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2007

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Takeshi Kosaka

Tokyo University of Science, [kosaka@ms.kuki.tus.ac.jp](mailto:kosaka@ms.kuki.tus.ac.jp)

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### Recommended Citation

Kosaka, Takeshi, "Rethinking Systems Analysis in A New View of Organizations" (2007). *PACIS 2007 Proceedings*. 116.  
<http://aisel.aisnet.org/pacis2007/116>

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## 113. Rethinking Systems Analysis in A New View of Organizations

Takeshi Kosaka  
School of Management  
Tokyo University of Science  
kosaka@ms.kuki.tus.ac.jp

### Abstract

*The effectiveness of IT investments is known to depend on intangible assets such as work practices. However current systems analysis has no concern about them due to the mindset of rational organization and functionalism. We rethink systems analysis in a new view of organizations proposed by Kay and colleagues who apply autopoiesis and complex theories to reconstruct the basis of organizational theories, and we make theoretical clarifications of the problems and issues of the current systems analysis. Among others, the absence of a frame has prevented people from seeing their work practices and at the same time made it practically difficult to take them into consideration in systems analysis, leaving rational systems analysis and design to be still in use. There is a need to develop a practical frame that business professionals can use to see their work practices.*

**Keywords:** Systems analysis, Autopoiesis, Activity theory, Work practices, Information systems development

### Introduction

Even after decades of computer usage, there is still a high rate of disappointment and failure of information systems (IS) implementation, regardless of whether the software is custom made or purchased from outside. Many have argued that system designers' failure to understand situated work practices lies at the heart of these poor implementation success rates (Schlutze et al., 2000).

Brynjolfsson (2003) explains that for every dollar of IT hardware capital that a company owns, there are up to \$9 of IT-related intangible assets, such as human capital and organizational capital. This means that the effectiveness of IT expenditure depends on others such as work practices that encompass much more than IT alone. With the increasing integration between information systems and work systems they support, methods that focus on computerized aspects of information systems but skim over the work system are increasingly inadequate (Alter, 2004b).

There is a need to radically rethink the way in which information systems are developed. A well-known text book by Whitten et al. (2004, p.186) on systems analysis for university students shows that systems analysis is a term that collectively describes the early phases of systems development, but that there has never been a universally accepted definition of systems analysis. Truex et al. (1999) say that analysis activities are no longer captured within the early stages of a system's life cycle, and instead, these activities are an ongoing service of the organizational information systems development (ISD) group. It is systems analysis in which business professionals and IT professionals need collaboration and must create a new way of collaboration. This suggests the growing importance of systems analysis in organizations and a need for a major change in systems analysis. The research presented in this paper rethinks systems analysis by using Kays's (2001) new view of organizations.

There has been the division of labor in ISD, with attention to organization not to people. As mentioned by Truex et al. (1999) like that a stable set of abstract requirements awaits discovery by talented analysts, systems analysts as a professional or expert often do requirements analysis by studying organizational needs to IS and produce requirements specifications. The requirements as a product are then delivered to systems developers, who then develop IS. Finally they deliver the IS to the organization. This sequence does not necessarily include the development of systems in a general sense of system. The information systems discipline is ostensibly about systems, but many of our fundamental ideas and viewpoints are about tools, not systems (Alter, 2004a). Systems development often refers to developing software tools that meet requirements and satisfy perceived needs of an organization, rather than developing or modifying a system in the organization.

Attention to an organization itself rather than to people or alternate work practices is exemplified by the wide use of "use case" in UML (unified modeling language) in systems analysis. To derive the functions and interfaces of information systems, the use case approach employs role rather than actor (Fowler, 1999). Role is a concept related to an abstract organization as opposed to actor. It presupposes that there are no multiple floating versions of social reality in an organization and that a systems analyst identifies "the" functions of the organization. Alter (2004a) says that in the realm of systems analysis and design, the centrality of "use cases" in UML illustrates the underlying assumption that the immediate goal is to create computerized tools whose features and capabilities satisfy usage requirements. It means that the interest of analysts lie in an abstract organization and its functions not the reality.

