10-2008

SYSTEMS ANALYSTS IN CHAORDIC ORGANIZATIONS

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Abstract

The aim of this paper is to identify who is a systems analyst in organizations in a turbulent world. We see a need to radically rethink the way in which information systems are developed. There have appeared some efforts to create systems analysis methods for business professionals, for example, Alter (2002) and Bednar (2000). To promote the development of such methods, there is a need to theoretically validate the need for the development.

From literature review, we derive a hypothesis that 'analysis by external agents' has been at the heart of the practice in organizations. In organizations that fit with the hypothesis, agency costs occur in the form of IS failures because business professionals could not forecast their future of business and are subject to bounded rationality not sufficient to control the agents.

Having encountered complexity theory and the turbulent economy of globalism, some practitioners and researchers have recognized the increasing importance of creativity and sustainability of organizations, and started to use a term "chaordic organization" to describe a new type of organizations in contrast to the rationalistic one assumed in the dominant management discourse. We will show the inappropriateness of the hypothesis by revealing the built-in causality in the light of theoretical arguments made by Stacey et al (2000). They derived Transformative Teleology from the review of philosophical thinking, the purpose of which is the continuity and transformation of identity and difference. In chaordic organizations under Transformative Teleology, the future is unpredictable and under perpetual construction. This focuses attention on conversation as the central activity of organizing. This is inconsistent with the notion of 'analysis by external agents.'

In a chaordic organization, its members create social realities under perpetual construction. Therefore, it is theoretically suggested that systems analysis becomes one of their ongoing activities. New systems analysis methods are required as the tools for sensemaking of their own practice and for interaction between the members. The methods are different from the conventional ones for IT professionals.

Keywords: systems analysis methods, business professionals, turbulent environments, chaord

1 INTRODUCTION

Systems analysis and design methods aimed at IT specialists are abundant, but there have just emerged a few methods for business professionals, for example, Alter's work systems methods, Bednar's SST, and Korpela's ActAD. The development of such methods has been initiated by practical needs. There has been little theoretical discussion on the needs for them. The aim of our research is to create and validate the theoretical needs for them in order to facilitate the perception and development of systems analysis methods for business professionals, methods for the early phase of IS development in particular.

In the business environment of globalization where organizational changes are at higher pace than ever, the effectiveness of conventional methods is an open question. We discuss who is a systems analyst. This necessarily entails the discussion of what systems analysis should be. Here, the systems analysis is not the analysis of information systems (IS) but that of work systems that include IS. In the systems analysis people are required to ask themselves where they came, who they are, what they are doing, and where they want to go.

Historically systems analysis and design have been carried out by IT specialists such as systems analysts and systems engineers. Jobs have been divided into tasks of a relatively small range to enhance efficiency. According to the principle of division of labour, tasks are assigned to individual specialists, giving rise to departments such as accountant, personnel etc. In line with this thinking, IT-related tasks have also been assigned to IT specialists, giving rise to IT department. This specialization led to the situation where tasks related to information and IT became not a work of everybody but a work of IT specialists. The advent of the expensive and difficult IT in the 1950's and 1960's also bolstered this specialization as well. This is evidenced by the fact that much of the systems analysis and design literature assumes that work will be organized and carried out by professional systems analysts (Alter et al, 2000).

Such historical background produced an IT-specific discourse where special terms such as user, project, participation etc are appropriated. A term 'user' carries a specific connotation in IS. As Whitaker (2007) notes, any concerns for the interrelationship between a person and her task were supplanted by attention to the interrelationship between the person and the artifact, that is, a 'user' and the IS product. A worker was trivialized simply into a user of IS produced elsewhere. Most of workers became basically uninvolved in systems analysis and design.

Notion of 'project' also has a special connotation. A project is an endeavour having start and end. It means the analysis and design is separated from daily work of workers, and is carried out by IT specialists to produce concrete requirement specifications for IS. It is a plan frozen to build IS. Thereby workers, business professionals, take on less systems analysis responsibilities than expected. Separation of IS from work is still alive even in Agile development as put by Hightsmith (2001) that the strategy of agile methods is to reduce the cost of change throughout a 'project.'

