Accepted to Fifth Workshop on Business Process Modeling, Development and Support (BPMDS'04), Vol. 2, Riga, Latvia, 7-11 June 2004

A Coordination Approach Towards Alignment

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Abstract. In this paper we present a coordination approach towards creating and maintaining alignment between the business and its support systems. The business objectives are related to the coordination of the outcomes of a number of work practices. A practice is apprehended as an *activity domain* which is the central construct in a new theory for coordinating human activity – the Activity Domain Theory. In this theory the achievement of shared meaning among the actors is in focus. The activity domain is constructed through an experiential learning strategy which integrates shared meaning, processes, information structures and support systems into a coherent whole. Some results from the Ericsson telecommunication company are discussed.

Introduction

The challenges in aligning the business with the information systems (ISs) and IS architectures supporting the business are well known (e.g. Earl, 1996; Opdahl, 1997; Chan, 2002). Some of the reasons for the difficulties are the accelerated pace of change, increased complexity of systems and a diversification of organizational functions in terms of outsourcing, alliances formation, etc. These challenges are further complicated by the fact that the alignment spans not only technical issues but also social issues such as how to align different informal structures and organizational cultures (Chan, ibid.). Moreover, alignment ventures have suffered from vagueness in defining central concepts like business goal, business structure, informal organization structure, etc. There is a lack of theories which provide an integrative view on alignment and at the same time is possible to operationalize[1].

The aim of this paper is to present a socio-technical coordination approach towards creating and maintaining alignment. In this approach the business objectives are inherently related to the product or services that the organization provide to its customers or clients. The product in turn is seen as the result of coordinating the

[11] By operationalization we mean that the theory can be expressed in elements which can be manipulated, measured or observed in a particular situation in order to influence this situation.

outcomes of a number of cooperating *work practices*. Each work practice is organized around a particular type of outcome which is needed in the overall product, such as printed circuit boards and control software for a telecom exchange.

The reason for focusing on practices is that the practice has been suggested as a proper Unit of Analysis where social and technical issues may be reconciled. Practices are considered to be a materially mediated nexus of activity where the "forms of individual activity depend on the practices in which people participate." (Schatzki, 2001:11). 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 work practices as *activity domains* (Taxén, 2003). The activity domain is the central construct in a new theory for coordinating human activity – the Activity Domain Theory (ADT) (Taxén, 2004). The activity domain integrates coordinating elements of human activity into a coherent whole.

The activity domain construct enables us to conceive of alignment as follows. The actors in a domain are actively *constructing* the social reality in that domain (Searle, 1995). The construction includes, among other things, the definition of business processes, business process support (BPS) systems and the achievement of shared meaning. By gradually adjusting these elements, the outcome of the domain is coordinated with the outcomes of other activity domains and thus aligned with the business objectives.

The paper is organized as follows. In the next section we describe the elements of the activity domain. This is followed by an account of applying the approach in reconstructing the main business process at Ericsson, a major provider of telecommunication systems world wide. In relation to this we also describe the process model used, which is based on state flows rather than work flows. This is followed by a discussion of the results.

The Activity Domain

In an activity domain *actors* are working together. Starting from certain *prerequisites* the actors work on an *object* in order to produce a certain *outcome*. They have a *motive* for coming together, which is the reason why the activity domain exists. The object is the main driver for organizing the activity domain. Other elements of the activity domain are:

- *Contextuality* and *spatiality* which is operationalized by a *context model*. This model is an information structure which signifies the context of the activity domain by articulating types of relevant phenomena, how they are characterized and how they are related to each other. When this model acquires a shared meaning it enables the actors to orient themselves in the activity domain. In the literature models designations like `information model', `data model', `business model', etc., can be found. We apprehend such models as various types of context models, thus highlighting their contextual nature.
- *Domain transition* which is operationalized by a *transition model*. This model is an elaboration of the Specification Based Data Model suggested by Gandhi &

Robertsson (1992). The purpose of this model is to signify how different activity domains interact.

