Here we shall discuss two of these: the S-domain which was established in Stockholm between 1997 and 2002 and the A-domain which was established in Aachen, Germany between 2000 and 2002. Both these domains had the same purpose: to coordinate development projects for the 3rd generation of mobile systems. Most of the functionality in the systems was provided by software which was developed incrementally at various Ericsson units located all over the world. More details about this can be found in Taxén (2003).

In Fig. 3 the context model for the S-domain in 1997 is shown. The white boxes are entities which were already established in the traditional, waterfall oriented software development practice. The grayish boxes signify entities which were considered necessary for the incremental development strategy. The focal entity in the context is the 'Feature Increment'.

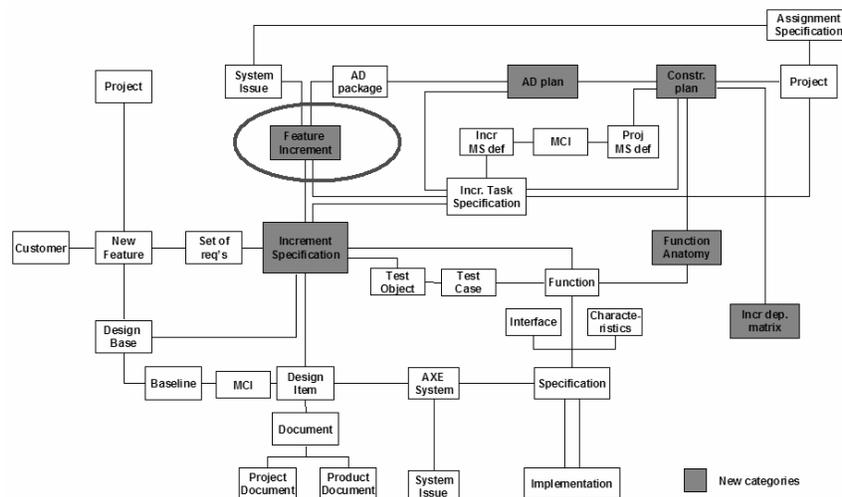


Fig. 3. Context model in the S-domain (1997)

The context model was implemented in the IS in a straight forward manner. From this implementation various user targeted views, reports, etc. were generated in order to ensure the usefulness of the model. Potentials for improvements were identified; the model was changed, re-implemented and tried out anew in an ongoing iterative process.

In Fig. 4 an example of an instantiation of the model in the IS is depicted. Among other things, an instance 'TRAF' of the focal entity 'Feature Increment' can be traced from the customer all the way to implementation products (the 'CNT', 'CAA', etc.).

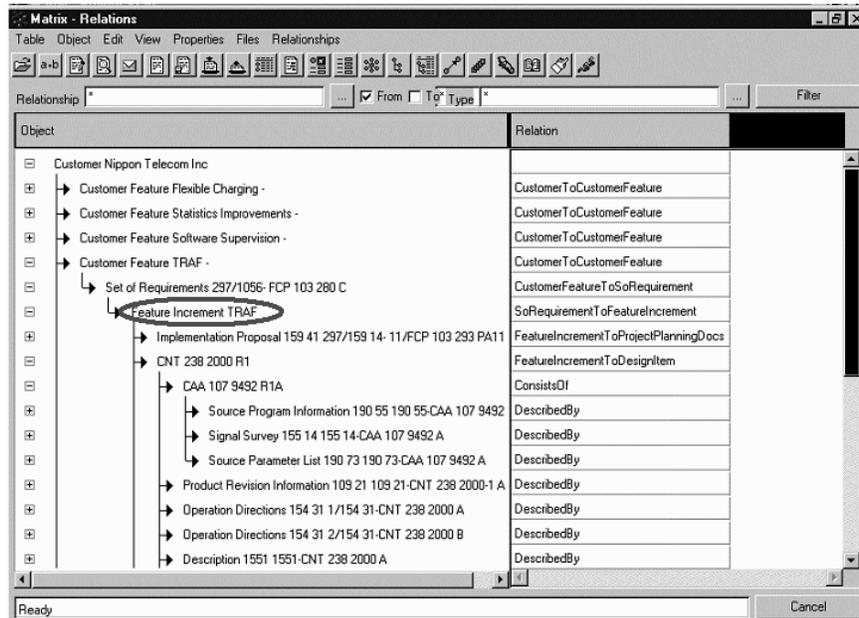


Fig. 4. The implementation of the context model in the S-domain (1997)

The diachronic evolution of the domain can be illustrated by the comparing the context model from 1997 with the one from 2001 (Fig. 5). Traces from the 1997 model can be found such as 'Feature Increment', 'Project', etc. However, the structure, content and form of expression in the two models are quite different.