In both aspects of theory and practice the underlying assumption of the current systems analysis reflects a particular type of organization images. For the aspect of theory, Kay et al. (2004) explain that the assumptions that most commonly underpin the IS literature can be identified as functionalist. For the aspect of practice, Westrup (1996) shows that focusing on the practices of systems developers suggests that developers actively construct representations of organizations that are rational, coherent and amenable to computerization. This is consistent with the vast majority of social and institutional theory that assumes a central role for intentionality or rational decision making in the process of social order creation (Kay et al., 2004). For management an organization is assumed to be a rational entity. For employees an organization is a machine that forces them to accept what management produces. In sum, the current systems analysis reflect functionalism, not seeing work practices in an organization.

In this paper we will rethink systems analysis. In so doing we need a new view of organizations, as suggested by Bansler et al. (2004) that there is a pressing need to develop an alternative theoretical perspective on ISD. As a new theoretical perspective of organizations and ISD, we employ a new view of organizations proposed by Kay (2001) and his colleagues, who approached the issue of applying autopoietic theory to the study of organizational phenomena for developing a new view, i.e. a view regarding the ontological nature of an organization.

To our knowledge, there is little research on rethinking of systems analysis in a new view of organizations except Truex et al. (1999), who describe new ISD for 'organization as emergent' (ibid). Their descriptions are still considered useful but limited because they are based on the problematic concept that an organization 'is' autopoietic, shown by their expression that "an organization uses its own identity as the primary point of reference when

it reconstruct itself" (ibid.). Therefore, it is considered that there is a need to radically rethink systems analysis in a new view of organization.

### **Autopoiesis and Organizations**

In this section we will explain briefly the theory of autopoiesis, the way in which an organization emerges among people who are autopoietic, and a new view of organizations.

#### ***The Theory of Autopoiesis***

The theory of autopoiesis was developed by H. Maturana and F. Varela (1980) to provide an explanation of what it is to be a living being. Central to the theory is the notion of self-production, which refers to a system where the components of the system participate in the production process that produces the same components that themselves constitute the system.

Autopoietic systems are structurally determined. All their changes within an autopoietic system can take two forms. Those structural changes are either a result of their own dynamics, or triggered by their interactions (Maturana et al., 1992, p.96). Although perturbations of the surrounding environment may trigger changes in the structure of an autopoietic system, the perturbations have no control over the results of those changes (Kay, 2001).

A living being has a nervous system, which can be characterized as having 'operational closure' (Maturana et al., 1992, p.164). That is a mechanism that maintains the structural changes of the organism within certain limits. The assumption is that every change of relations of nervous system activity results from and leads to further changes of relations of nervous system activity in a closed cycle. What will trigger a change in one autopoietic system will not necessarily trigger a change in another, or if it does, that change will not be the same, due to the differing triggering agencies within the structure of each individual nervous system (Goldspink et al., 2003). Furthermore, the same perturbation experience at a different point in time may elicit a different response even in the same individual as the state (structure) of its nervous system will not be the same from one time to the next (ibid.).

"Self-production leads to self-reference. Autopoietic systems are 'operationally closed,' meaning that no 'information' is taken in from outside. For this reason it is common to refer to autopoietic systems as autonomous systems or unities" (ibid.)

#### ***Emergence of Organizations***

The theory of autopoiesis provides a link between the behaviors of individuals and the development of a social system. An organization is a social system that is the environment where human individuals realize their autopoiesis. An organization is a source of perturbation that may trigger structurally determined changes to individuals. At the same time, individuals, through their interactions with others, produce sets of recurrent interlocking behaviors, which over time may become distinguished by observers as an organization (Kay, 2001).

An organization is an emergence, similar to a system. We need to make a distinction between the physical existence of humans and the representation of an organization in non-physical space. Humans may distinguish organizations, while organizations are unable, as an entity, to distinguish anything, as they are a distinction themselves (Kay, 2001). We need to recall the concept of system in Checkland (1993, p.247) who says "... system is an epistemology before it is an ontology ... ." A system is an expression of an observer's viewpoint or

particular world-view and does not have independent existence out there. The perceived ability of an organization to distinguish something from its environment is nothing more than a description given by an observer (Kay, 2001). Such a description pertains only to the observer who can witness the organism and its environment and relate the two (Mingers, 1995, p.33).