- *Temporality* which is operationalized by a *coordination model*. This model signifies the dependencies between the activities in the activity domain. It corresponds to the definition of coordination according to Malone & Crowston (1994:90). Business process models are examples of coordination models.
- *Stability* which is operationalized by a *domain core*. The domain core includes such items of activity domain which provide stability, for example, routines, rules, standards, norms, codes, etc.
- *Tool-instrumentality* which is operationalized by *information systems*. An IS is regarded as an instrument which supports the activities in the domain. A BPS system is an example of an IS. The models and the domain core are implemented in one or several ISs. These constitute in relation to each other the *IS architecture* in the domain.

The construction of the activity domain utilizes an *experiential learning* strategy which can be summarized as follows (Kolb, 19984). A representative group of users and IS designers suggest a first version of the models and the domain core which is implemented in the ISs. The implementation is tried out in practice in, for example, an ongoing development project. The experiences are reflected upon by the group and modifications to the models and the domain core are suggested and implemented anew.

In this iterative process, the models, the domain core and their implementations in the IS are conceived of as composite signs (Innis, 1985) which gradually acquire shared meaning among the actors. As a consequence the activity domain is in a state of constant development. 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 activity domain exist. A similar approach has been suggested by Truex et al. (1999).

Related Theories

The ADT shares its action perspective with a number of other theories such as 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).

It is outside the scope of this paper to make a detailed comparison between the ADT and these theories. However, we will shortly describe the connection between the ADT and one of its main source of inspirations, the Activity Theory (AT) (e.g. Engeström, 1999).

The ADT shares the philosophical underpinning with the AT. Like AT, the ADT is inspired by a world view where socially organized labor is seen as the basic form of human activity. In particular, the ADT is influenced by the perspective of the *praxis*. Praxis can be defined as "the ontological centre of the individual's interaction with the objective reality and thus the locus of all human knowledge about reality. It is the

scene for the transformation of the objective into the subjective and the subjective into the objective" (Kosík, 1976:71). This means that the aspects of object, outcome, subject, community, tools, signs, symbols, division of labor, rules, etc. are also present in the ADT. Also, the ADT shares with AT the emphasis on historicity and change.

The main differences between the ADT and AT are as follows:

- The practice is structured differently in the two theories. The elements which constitute the activity domain have no direct correspondence in the activity system of the AT. Moreover, the ADT has been informing the design of ISs for supporting exceptionally complex tasks such as the coordination of telecommunication systems' development (Taxén, 2003). The AT appears so far to have been used mainly as an analytical perspective rather than as basis for operational methods for the design of ISs (Berthelsen, 2001).
- The transition between practices is emphasized in the ADT. This is of vital importance for the discussion of cooperating practices. In AT this aspect is not evident.
- In AT the concept of mediation plays a key role. Human activity is 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). In the ADT *interaction* is taken as the main source of sense making, or semiosis (Bickhard & Terveen, 1995). This leads to a position where instrumental and semiotic activities are variants of the same pattern but with different kinds of emphasis. The fundamental nature of mediation is seen as anticipations of *interaction potentials*, regardless of whether that potential is semiotic or instrumental in character.
- In AT the discontinuous development of the activity system through contradictions is emphasized. This aspect is not present in the ADT.

Some Results

The coordination approach has been applied in the analysis of the business process at Ericsson. The existing process was specified by a traditional, work-flow based model (Figure 1). Prerequisites are shown to the left and outcomes to the right. The flow between the activities is shown as well as a set of states which shall be reached during the execution of the process. In addition, various functional units carrying out the activities are shown.

The signifying properties of this model are weak. For, example it is virtually impossible to follow the state progression of a certain entity. The vagueness of the model makes it fairly easy to obtain a superficial consensus about it since it leaves room for individual interpretation. However, the different interpretations will become major obstacle when implementing a BPS system based on this model.