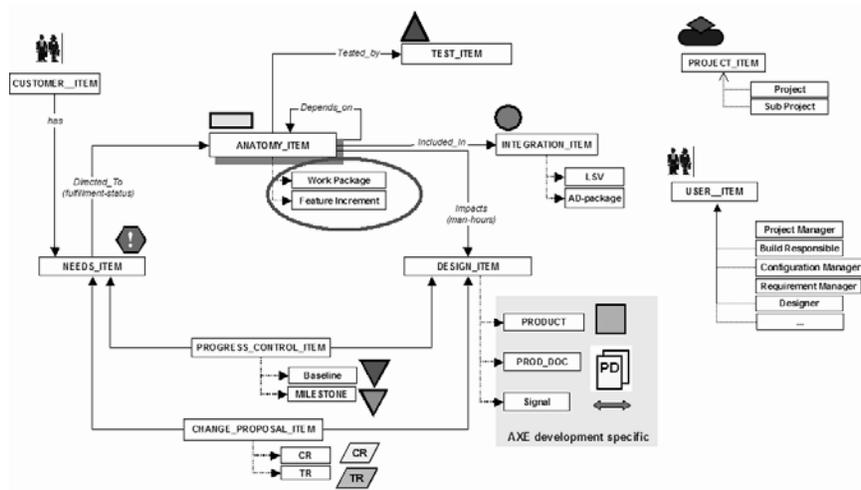


Fig. 5. Context model in the S-domain (2001)

The synchronic evolution across Ericsson can be seen by comparing the S-domain context model from 2001 (Fig. 5) with the model from the A-domain from the same time (Fig. 6).

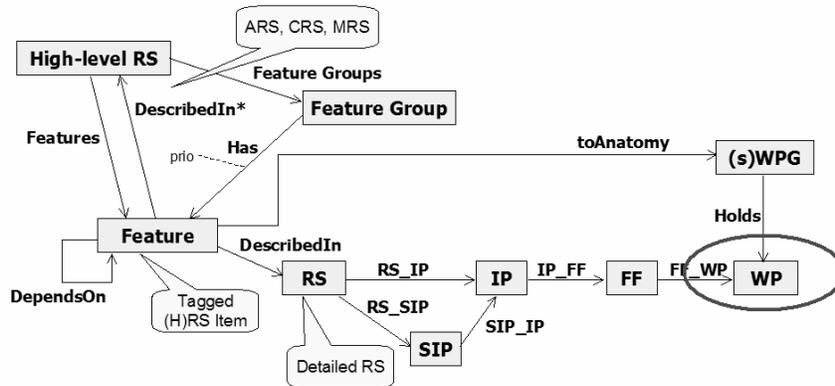


Fig. 6. Context model in the A-domain (2001)

The A-domain model had also evolved diachronically, however to a completely different one as compared with the S-domain model. Virtually no items are in common. In the S-domain (Fig. 5) various foci can be seen such as engineering change management with the 'CHANGE_PROPOSAL_ITEM in focus, test management with the TEST_ITEM in focus, project control with the PROGRESS_CONTROL_ITEM in focus, requirement management with the

NEEDS_ITEM in focus, incremental development with the items ANATOMY_ITEM, INTEGRATION_ITEM and DESIGN_ITEM as focal items, etc.

The A-domain does not contain any of these items. There is a requirement management focus organized around the Feature and High-Level RS¹ and the RS items but the structure of that context is different from that of the S-domain. The only element indicating that the S-domain and the A-domain have similar purposes is the 'WP' item in the A-domain model and the 'Work Package' element in the S-domain model (encircled in the figures). These entities denote the same phenomenon; an increment developing a certain functionality in the system. However, not even the fairly straightforward naming convention is synchronized.