This discussion leads to an idea, i.e., a rough hypothesis: Project-based systems analysis and design is carried out by IT specialists outside an organization of the workers that will use the IS. With this rough hypothesis as a starting point, we will investigate the underlying basis of the conventional IS development practices and show the theoretical and practical consequences. Then, we theoretically derive who should practice systems analysis, and the need for systems analysis methods for business professionals based on the research of Stacey et al (2000) who show Transformative Teleology for organizations in turbulent environments.

2 CONSTRUCTION OF A HYPOTHESIS OF CONVENTIONAL APPROACHES

In the previous section we derived a rough hypothesis concerning systems analysis. In this section we make a more complete hypothesis by reviewing literature about IS. First, we formulate who have been

working on systems analysis. In the literature the silver or magic bullet theory is considered worthy of investigation because it articulates a relation between IT specialists and IS users. Markus et al (1997), authors of IT magic bullet, ask why change management practices are not being followed in the field of IS development. They revealed the fact that IT specialists who do not follow change management practices espouse a silver or magic bullet theory.

As Markus et al (1997) note, even non-adopters of change management best practices believe that they are change agents if they initiate or develop IT, because they think IT itself has the power to create organizational change. These people describe IT as a magic or silver bullet, and believe that they built the gun. There are two logical implications of the analogy between IT and a bullet. First, users are the intended targets of the bullet because it changes the behaviour of people who use the IT by enabling new work practices and preventing old ones. Second, IT specialists play the role of designing and building guns away from the organization of intended users. This suggests that IT specialists are agents external to the organization of users. Therefore they are segregated from the day-to-day activities of users.

Discussion is not complete if we take only non-adopters of change management practices into consideration. In projects that some users participate in, change management practices are often followed. Change management is a structured approach to transferring individuals and organizations from a current state to a desired one. Here it is worth mentioning that a desired state is assumed to be a clearly articulated one in advance. In thinking about what change management means, a control mechanism comes readily to mind. It is employed to narrow the gap between the current state and the desired one. The target of change management is people and the organization external to the IT manager and specialists. Again this also shows that IT specialists are agents external to the organization of users. This also brings the existence of a planned or frozen desired state to the fore. This point is discussed later in this section.

In the above discussion we have formulated who have been primarily working on systems analysis. In the following we examine what they are doing in systems analysis and design by reviewing literature. Alter (2004) says that most of IT specialists pay attention to IT artifact rather than work systems where the IT artifact is used. For example, most (but definitely not all) of the discussions of important IS types such as DSS, EIS, and GSS treat IS of these types as tools whose use is based on its features and capabilities, rather than as systems in which human participants perform work such as analyzing decisions, making sense of the environment, and solving problems (Alter, 2004). This means that IT specialists treat IS just as a tool even thought IS is called ‘system.’

Whitaker (2007) further clarifies this from the theoretical viewpoint, saying that conventional IS methodologies are predicated on logical empiricism. The net effect of a logical-empirical approach tends to emphasize the form and function of a new IT artifact over the process and procedures of the work systems this artifact was commissioned to support. The specialists are interested in a product more than the process where the product is used. This often results in a belief that better solution could be obtained from external software vendors, as suggested by Lyytinen et al (1999). Product orientation rather than process orientation is perpetuated among the specialists.

This tendency is strengthened by conventional IS methodologies. They address the user from an objective or a third-person perspective (3PP). From the third-person perspective vantage a user is a simple unity, and analysis is a matter of reducing her operations to an inventory of inputs and outputs (Whitaker, 2007). Here users are considered not workers but just input-output machines.

IT specialists are concerned mainly with producing requirement specifications as a product for IT artifact. There is often user participation in IT projects, but their role is to play a power user role as an ideal type. For example, in NIBCO, a famous teaching case, power user roles were filled by business people who knew how transactions were processed on a daily basis (Brown et al, 2000). They participated in the project as a full time assignment separated from their daily work. Here, user participation in a project means that their knowledge, not an actual process, is appropriated for producing requirement specifications.