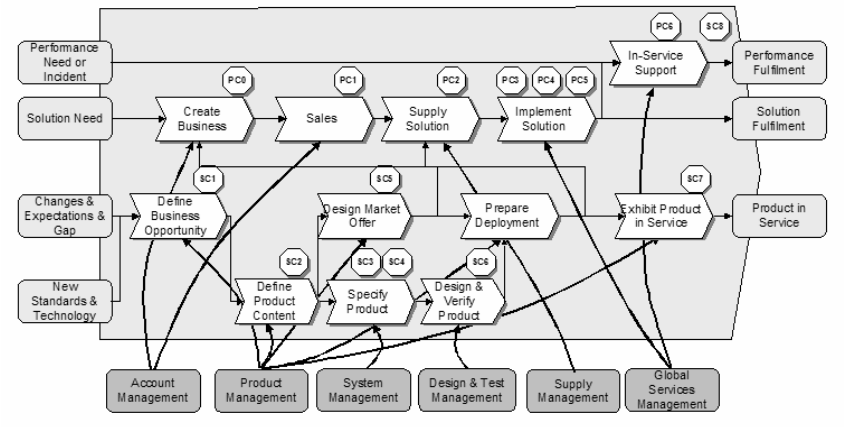

Fig. 1. The work-flow based business process model

The business process was reconstructed using the coordination approach. First, the Ericsson organization was analyzed in terms of activity domains. Four major domains were identified: A: 'Market and Sales' working with customers and tenders, B: 'Research and Development' working with product development, C: 'Supply' working with producing the product against orders and D: 'In Service Support' working with installation and service. Starting from the work-flow model in Figure 1 the coordination model in Figure 2 was derived:

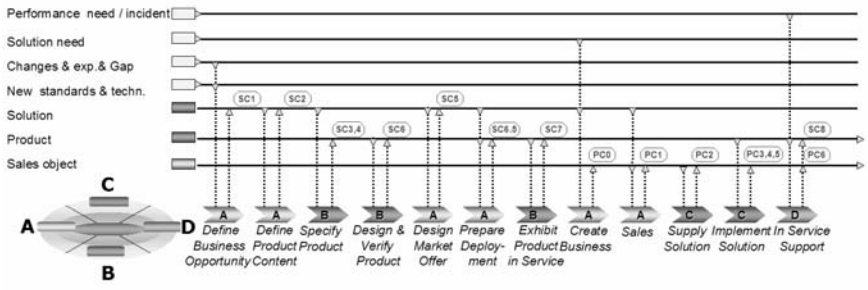

Fig. 2. The state based coordination model

The formalism used in the coordination model is called Information Flow Diagram (IFD). An IFD consists of entities, their life-cycles, the activities and the dependencies between the entities and activities. The entities are signified by boxes piled up vertically to the left. The state progression of the entities is signified by states along horizontal lines. At the bottom of the diagram the activities are outlined. It is also indicated in which activity domain they are carried out. The dependencies between the activities and the entities are signified by vertical arrows, which indicate entities which are prerequisites for and outcome of a certain activity. Each outcome results in a state change.

The IFDs belong to a class of process models called entity-based process models in which the focus is on entity state progress (Humprey & Kellner, 1989). The IFDs

have several appealing qualities. First, the state progress of an entity is easy to follow. Second, entity states provide a more stable control mechanism than activity states in turbulent situations. Third, the dependencies between entities and activities are easier to apprehend with IFDs. Thus, the achievement of shared meaning concerning the process is easier as compared to the work-flow model once the basic nomenclature has been grasped.

The coordination model needs to be compliant with a corresponding information structure which signifies the context of the main Ericsson activity domain. This is shown in Figure 3.