8 Discussion

As can be seen from the results the semiosis process proceeds both diachronically within each activity domain and synchronically across different activity domains. In spite of having the same purposes (coordinating work package based SW-development projects), the actors in each domain constructed totally different social realities. Some efforts were made to align the domains but these efforts had virtually no impact on the evolution of the domains. The mere pace of the semiosis process, with almost daily changes in the IS implementation, made this more or less impossible. Moreover, the geographical distance between Stockholm and Aachen also played a role.

It is interesting to note that the technical IS platform was the same in both the S and A-domains (the Product Data Management system eMatrix from Matrix-One, Inc.). However, even if the functionality implemented was quite different the actors in both domains managed to coordinate extremely complex system development projects. For example, tracing any coordination item to any other item in the same IS had not previously been possible. Moreover, the functionality in the ISs was far more advanced as compared to similar IS implementations on other platforms in the company. The profoundness of the impacts is illustrated by the following statement from a project manager in one of the 3G development projects:

“Especially for the execution part I think we would not have been able to run this project without the tool. I think if you simply look at the number of work packages, the number of products that we have delivered, the number of deliveries that we have had, if we would have had to maintain that manually, that would have been a sheer disaster. [...] we had some, only in my part of the project, some 200 work packages or work packages groups or whatever you want to call them, deliveries, on the average 2-5 subprojects within them 5-10 blocks being delivered, just keeping track of that [...] would have been a hell of a job.”

¹ RS: Requirement Specification, a document describing the requirements on the system.

These results indicate that an efficient semiosis construction requires that the domains are limited to culturally isomorphic parts of the organization. If a domain contains too disparate cultures the semiosis process becomes less efficient and may even come to a halt.

However, the semiotic incompatibility of the two domains creates problems if they became involved in the same, overall development project. Some restrictions on the domain construction must be maintained, otherwise the domains cannot cooperate. For example, the 'Work Package' with its attributes, life cycle state set, etc. might have been enforced as mandatory for both the S and A-domains. However, this did not happen at Ericsson. Instead, problems that occurred were resolved in an ad-hoc manner. The reason for this was that there was no authority which could impose the necessary restrictions.

This means that a balance must be upheld between the efficiency of the semiosis process and the need to coordinate disparate domains. This has also been observed elsewhere (Eriksson et al., 2002). However, the nature of this balance, and how to uphold it, requires further research.

The diachronic evolution of the context models can be regarded as an articulation of the domain's learning trajectory for the domain concerned. The models represent the shared meaning of the social reality at a particular moment in time. Since these models are articulated and accessible for manipulation, there is no need to examine in detail how this process occurs within each individual. Thus, it is possible to move beyond the awkward notion of different worlds (the subjective, objective and social ones) as proposed by, for example, Habermas (1984). The models may be regarded as composite, shared signs with a collective action potential in a particular domain.

Concerning IS development the strategy proposed implies that the IS should be considered as one of several elements participating in a semiosis construction process. One consequence of this view is that the IS, as well as the other elements, will never be 'finalized'. This means that the IS development process should be conceived of as a continuous redevelopment process which is active as long as the domain exist. A similar approach is suggested by Truex et al. (1999).

Interaction and contextuality are two organizing principles for the construction of organizational semiosis. However, other principles included in the ADT, such as temporality, stability and domain transition also need to be considered (Taxén, 2004). Temporality concerns the dependencies between activities in the domain. Stability is related to norms, values, routines, standards, etc. Domain transition refers to translation of meaning structures between cooperating domains.

9 Conclusions

The results indicate that a semiotic perspective combined with the practice as a Unit of Analysis is a promising line of investigation. The impact on semiosis from organizing principles such as interaction and contextuality can be studied from an individual and a social perspective. Also, these principles can be utilized in advancing the organizational semiosis process. Normative strategies, such as the proposed

construction strategy, may be devised and investigated. This approach has shown to be beneficial in coordinating extremely demanding system development projects.

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