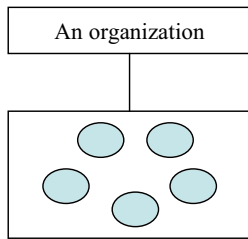
The concepts of structural coupling and consensual domain provide a bridge between the cognition of the individual and the emergence of a social system such as an organization. When two or more organisms interact recursively as structurally plastic systems, each becoming a medium for the realization of the autopoiesis of the other, the result is mutual ontogenic structural coupling (Maturana, 1978, p.47). He calls the domain of interlocked conducts that results from ontogenic reciprocal structural coupling between structurally plastic organisms a “consensual domain.” Consensual domains (or the sets of interlocking behaviors) operate essentially as closed systems i.e. they are self-organizing (Kay et al., 2002). It is considered that the concepts of structural coupling and consensual domain provide the basis for the description of organizing and a social force.

***A New View of Organizations***

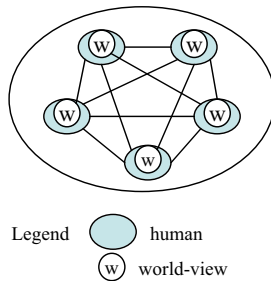
The following is the brief description of a new view of organizations proposed by Kay (2001) and his colleagues (Kay and Ceez-Kecmanovic, 2002, 2003; Goldspink and Kay, 2003; Kay and Goldspink, 2004). Their idea is based on autopoiesis and complex theory.

The primary component of an organization is considered the human individual who is an autopoietic unity, unlike communications as a component in Luhmann who thought that an organization ‘is’ autopoietic. People that have become structurally coupled can be considered as having formed a higher order system. Each such higher order system may be treated as operationally closed in that the recurrent interaction which gives rise to it is uniquely determined by the structures of the participants and their individual and collective histories of interaction (Goldspink et al., 2003).

In human systems, domains of interaction are mainly brought forth and maintained in language. We can distinguish two domains: a physical domain in which humans, i.e., autopoietic entities exist and the linguistic domain. The latter arises from the interaction of the humans in the physical domain.



**Figure 1: Humans and an organization**



**Figure 2: Embodied aspect of a world-view**

There are some distinguishing features of humans that are of fundamental importance to understanding organizations. "Unlike most other biological entities, human attained a level of structural plasticity that allows for language. Language makes possible reflexive self-awareness, i.e. we can distinguish 'self' from 'other' and become observers of self. Furthermore, we can observe our environment and adjust our operational structure on the basis of such observation." (ibid.) As a result, an organization can be distinguished by the individuals who comprise it as well as outside observers.

The organization is no longer an entity external to the individual; it becomes an embodied aspect of the individual's world-view (Kay, 2001). This implies a shift from viewing the organization as something that is "out there", as is common within many organizational theories (Figure 1) to a view where an organization is internal to each of us yet mutually derived in having arisen in a linguistic domain (Figure 2) (Kay, 2001; Goldspink et al., 2003).

Kay and his colleagues provide the framework that avoids reification of higher order social systems, providing a means for viewing them as emergent, while helping explain their history dependence and their origin in physical processes. These properties provide a basis for understanding the relationship and interplay between macro and micro phenomena through the specification of the generative processes which link the two (Goldspink et al., 2003).

An individual's world-view is often unique to the individual. The observer could be the individual herself or an outside observer watching the individual. Here it should be noted that what the observer sees is the behaviors of unities not the world-views of others which are invisible to her.

### **Systems Analysis and a New View of Organizations**

Major working concepts learnt from the above review of the theory of autopoiesis and Kay and colleagues' new view of organizations are structure-determined changes, the embodied aspect of a world-view, and the structural coupling with a consensual domain.

Rational analysis and design are considered inappropriate for autopoietic unities such as humans. Humans are so autopoietic and autonomous that any changes are structurally determined. Therefore, the rational analysis and design by someone who is not a user is not necessarily accepted by a user as is intended. The results of systems analysis and design by IT professionals are a perturbation for users that may become a trigger for changes. The perturbation does not determine what happens to the users. It is the structure of users that determines what change occurs in them. Management could not necessarily bring forth intended changes in their organization. The role of ISD would therefore be to influence the specific dynamics of a current pattern or to perturb the system such that it moves to an alternative pattern - one that is hopefully more desirable, as mentioned by Kay et al. (2004)

Functionalism in ISD is considered inappropriate for autopoietic unities. Matruiana et al. (1992, p.245) say that the knowledge of knowledge compels us to realize that the world everyone sees is not 'the' world but 'a' world that we bring forth with others. It is inappropriate for IT professionals to presuppose a single world-view for an organization they are analyzing. An organization is just a distinction distinguished by a person who has a specific world-view, and is an embodied aspect of her world-view. There are multiple floating descriptions of an organization around people involved. Therefore, functionalism that presupposes a single world is inappropriate for ISD.