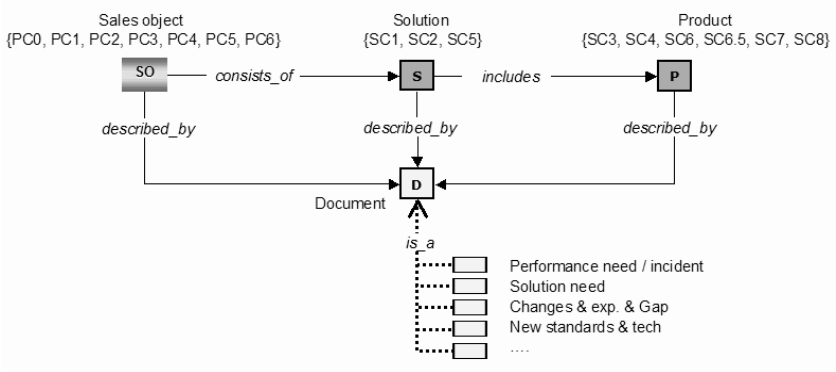

Fig. 3. A possible context model for the Ericsson activity domain

The context model includes the entities (shown to the left in the coordination model) and their relationships, attributes, etc. In general, the context and coordination models are interrelated in the sense that the context model constrains the coordination model. For example, the 'Solution' entity includes the 'Product' entity which means that the state progression order for these entities cannot be set independently of each other. This is also shown in the coordination model.

Discussion

The coordination and context models are easily implemented in a modern IS[2]. The most arduous task, however, is to achieve a shared meaning about these models and their implementation. This is because there is no objective criteria against which their validity can be judged. The only way to assert this is to try them out in practice. If they are useful in contributing to the objectives of the organization they are considered valid.

The discussion above is valid for each activity domain. For example, the product is developed in the Research & Development activity domain. The actors in this domain

[2] At Ericsson the commercial Product Data Management (PDM) system Matrix from Matrix-One, Inc. was used.

will construct models and IS support according to their needs. This can be seen as alignment of business objectives and support systems for that particular domain.

The interaction between domains implies that the transitions between them must be defined. For example, the state progression of the product may differ between the main activity domain and the Research & Development domain. In such a case these sets must be mapped onto each other. This mapping is an example of elements in the transition model in the ADT.

The suggested coordination approach means that the activity domain is regarded as the central enabling construct in achieving alignment. The activity domain can be seen as linking the business objectives to the business processes and BPS systems. Moreover, the activity domain construct enables us to address the socio-technical aspects of alignment. Process models and support systems are regarded as composite signs for action which must acquire a shared meaning for the actors in action. Otherwise coordinated action is not possible. A consequence of this is that each domain will inevitably construct different social realities. Even if some parts of this reality can be incorporated as 'best practice' form other domains, there will always be some unique parts in every practice.

Furthermore, the approach suggests that all the elements in the ADT need to be considered in the alignment. Aligning business process models and BPS systems is not enough. Context models, domain transitions and stabilizing elements must also be considered. Moreover, the interdependencies between these elements must be managed. This implies that there is no precedence for one of these elements over the other. For example, the process should not be apprehended as 'containing' the information structures. Rather, they should be considered as independent elements which are highly interrelated.

Finally, in the coordination approach the alignment process cannot be conceived of as staged in a creation and maintenance phase. Rather, it is an ongoing process in which the activity domains and their elements are constantly evolving.

References

Berthelsen O (2001) Operationalizing Activity Theory, IRIS 24 workshop, *24th Information Systems Research Seminar in Scandinavia*, Ulvik, Norway, 11th-14th August 2001.

Bickhard MH, Terveen L (1995) *Foundational Issues in Artificial Intelligence and Cognitive Science: Impasse and Solution*. Elsevier Scientific, Amsterdam.

Bødker S, Bøgh Andersen P (2004) Complex Mediation (*draft*).

Earl M J (1996) An Organizational Approach to IS Strategy Making, in Earl M J (Ed, 1996), *Information Management - The Organizational Dimension*, Oxford University Press, pp. 136 - 170.

Chan Y (2002) Why haven't we mastered alignment? The importance of the Informal Organization Structure, *MIS Quarterly Executive* Vol. 1 No. 21, June 2002, pp. 76 - 112.