We have investigated what they are doing in systems analysis and design. It can be summarized as follows: In a project with start and end, IT specialists produce IS requirement specifications as a plan frozen at the end time of the project with little interacting with actual work systems.

As a hypothesis A->B form, we rephrase as follows: As to the part A, he is an IT specialist who is an agent external to the organization of users. As to the part B, he produces IS requirement specifications as a plan frozen at the end time of the project with little interacting with actual work systems.

3 THE IMPLICATION AND VALIDITY OF THE HYPOTHESIS

Before questioning the effectiveness of the hypothesis in turbulent environments, we look at the theoretical and practical consequences brought from conventional approaches that fit the hypothesis to verify the gravity or implication of the hypothesis in organizations. Then, in order to check the validity of the hypothesis, we investigate the theoretical foundation, i.e., the underlying basis of the hypothesis.

3.1 Theoretical and practical consequences of conventional approaches

Conventional approaches assume that if we just tried hard enough, we could anticipate the complete set of requirements early and reduce cost by eliminating change (Hightsmith, 2001). They assume stable systems in order to produce requirement specifications that are frozen. Stable systems thinking presumes that a stable set of abstract requirements awaits discovery by talented analysts (Truex et al, 1999). It is presumed in conventional approaches that humans are rational enough to know and describe the future of organizations. However, this presumption is rarely satisfied because humans are subject to bounded rationality. This has resulted in high rate of IS failures, widely known by Standish report (2004).

Here we examine the theoretical consequences of conventional approaches that fit the hypothesis in the light of the principal agency theory (Roberts et al, 1992). Principal-agent problems occur between principals and agents when there is information asymmetry between them because humans are subject to bounded rationality. An agent is supposed to work on behalf of a principal, who cannot have complete understanding of the action of the agent. This information asymmetry causes the principal-agency problems or simply agency problems of moral hazard. Agency cost is incurred in an individual or organization associated with an agency problem. Moral hazard occurs when a principal is shielded from the processes and consequences of poor decision-making by an agent. It is considered in principal agent theory that an agent usually pursues his own objectives rather than the objectives of the principal because of his opportunism.

We assume a business professional a principal and an IT specialist an agent. With their bounded rationality it is difficult for IT specialists to fully know organizational knowledge necessary for IS design. It is because that the knowledge exists in the patterns of interlocking behaviours between organization members, rather than the individuals themselves (Kay et al, 2003). It is situated work practices. Schultze et al (2000) say that system designers' failure to understand situated work practices lies at the heart of IS poor implementation success rates.

It is widely shared that the determination of requirement specifications is a very hard task. Because of information asymmetry a business professional as a principal can not understand and control the action of IT specialist, so that the IT specialist's concern shifts from the situated work practices to a rational image of an organization in favour of less work load, his more interest in IT and his rational thinking. By focusing on the practices of systems developers, Westrup (1995) reveals that developers actively construct representations of organizations that are rational, coherent and amenable to computerization. Moral hazard occurs when IT specialists choose an easy task rather than the hard one associated with situated work practices.

Once the concern shifts to rational organizations or IT artifacts, there is abundant external knowledge readily available to him. Given that so much external knowledge is potentially available, IT organizations tend to seek knowledge that corroborates existing beliefs and values (Lyytinen et al, 1999). IT organizations are keen to learn from external sources and are generally eager to

accommodate new technologies (ibid). There grows the belief that a better solution could be obtained from external software vendors (ibid).

Requirement specifications are derived with reference to external materials, and frozen at a specific time with slight accommodation of the differences between the model and the actual organization, as also seen in the NIBCO case (Brown et al, 2000). Therefore, the specifications lose touch with the situated work practices in the organization. However, it is widely known that work practices well matched to some organization might be poorly matched to others with different interests and capabilities.