Understanding work practices becomes important in systems analysis. Organizational knowledge that IT professionals seek does not exist in either an organization reified or individuals themselves who comprise it. That the organizational knowledge exists in the patterns of interlocking behaviors between members of a group or organization, means that work practices and the process by which they evolve become the focus for study (Kay et al., 2003). Furthermore, there are multiple different work practices within an organization depending on social forces or individuals. "Work practices well matched to some participants might be poorly matched to others with different interests and capabilities. ... the design of the system may have to accommodate those differences (Alter, 2004b).

Reflecting the above problems, systems analysis needs several shifts including a shift from IT professionals to business professionals, a shift from product to process, a shift from the world to a world, and others. Here we also use the concepts of sensemaking and organizing in Weick (1995) to derive these shifts in that they are concepts related to autopoietic unities i.e. humans. Sensemaking is concerned with making sense of environmental perturbations. Sensemaking is not simply an interpretation but action. It is about authoring as well as reading (Weick, 1995, p.7). It is related to structural coupling with environments. Sensemaking is enactive of sensible environments, meaning that a person participates in the evolutions of her environment and then must make sense of environmental events that resulted in part from her participation (Seligman, 2000). Organizing is a concept that is closely related to interlocking behavior and consensual domain that are unique to human social systems. Weick (1979, p.3) defines organizing as a consensually validated grammar for reducing equivocality by means of sensible interlocked behaviors.

Who practices systems analysis? Sensemaking is never solitary because what a person does internally is contingent on others (Weick, 1995, p.40). Sensemaking is social, in that no one makes sense in isolation, but each person derives sense in part from the works and actions of others, and produces sensible action and discussion that contribute to the sensemaking of others (Seligman, 2000). With the notion of structural-determined changes, this requires that practitioners of systems analysis be business professionals who are going to be structurally coupled with the information systems and their associated people. No IT professionals can make sense in isolation from practitioners. Therefore, their role in systems analysis shifts to a facilitator of systems analysis for business professionals who perform systems analysis.

In parallel with a shift from IT professionals to business professionals, there is a need for a shift from product to process. Currently IT professionals intend to produce requirements specifications based on the analysis of organizational functions. The requirement specification is a product of systems analysis. For that purpose there are companies that even introduce a best practice as a product, i.e., requirement specifications from outside instead of doing systems analysis by themselves in order to reduce workload for systems analysis. In the new systems analysis, business professionals themselves are expected to seek a new structural coupling and a consensual domain through the process of systems analysis with associated people. Kay et al. (2004) also say that "... no amount of requirements analysis will necessarily lead to an appropriate IS design, ... Rather, the emphasis needs to be shifted to processes which support flexible design and post implementation adaptability both technologically and socially." For example, Brown et al.'s (2001) case study of ERP implementation shows a glimpse of the emergence of a new structural coupling through process. They illustrate the implementation as a process in which interacting activities over many months produce the result of changing the way that people operate.

When do they practice systems analysis? In the current ISD, information systems are built in a project base. During a period between projects, IS are substantially frozen except minor modifications. However, people in organizations have to adapt to ever-changing environments and sometimes have to change themselves even without their environmental changes. As a result they have been continuously battling against their constraining information systems. In continuously remaking structural coupling, social forces or 'actor networks' (Latour, 1999) must do so with constant negotiation and constant systems analysis. Thus, systems analysis activity undergoes a shift from one-time job to a part of everyday job of business professionals.

There must also be a change in systems analysis methods. Business professionals do systems analysis, therefore systems analysis methods must be approachable for them. This supports Alter's (2004a) opinion that effective systems analysis method for business professionals could help them analyze systems for themselves and could help them communicate with peers and IT professionals. Emphasis is in its ease of use and the communication between business professionals.