Dewey J (1931) The development of American pragmatism. Included in Dewey J (1931) Philosophy and civilization, Minton, Balch & Co, New York.

Dietz JLG (1994) Business Modelling for Business Redesign. In Proceedings of 27th Annual Hawaii International Conference on System Science, IEEE.

Engeström Y (1999) Activity theory and individual and social transformation, in Engeström Y, Miettinen R, Punamäki RL (eds. 1999) *Perspectives on Activity Theory*, Cambridge University Press, Cambridge UK., pp. 19 - 38.

Gandhi M, Robertson E L (1992) A Specification-based Data Model*, Indiana University Computer Science Department Technical Report TR344*, Indiana University, Indiana. Available at http://www.cs.indiana.edu/ftp/techreports/index.html (Oct 2002).

Giddens A (1984) The Constitution of Society. Cambridge: Polity Press.

Goldkuhl G (2004) Meanings of Pragmatism: Ways to conduct information systems research. *Proceedings of the 2nd International Conference on Action in Language, Organisations and Information Systems (ALOIS-2004),* Linköping University

Humphrey W, Kellner M (1989) Software Process Modelling: Principles of Entity Process Models*, CMU/SEI-89-TR-2*, Software Engineering Institute, Carnegie Mellon University.

Innis R (1985) *Semiotics. An Introductionary Anthology* (edited by Innis R), Indiana University Press, Bloomington, USA.

Kolb D A (1984) *Experiential Learning: Experience as the Source of Learning and Development*, Prentice Hall, Englewood Cliffs, New Jersey.

Kosík K (1976) *Dialectics of the concrete*. Reidel, Dordrecht.

Latour B (1991) Technology is society made durable. In A sociology of monsters: essays on power, technology and domination (Law J, Eds.), Routledge, London, pp. 103-131.

Malone T, Crowston K (1994) The Interdisciplinary Study of Coordination, *ACM Computing Services*, Vol. 26, no 1, pp. 87-119.Schatzki TR (2001) Introduction: Practice theory, in Schatzki TR, Knorr Cetina K, von Savigny E (Eds., 2001) *The practice turn in contemporary theory*, Routledge, London.

Opdahl A L (1997) A model for comparing approaches to IS-architecture alignment*, Proceedings of "Norsk konferanse om organisasjoners bruk av IT*", Berit Irgens, Kjell Ellingsen, Eystein Mathisen, Nils M. Nielsen and Zaheer Uddin Quazi (eds.), Bodö / Norway, June 1997.

Schatzki TR (2001) Introduction: Practice theory, in Schatzki TR, Knorr Cetina K, von Savigny E (Eds., 2001) *The practice turn in contemporary theory*, Routledge, London.

Searle J R (1995) *The construction of social reality*, London: Allen Lane.

Taxén L (2003) *A Framework for the Coordination of Complex Systems' Development.* Dissertation No. 800. Linköping University, Dep. of Computer &Information Science, 2003. Downloadable from http://www.ep.liu.se/diss/science_technology/08/00/index.html

Taxén L (2004) Articulating Coordination of Human Activity - the Activity Domain Theory*, Proceedings of the 2nd International Conference on Action in Language, Organisations and Information Systems (ALOIS-2004),* Linköping University. Available at http://www.vits.org/konferenser/alois2004/proceedings.asp (March 2004).

Truex D P, Baskerville R, Klein H (1999) Growing Systems in Emergent Organizations*, Communication of the ACM,* August 1999, vol. 42, No. 8, pp. 117-123.

Wicks A C, Freeman R E (1998) Organization Studies and the New Pragmatism: Positivism, Anti-positivism, and the Search for Ethics. Organization Science, Vol. 9. No. 2. March-April 1998, pp. 123-140.

Winograd T, Flores F (1986) Understanding Computers and Cognition, Ablex Publishing, Norwood.