In sum, as there is information asymmetry between business professionals and IT specialists, IT specialists might exercise opportunism, but business professionals cannot control the behaviours of IT specialists. Therefore IT specialists tend to increasingly focus on IT artifacts rather than work systems, ant tend to assume organizations rational, coherent and amenable to computerization.

Also in a practical sense, the conventional approaches have a major problem. The product by IT specialists is so fixed or frozen that there appears a problem that it does not support the changes of an organization in changing environments. As Truex et al, (1999) note, having low-maintenace, stable systems means the organization is continuously battling against its constraining IS as it adapts to an ever-changing environment. Nerur (2005) also says, Today's dynamic business environment has given rise to emergent organizations that continuously adapt their structures, strategies, and politics to suit the new environment. As such organizations need IS that constantly evolves to meet the changing requirements, stable IS inhibits rather than facilitates organizational changes. Stable or frozen IS might be successful at the time of implementation, but becomes a problem over time. Therefore, IS and the development that fit the hypothesis give rise to possibly large agency cost as a practical consequence.

We now arrive at the stage where it is worth questioning the hypothesis itself and the underlying assumptions theoretically.

3.2 The underlying basis of the hypothesis

Before questioning its effectiveness in turbulent environments, we investigate the theoretical foundation, i.e., the underlying basis of the hypothesis that we constructed. We look at their theory-in-use about systems development, in other words, to examine where the underlying basis comes from.

To begin with, messages from researchers associated with Agile methodologies are of some help. They make reference to the predictability of future embedded in conventional approaches. For example, Hightsmith et al (2001) mention that traditional approaches assumed that if we just tried hard enough, we could anticipate the complete set of requirements early and reduce cost by eliminating change. Nerur et al (2005) also say that such a conventional approach assumes that problems are fully specifiable, and that an optimal and predictable solution exists for every problem.

Along the lines with this thinking, most managers continue to believe that their role is to design an organization and to control its activities. However, the predictability is questionable because of human's limitation of information processing. Here, helpful for our discussion is the research made by Stacey et al (2000) who studied the relation between complexity and management based on the history of philosophy about nature and human.

According to them, Rationalist Teleology and Formative Teleology are considered to underlie this managers' thinking. They say that today's dominant discourse on the management of human organizations is built on thinking that seeks to apply the method of natural science to human action in ways that reflect Kant's split between causality in nature and causality in human action. The dominant management discourse is built on Rationalist Teleology as an explanation of choice and Formative Teleology as an explanation of how the choosing manager or social dynamics works. Stacey et al (2000, p.58) say:

Rationalist teleology applies to the choosing manager (theorist, researcher, decision-maker), from whom the organization itself is split off as a 'thing' to be understood. The organization, that which is to be explained and operated on, is then regarded as an objective phenomenon outside the choosing

manager (theorist, researcher, decision-maker), equivalent to a natural phenomenon, to which Natural Law or Formative Teleology can be applied.

Rationalist Teleology means that the manager can choose the goals of the organization and design the systems or actions to realize those goals. They use a term Formative Teleology in which there is an end state, or final form, knowable in advance. The final form is enfolded in the sense that whole exists in some sense before the parts. The purpose is to reach this enfolded end state. It is as if the whole was moving toward a subordinate final state that was already given: namely, a mature form of itself, in other words, it is unfolding an already enfolded form (Stacey et al, 2000, p.25).

In Rationalist Teleology both stability and change are human choices. It is assumed that organizations are designs chosen by humans and humans can design the truly novel (ibid, p.28). There are assumptions that human action is essentially individual action and that managers are objective observers who stand outside the processes of the organization and design them according to rational criteria to do with goal achievement (ibid, p.158).

Stacey et al (ibid, p.58) say there are two major problems in this thinking: First, managers and researchers are humans participating in the very phenomenon their approach splits them off from: they cannot be objective observers in the manner of the natural scientist, but they proceed as if they can. Second, and closely related to the first, the split locates human freedom entirely in the manager (theorist, researcher, decision-maker) and reduce other members of the organization to inhuman parts without freedom.