The systems analysis methods must include the visualization of world-views and work practices. Several different work practices and different world-views are floating depending on consensual domains within a company. They are usually invisible not only to other people but also even to those people who have them, as implied by intangible assets. The required feature in systems analysis methods is new because the current ones do not see multiple consensual domains in an organization.

Although systems analysis methods require a major addition, the components of the current systems analysis methods or notations such as UML are considered valid once accommodation among multiple work practices is achieved through the process of systems analysis.

#### **A Practical Problem of New Systems Analysis**

The above discussion is concerned with a theoretical clarification of the problems and issues of and around the current systems analysis. There remains a major practical problem to transform systems analysis for IT professionals into that for business professionals. Kay et al. (2002) also mentions that considerable work remains to be done in terms of translating the concepts of structural coupling and consensual domains into practical solutions for the workplace.

Linguistic or dialectical engagement is the process in which a structural coupling emerges in human social systems. In an organization this process always carries politics, conflicts and struggles between multiple social forces, each having a different consensual domain. For example, Suchman (1995) shows that the visualization of work practices goes with politics among social forces. However, the process leads to self-reference and the construction of shared reality. Conflicts always arise wherever there are multiple versions of reality in an organization. By nurturing a deeper understanding of such conflicting versions of reality, reality becomes easier to reconstruct, and new structural couplings are encouraged.

Self-reference is at the core of self-reproduction and autonomy. Social forces use their own identities as the primary point of reference when they reconstruct themselves. In continuously remaking structural coupling, social forces or 'actor networks' (Latour, 1999) must do so with constant reference to themselves, work practices and world-views. They need reference



to others as well as self-reference because social forces or actor networks are always changing their boundaries. Central to the reference are work practices and world-views that make the work practices meaningful to the people involved.

Although self-reference is of importance to structural coupling in human social systems, there has been no practical or approachable tool with which to express and communicate their own work practices and world-views. Schlutze et al. (2000) say that ethnographic research methods are particularly well suited to the study of practice. Westrup (1996) also says that within IS development and the field of organizational analysis, ethnography promises to give insight into the micropractices of everyday working life. However, this careful use of ethnography makes it difficult for those not skilled in ethnographic work to accomplish this activity (Westrup, 1996). Another candidate is soft systems methodology (SSM), which facilitates people to bring their current work practices and world-views up in their consciousness with use of ideal types. However, SSM is not easily approachable for business people, as mentioned by Alter (2004a) that experience to date shows that typical American business professionals need a systems analysis approach that is more prescriptive than SSM and that includes specific, teachable vocabulary and concepts. In addition, “graphical languages do exist already in systems design. ... But few of these diagrams focus on people and how they work” (Beyer et al., 1997, p.85).

According to the mediational agency of a tool described in Vygotsky (1978), the absence of a practical tool has prevented people from seeing the underlying aspects of consensual domain and structural coupling, and in turn is considered to have mediated the development of the mindset of rational organization and functionalism. Therefore, the absence has helped the rational analysis and design to be widely accepted in ISD. As a result, systems analysts and designers, who facilitate other people's work by technology, do not have tools for work development, and practitioners usually are not capable of providing IS requirements based on work development efforts (Mursu, 2004).

Frameworks or frames are essential to facilitate self-reference and the understanding of others. There is no doubt that frames enable people to locate, perceive, identify, and label occurrences in their lives and perturbations from the environment. A cue in a frame is what makes sense, not the cue alone or the frame alone (Weick, 1995, p.110).

Activity theory (Vygotsky, 1978; Engeström, 1999a) is in a long-standing effort but has not been accepted as a practical frame. However, we see a potential in activity theory for a frame. Activity theory uses human activity as a unit of analysis, while many psychological theories use human action as a unit of analysis. The use of isolated actions in analyzing real-life situations outside a laboratory is fruitless. The solution offered by activity theory is that a minimal meaningful context for individual actions must be included in the basic unit of analysis (Kuutti, 1996). This unit is called an activity. Activity is more a general concept than an operation or an action, and at the same time is more specific than a society or a culture, however, implies all of them (Blackler, 1993). An activity is a form of doing directed to an object, and activities are distinguished from each other according to their objects. Transforming the object into an outcome motivates the existence of an activity. Based on the concept of mediation by Vygotsky (1978), Engeström (1999a, 1999b) and his colleagues developed a diagrammatic frame using three mediations of a tool, the division of labor and social rules, to express work practices for understanding our and other's world-views.