Returning to examine the underlying basis of our hypothesis, we can see isomorphism between the thinking of dominant management discourse and our hypothesis as follows: In our hypothesis A -> B, the part A is that he is an IT specialist who is an agent external to the organization of users. In the thinking of the dominant management discourse, he is a choosing manager, an objective observer, who stands outside the processes of the organization. The part B is that he produces IS requirement specifications as a plan frozen at end time of the project with little interacting with actual work systems. In the thinking of the dominant management discourse, organizations are designs chosen by individual actions of managers without interacting organizational members who are considered inhuman parts without freedom. The purpose of the organization is to reach an already enfolded form given by managers as a design in advance.

Since there is isomorphism between the underlying basis of the hypothesis and the thinking in dominant management discourse disclosed by Stacey et al, conventional IS approaches are also suggested to share the problems pointed out by them. With the isomorphism found, our hypothesis is still valid from the theoretical viewpoints as far as some type of organization is concerned. In the next section after the following brief review of the related research, we examine and discuss the effectiveness of the hypothesis in chaordic organizations, a new type of organization.

4 RELATED RESEARCH

We are asking who should be a systems analyst from a theoretical perspective and try to produce a theoretical need for systems analysis methods for business professionals. There are several researches that are related to our research theme, for example, Checkland (1993), Truex et al (1999), Alter (2002, 2004), Bednar (2000, 2005) and Kosaka (2004, 2007). Among them Truex et al's paper (1999) have a theoretical investigation directly addressing the topic. Their research result is very suggestive by describing a new way of IS development in turbulent environments. Although it is theoretically made, their research has a drawback in terms of organization change because it is the based on Luhmann's autopoiesis of social systems. Luhmann does not claim that social systems are living systems by conceiving of autopoietic social systems as systems in nonphysical space defined by non-physical components. Therefore, humans occupying physical space constitute not the system but the environment of the system. He suggests that the autopoietic system of communications exists as a unity, or in other words without humans as a part of the system (Kay, 2001). Such a premise has little explanatory value in terms of organizational change (ibid). Therefore the research based on Luhmann's is theoretically weak.

Alter's researches (2002, 2004) are another important strand in this theme. Based on practical needs for systems analysis methods for workers, he is constructing a method that expands the domain of analysis from IS to work systems. The subject who undertakes systems analysis is assumed to be business professionals from the outset. The method is considered very helpful, however, it is proposed without a theoretical discussion of systems analysis and analyst in terms of organization change.

Bednar (2000, 2005) proposes there is a need for producing a method for workers that helps them reflect on their work practices in order to understand their own social reality and to empower them. And he created and proposed a method, SST, that combines personal learning with organizational one. However, there is no theoretical investigation into systems analysis and systems analyst.

As contrast to the other methods and thinking mentioned above, Soft Systems Methodology (Checkland, 1993) is widely known. It is usually used in a project often at an offsite place. It has a theoretical problem in terms of who performs systems analysis. As noted by Stacey et al (2000), systems thinking contains a fundamental difficulty right at its roots. This is to regard human interaction as a system. This assumption leads to thinking about interaction as something about which another human standing outside it makes choices. Therefore, the novelty or fundamental change might be constrained since its source is outside of an organization at the theoretical level.

As mentioned above, our theme has not been addressed enough in the related researches from a theoretical perspective. Therefore, it is worth undertaking a research to ask who should be a system analyst and to produce the theoretical needs for systems analysis methods for business professionals.

5 INVESTIGATION OF THE HYPOTHESIS IN TURBULENT ENVIRONMENTS

5.1 Conventional approaches and chaordic organizations

Organizations that fit the hypothesis assume predictable environments and inhuman organization. However, as well known, the business environment continues to change at a dramatically increasing pace. To thrive in this turbulent environment, we must confront the business need for relentless innovation and forge the future workforce culture (Highsmith et al, 2001). In this environment is it still valid to hold the part B of the hypothesis A -> B? That is, there are organizations that espouse predictability and keep stable set of requirement specifications over time, without interacting with organizational members and with high dependence on external knowledge. The effectiveness of their theory in use is questionable in the current turbulent environments. For one thing, externally acquired knowledge seems to bring little competitive advantage to a company because similar knowledge is readily available to any competitor (Lyytinen, 1999).

In recent years, there has emerged a new term 'chaordic organization' to describe a new type of organization that survives in the turbulent global economy. Dee Hock (1995), founder of VISA Card, introduced the term chaord. "By Chaord, I mean any self-organizing, adaptive, non-linear, complex system, whether physical, biological, or social, the behaviour of which exhibits characteristics of both order and chaos or, loosely translated to business terminology, cooperation and competition" (Hock, 1995). Chaordic organizations create differences and change themselves on their own, without direct control from outside.

Organizations that favor conventional approaches are not self-organizing but formative with outside controlling managers. Because of this difference, the hypothesis is expected to be invalid in chaordic organizations. In the next section we will investigate the validity of the hypothesis in the light of the underlying basis of chaordic organizations.

5.2 Insignificance of the hypothesis in chaordic organizations

In a previous section, we examined the underlying basis of the hypothesis. In other words, we examined where the underlying basis of conventional approaches comes from. It is fundamentally based on Rationalist Teleology and Formative Teleology. In what follows, we theoretically show the

insignificance of the hypothesis under a different underlying basis, Transformative Teleology, which is eligible for turbulent environments.

In a growing concern for complexity, chaos theory became a focus of study in the late 20th century, but it did not model internal or intrinsic creativity. Chaos models display the unfolding of patterns in a sense already enfolded in the specification of the model (Stacey et al, 2000, p.90). While on the other hand, Prigogine formulated the theory of dissipative structure where the pattern of behaviour is caused by fluctuations that are small variations in the interactions between entities of the system, and the system has a potential for producing unpredictable behaviour.

Questioning an asymmetry of time between past and future, Prigogine asked a fundamental question in his book (1997, p.1) "Is the future given, or is it under perpetual construction?" He made the past different from the future. This means that the future is unpredictable and what happens to the system depends upon here-and-now interactions among people and between people and the environment. He sees the future for every level of the universe as under perpetual construction and suggests that the process of perpetual construction, at all levels, can be understood in nonlinear, non-equilibrium terms (Stacey et al, 2000, p.97). A system self-organizes to take unpredictable paths into the future. Here the process at all levels means a holonic process. A holon is an entity that is whole and a part of a greater whole at the same time (Koestler, 1967). There we see a holarchy as a hierarchy of functioning.

Stacey et al (2000, p.19) argue that self-organization as cause can be understood in one of two fundamentally different ways, the first being formative and the second being transformative. Based on the distinction of philosophical thinking between Kant and Hegel, they derived Transformative Teleology where there is self-organization that has the potential for transformation as well as continuity at the same time.

They relate their analysis of philosophical thinking with that of chaos theory and dissipative structure. And they say that these features, unknowable futures emerging in here-and-now interactions, are essentially what they have defined as the causal framework of Transformative Teleology (ibid, p.97).

Here we assume that Transformative Teleology is the underlying basis of a new organization, chaordic organization. It is because the future of organizations and environments are unpredictable. In the environments externally acquired knowledge has bounded effectiveness. It is also because the source of knowledge is expected to be interaction among members.

What is organizing in a chaordic organization? Members of an organization will have a shift in their way of thinking from a way that treats them inhuman as the object of control from outside, to another way that places interactions between them as a transformative cause of the organization. This gives rise to the importance of communication as the core of organizing. The points here are the diversity of people in and around the organization and fluid conversations among them. They enable perpetual construction of future and create a sort of collective minds, as mentioned by van Eijantten (2003) as an orgmind. People jointly create the meaning of what they are doing when they act into the unknown, co-creating their future in interaction with others (Stacey et al, 2000, p.194). When members are divergent and open to change, the chaordic organization continues to innovate itself on its own. It is in this process that mind and self arise between people rather than being located in an individual (ibid, p.174). Management could influence this collective mind.