Bertelsen (2004) says that activity theory framework has gained increasing popularity within the IT-design communities, but it has mostly been applied as a conceptual framework for researchers, at the first international workshop on activity theory based practical methods for IT-design (ATIT2004) held in 2004. Despite a growing corpus of research using it as a theoretical approach, there has not been a corresponding initiative in developing activity theory as a practical method (Guy, 2004).

One of the unresolved problems in activity theory concerns the relation between collective and individual activities (Davydov, 1999). It is known that social scientists refused to discuss the existence of the activity of collective subjects. Recently collective identity is being used to represent the dialectical or conversational process of a group (Hardy et al., 2005). Collective identity can be used to identify multiple social forces, each having a different consensual domain and structural coupling in an organization, and is concerned with the process of organizing between human individuals and a reified organization.

Since ATIT 2004 workshop, there appear some researches focusing on the development of the practical methods. For example, a research (Kosaka, 2005, 2006) is focused on the development of a practical frame based on activity theory. In the research the collective identity is introduced to represent multiple, conflicting social forces and activity theory is made into multiple diagrammatic stages from simple to higher-order social systems by using the concepts of semiotic self (Wiley, 1994) and social semiotics (Lemke, 1990).

Having re-thought systems analysis in the light of a new view of organizations, we have clarified problems and issues around systems analysis theoretically, and paved an avenue for future research on a practical frame for understanding work practices.

## References

- Alter, Steven, "Desperately Seeking Systems Thinking in the Information Systems Discipline," *Proceedings of International Conference on Information Systems*, 2004a, pp.757-769.
- Alter, Steven, "Making Work System Principles Visible and Usable in Systems Analysis and Design," *Proceedings of the Tenth Americas Conference on Information Systems*, 2004b, pp.1604-1611.
- Bansler, J. P. and Havn, E. C., "Improvisation in Information Systems Development," in *Information Systems Research: Relevant Theory and Informed Practice*, B. Kaplan, D. P. Truex III, D. Wastell, A. T. Wood-harper and J. I. DeGross (eds.), Kluwer Academic Publ., 2004, pp.631-646.
- Bertelsen, O. W., Korpela, M. and Mursu, A., "ATIT2004 preface," *Proceedings of the First International Workshop on Activity Theory Based Practical Methods for IT-Design*, 2004, p.3.
- Beyer, H. and Holtzblatt, K. *Contextual Design: A Customer-Centered Approach to Systems Designs*, Morgan Kaufmann Pub. Inc., 1997.
- Blackler, Frank, "Knowledge and the Theory of Organizations: Organizations as Activity Systems and the Reframing of Management," *Journal of Management Studies*, Vol.30, No.6, 1993, pp.863-884.
- Brown, C. V. and Vessey, I. "NIBCO's Big Bang," *The Proceedings of International Conference on Information Systems*, 2000.
- Brynjolfsson, Erik, "The IT Productivity Gap," *Optimize*, Issue 21, July 2003 (available online at <http://www.optimize.com/issue/021/roi.htm> accessed March 1, 2007).
- Checkland, Peter, *Systems Thinking, Systems Practice*, Wiley, 1993.