Returning to the hypothesis, theory-in-use in the hypothesis assumes future is predictable while the espoused theory in chaordic organizations is that future is unpredictable. The world of the hypothesis is of one-time construction while that of chaordic organizaitions is of perpetual construction. In the world of the hypothesis the requirement specifications are produced by specialists with little interaction with actual work systems while in chaordic organizations the here-and-now interaction among members working in fields is considered critical. It becomes clear from these discussions that every critical point is different between the world of the hypothesis and that of chaordic organizations as far as the part B of the hypothesis A -> B is concerned.

In the hypothesis, the Part A is that he is an IT specialist who is an agent external to the organization of users. While on the other hand, in perpetual construction, main members of conversation should be internal people. In chaordic organizations managers and IT specialists are no longer external agents

who can control the organization. They are part of the organization. Therefore, the assertion of the Part A becomes an invalid argument in chaordic organization.

Through the above discussion, we understand the left and right arguments of the hypothesis are invalid in chaordic organizations. The hypothesis is insignificant in chaordic organizations, although we do not refute the hypothesis, that is, the relation between them,

6 DISCUSSION

There appear a few systems analysis methods for business professionals. However, interests to develop systems analysis methods for them are not widely shared. And there is no theoretically validated need for such methods. Therefore, we have tried to produce the theoretical need for them.

In the discussion, we investigated the underlying basis of the conventional approach that IT specialists as an external specialist produce requirement specifications for a new IS within a project. It was made clear that the conventional approach is theoretically ineffective in a new type of organization, chaordic organization, that is expected to survive in turbulent global environments.

In turbulent environments systems analysis must change from one-time activity by specialists to everyday activity by every business professional. In order to realize this transition, systems analysis methods for business professionals are required with a support structure enabling people to do systems analysis at the lowest possible level in the organization. However, it should be noted that IT specialists are still necessary. Since systems analysis becomes everybody's ongoing activity, the work style of IT specialists is expected to become of a teacher or consultant that is different from the conventional style where they have initiatives in building IT artifacts. They can contribute to enlarge the diversity of knowledge necessary for communication to produce innovation.

Work practices in Toyota motor (Bowen et al, 1999) are of some help to image the new work style and methods. Toyota sets up all its works as experiments. Workers and managers engage in the kind of experimentation. By making people capable of and responsible for doing and improving their own work, Toyota pushes the resolution of actual problems to the lowest possible level. It has any improvement be made in accordance with the scientific method of the hypothesis building and test cycle, under the guidance of a teacher, at the lowest possible level in the organization. Because improvement is of everyday work for everyone, a worker encountering a problem is expected to ask for assistance at once, as know as Andon, a lamp, that gives the worker the ability to stop production when a defect is found. Each plant and major business unit in Toyota have a number of consultants whose primary responsibilities are to help senior managers and workers move their organizations toward the ideal. Here we see an idea similar to the thinking for the systems analysis practices and methods required in a turbulent environment. It should be also noted besides practices and methods that there is a shift of belief from workers as an inhuman thing to workers as the most significant corporate asset. The scientific method used in Toyota helps us make systems analysis methods be oriented toward understanding situated actions. Therefore, the systems analysis methods for business professionals are expected to make sense of their identity and their work practices.

As to the limitation of this research, the research result presented in this paper is not concerned with changes of huge infrastructure. It still belongs to a domain of upper management. However, such kind of work is known as a rare case in the nature of things. As noted by Truex et al (1999), the US railroad system provides a metaphor for a new IS development. There has not been a nationwide development project to replace the entire railroad system in the US. The railroad system has emerged to match the needs of the nation and the limits of the technology. This emergence is a consequence of continuous enhancements, that is, a perpetual construction.

References

Alter, Steven. (2002). The Work System Method for Understanding Information Systems and Information System Research. In Proceedings of Eighth Americas Conference on Information Systems, 2372-2380.

Alter, Steven. (2004). Desperately Seeking Systems Thinking in the Information Systems Discipline. In Proceedings of International Conference on Information Systems, 757-769.
Alter, S., Conger, S., and Green, C. (2000). Systems Analysis Techniques for Business People: How Should These Techniques Differ from Techniques for IS Professionals. In Proceedings of the Americas Conference on Information Systems.
Bednar, P. M. (2000). A Contextual Integration of Individual and Organizational Learning Perspectives as Part of IS Analysis. The Informing Science Journal, 3(3), 145-156.
Bednar, P. M. and Welch, C. (2005). IS, Process, Organizational Change and Their Relationship with Contextual Dependencies, In Proceedings of European Conference on Information Systems.
Bowen, Kent, H. and Spear, Steven. (1999). Decoding the DNA of the Toyota Production System. Harvard Business Review, Set.-Oct., 95-106.
Brown, Carol V. and Vessey, Iris, (2000). NIBCO's 'Big Bang.' In Proceedings of the International Conference on Information Sytems.
Checkland, Peter. (1993). Systems Thinking, Systems Practice. Wiley.
Hightsmith, Jim and Cockburn, Alistair. (2001). Agile Software Development: The Business of Innovation. IEEE Computer, Sep., 120-122.
Hock, Dee W. (1995). The Chaordic Organization: Out of Control and Into Order. World Business Academy Perspectives, 9(1).
Kay, Robert and Cecez-Kecmanovic, Dubravka. (2003). Organizational Knowledge & Autopoiesis: Towards a new view. In Proceedings of the Eleventh European Conference on Information Systems.
Koestler, Arther. (1968). The Ghost in the Machine. Macmillan.
Korpela, M., Mursu, A. and Soriyan, H. A. (2002). Information Systems Development as an Activity. CSCW, 11, 111-128.
Kosaka, Takeshi. (2004). Rethinking Systems Analysis in A New View of Organizations. In Proceedings of the Eighth Pacific-Asia Conference on Information Systems, 2247-2253.
Kosaka, Takeshi. (2007). Rethinking Systems Analysis in A New View of Organizations. In Proceedings of the Eleventh Pacific-Asia Conference on Information Systems.
Lyytinen, Kalle, and Robey, Daniel. (1999). Learning failure in Information Systems Development. Information Systems Journal, 9, 85-101.
Markus, L.M., and Benjamin, R.I. (1997). The Magic Bullet Theory in IT-Enabled Transformation. Sloan Management Review, Winter, 55-68.
Nerur, S., Mahapatra, R.K., and Mangalaraj, G. (2005). Challenges of Migrating to Agile Methodologies. Communications of the ACM, 48(5), 73-78.
Prigogine, Ilya. (1997). The End of Certainty, Free Press.
Roberts, Paul and Milgrom, John. (1992). Economics, Organization and Management. Prentice-Hall international editions, 1992.
Schultze, U. and Boland Jr., R. J. (2000). Knowledge Management Technology and the Reproduction of Knowledge Work Practices. Journal of Strategic Information Systems, 9, 193-212.
Stacey, Ralph D., Griffin, Douglas, and Shaw, Patricia. (2000). Complexity and Management: Fad or Radical Challenge to Systems Thinking ? Routledge.
Standish Group. (2004). CHAOS Chronicles, 2004, Standish: Project Success Rates Improved Over 10 Years. January 15. cited by softwaremag.com (available online at http://www.softwaremag.com/L.cfm?Doc=newsletter/2004-01-15/Standish; accessed September 7, 2008)
Truex, Duane P., Baskerville, R., and Klein, Heinz. (1999). Growing Systems in Emergent Organizations. Communications of the ACM, V42(8),117-123.
van Eijnatten, Frans M.(2003). Chaordic Systems Thinking: Chaos and Complexity to Explain Human Performance Management. In Proceedings of Business Excellence Conference.
Whitaker, Randall. (2007). Applying Phenomenology and Hermeneutics in IS Design: A Report on Field Experiences. The Informing Science Journal, 10, 63-96.