- Davydov, Vassily, "The Content and Unsolved Problems of Activity Theory," in *Perspectives on Activity Theory*, Y. Engeström, R. Miettinen, and R. Punamaki (eds.), Cambridge University Press, 1999, pp.39-52.
- Engeström, Yrjo, *Learning by Expanding: An Activity-theoretical Approach to Developmental Research*, Shinyousha, 1999a (in Japanese translation).
- Engeström, Yrjo, "Activity theory and individual and social transformation," in *Perspectives on Activity Theory*, Y. Engeström, R. Miettine, and R. Punamaki (eds.), Cambridge University Press, 1999b, pp.19-38.
- Fowler, Martin, *UML Distilled, 2nd Ed.* Addison-Wesley, 1999.
- Goldspink, C. and Kay, R, "Organizations as Self-organizing and Sustaining Systems: A Complex and Autopoietic Systems Perspective," *International Journal of General Systems*, Vol.32, No.5, 2003, pp.459-474.
- Guy, Elizabeth S. "Appropriating Patterns for the Activity Theory Toolkit," *Proceedings of the First International Workshop on Activity Theory Based Practical Methods for IT-Design (ATIT2004)*, 2004, pp.32-47.
- Hardy, C and Lawrence, T. B., "Discourse and Collaboration: The Role of Conversations and Collective Identity," *Academy of Management Review*, Vol.30, No.1, 2005, pp.58-77.
- Kay, Robert, "Are Organizations Autopoietic? A Call for New Debate," *Systems Research and Behavioral Science*, Vol.18, 2001, pp.461-477.
- Kay, R. and Cecez-Kecmanovic, D. "Toward an Autopoietic Perspective on Information Systems Organization," *Proceedings of International Conference on Information Systems*, 2002, pp.383-390.
- Kay, R. and Cecez-Kecmanovic, D. "Organizational Knowledge & Autopoiesis: Towards a new view," *Proceedings of the Eleventh European Conference on Information Systems*, 2003.
- Kay, R. and Goldspink, C., "Developing Information Systems in the Absence of Purpose: A complex & autopoietic view," *Proceedings of Austrasia Conference on Information Systems*, 2004.
- Kosaka, Takeshi, "Frames by Subject Levels for Sensemaking of IS Development," *Proceedings of the Ninth Pacific-Asia Conference on Information Systems*, 2005, pp.1499-1505.
- Kosaka, Takeshi, "Introducing Collective Identity into Information Systems Research: Collective Identity as a Bridge between IS research and Practitioners," *Proceedings of the Tenth Pacific-Asia Conference on Information Systems*, 2006, pp.1056-1069.
- Kuutti, Kari, "Activity Theory as a Potential Framework for Human-Computer Interaction Research," in *Context and Consciousness*, B. A. Nardi (ed.), 1996, pp.17-44.
- Latour, Burno, "On Recalling ANT," in *Actor Network Theory and After*, John Law and John Hassard (eds.), Blackwell Publishers, 1999, pp.15-25.
- Lemke, Jay L., *Talking Science: Language, Learning, and Values*, Ablex Pub., 1990.
- Maturana, Humberto R. "Biology of Language: The Epistemology of Reality," in *Psychology and Biology of Language and Thought: Essays in Honor of Eric Lenneberg*, G. Millar and E. Lenneberg (eds.), Academic Press In., 1978, pp.27-63.
- Maturana, H. R. and Varela, F. J., *Autopoiesis and Cognition: The Realization of the Living*, Kluwer, 1980.
- Maturana, H. R. and Varela, F. J., *The Tree of Knowledge - The Biological Roots of Human Understanding*, Shambhala, 1992.
- Mingers, John, *Self-Producing Systems*, Prenum Press, 1995.
- Mursu, Anja, "Analyzing the present state of an activity," *Proceedings of the First International Workshop on Activity Theory Based Practical Methods for IT-Design*, 2004.

- Schultze, U. and Boland Jr., R. J., "Knowledge Management Technology and the Reproduction of Knowledge Work Practices," *Journal of Strategic Information Systems*, Vol.9, 2000, pp.193-212.
- Seligman, Larry, "Adoption as Sensemaking: Toward an Adopter-Centered Process Model of IT Adoption," *Proceedings of International Conference on Information Systems*, 2000, pp.361-370.
- Suchman, Lucy, "Making Work Visible," *Communications of the ACM*, Vol.38, No.9, 1995, pp. 56-65.
- Truex, D. P., Baskerville, R., and Klein, H., "Growing Systems in Emergent Organizations," *Communications of the ACM*, Vol.42, No.8, 1999, pp.117-123.
- Vygotsky, L. S., *Mind in Society*, Harvard University Press, 1978.
- Weick, Karl E., *Social Psychology of Organizing*, McGraw-Hill Inc., 1979.
- Weick, Karl E., *Sensemaking in Organizations*, Sage Publications, 1995.
- Westrup, Chris, "Transforming Organizations through Systems Analysis: Deploying New techniques for Organizational Analysis," in *Information Technology and Changes in Organizational Work*, W. Orlikowski et al. (eds.), 1996, pp.157-176.
- Whitten, J. L., Bentley, L.D. and Dittman, K. C., *Systems Analysis and Design Methods, 6th Ed.*, McGraw-Hill, 2004.
- Wiley, Norbert, *Semiotic Self*, The University of Chicago Press, 1994.