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知識表出化ツールとしてのシステム思考

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要旨 本報告では、システム思考を知識表出化の本質的なツールとして提案する。従来からシステム思考の重要な概念として、全体性とフィードバックメカニズムが議論されてきた。これらの機能は、例えば組織学習(Argyris and Schon, 1978; Senge, 1990, Schon, 1983)やシステム方法論(Checkland and Scholes, 1990)の主要素として活用されている。このような適用分野では、形式化できない知識の重要性は認識されていたが、それらの取り扱いについてはあまり議論されるにいたっていなかった。一方、野中ら(Nonaka and Takeuchi, 1995)は、組織的知識創造における暗黙知(Polanyi, 1966)の役割を明確にし、さらに暗黙知と形式知との知識変換の SECI モデルを提唱した。本報告では、この組織的知識創造理論を基礎としてシステム思考を捉える(吉田、2002a; Yoshida, 2002b)ことにより、知識表出化のツールとしての役割について考察する。

System Thinking as a Tool for Externalization

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Abstract: This paper proposes that system thinking is an essential tool for externalization of knowledge. Two of the important concepts of system thinking are holism and feedback mechanism, which have been employed in the organizational learning (Argyris and Schon, 1978; Senge, 1990, Schon, 1983), systems methodologies (Checkland and Scholes, 1990), and so on. Although the importance of so-called tacit knowledge have been recognized in these embedded areas, almost no discussion exist how to deal with such tacit knowledge. Nonaka and Takeuchi (1995) clarified the role of tacit knowledge in the organizational knowledge creation and established SECI model as the knowledge conversion between explicit and tacit knowledge. We employ their theory of organization knowledge creation and discuss an important role of system thinking (Yoshida, 2002a; Yoshida 2002b).

1. INTRODUCTION:

According to Nonaka and Takeuchi (1995), knowledge is created through the interaction between tacit and explicit knowledge; and there are four main processes of knowledge conversion: socialization (tacit to tacit); externalization (tacit to explicit); combination (explicit to explicit); and internalization (explicit to tacit); while other three are fairly covered by several fields in business practices, externalization was somehow neglected by previous researchers and considered fundamental by the author, who in his book used examples in Honda, Canon, and Hitachi to show the use of metaphor and analogy as tools for externalization. This paper proposes the use of the concept of system thinking, more specifically soft system methodology, as tool for externalization in addition to metaphor and analogy. To pursue paper's objectives firstly, we will briefly review SECI model and describe the four

process of knowledge conversion, emphasizing externalization and its importance for knowledge creation. Secondly, we present the concept of system thinking and summarize soft system methodology. Furthermore, we propose a new approach for system thinking: tool for externalization, more specifically, to create the idealization for the real situation, thus making it easier to be communicate in more explicit way, then determine the gap between ideal and real matter, making it explicit, in other words knowledge conversion. Finally, theoretically we discuss the idea concerning limitations and implications for future works.

2. THEORECTICAL FOUNDATION

2.1. SECI Model

According to Nonaka & Takeuchi (op. cit), knowledge is dynamically created through the interaction between individuals, ultimately through the interaction between tacit and explicit knowledge (knowledge conversion). There are four types of knowledge conversions:

- **Socialization**: tacit to tacit, is generally related to practical experience, and typically found when apprentices learn how to perform a task by observing and imitating their masters.
- **Externalization**: tacit to explicit, when tacit knowledge is articulated and verbalized; examples of explicit tacit knowledge are metaphors, analogies, concepts, hypotheses and models. Externalization will be explained in more details later in this section.
- **Combination**: explicit to explicit, is basically to combine different pieces of explicit knowledge available inside or outside the organization to create new knowledge.
- **Internalization**: explicit to tacit, when explicit knowledge available to one individual is incorporate by his or her body of knowledge.

Externalization is the key process of knowledge conversion, according to Nonaka & Takeuchi (op. cit), because knowledge available inside an organization is mainly inside people's mind and tacit. Tacit knowledge, by definition Polanyi (1966), is highly contextual and inherent to an individual, thus must be made explicit to be efficiently used by organizations. Nonaka and Takeuchi (op. cit) used examples of Japanese companies to show metaphor and analogy for knowledge externalization. For example, Honda used the metaphor of "Theory of Automobile Evolution" to develop the Honda City that created a new sector of small and comfortable cars in Japan. Canon used the analogy of an aluminium can to design its revolutionary cheap to replace cylinder for copy machines. The cylinder should be as cheap as aluminium can. Also, when Hitachi developed its first home bakery the standard for the machine's bread quality was set by a metaphor that it should be as good and as crispy as Osaka hotel's bread. Those are concrete examples, but also have shown dependency of the process on managers' ability to create adequate metaphors and analogies, thus there is a need to find an alternative to metaphor and analogy.

2.2. SYTEM THINKING

According to Jackson (1991), during the sixties, systems approach starts to dominate management theory. The holism, the idea of see the whole picture, defeated the reductionism, the scientific strategy to analyze parts independently. Additionally, according to that systemic approach, organizations started to be seemed as open systems, in constant interaction with the environment, rather than closed and independent machine, feedback mechanism. Despite the several methodologies developed since then, we will focus on soft systems methodology (SSM), one of system thinking methodologies. There are four principles of SSM according to Flood and Jackson (1991): learning, culture, participation, and the two modes of thought. About the first, Checkland and Scholes wrote that SSM is more likely to be an organized learning system that does not reach the optimal solution, generally help users to incrementally understand better the issue. Culture is essential parts of SSM because is related to what is perceived to be the system desirability. Participation has to do with considering equally perspectives of the multiple parts involved on the issue. Finally, the two modes of thought are abstract and ideal system thinking and specific real word thinking. System thinking is composed by seven steps that are described as follows.

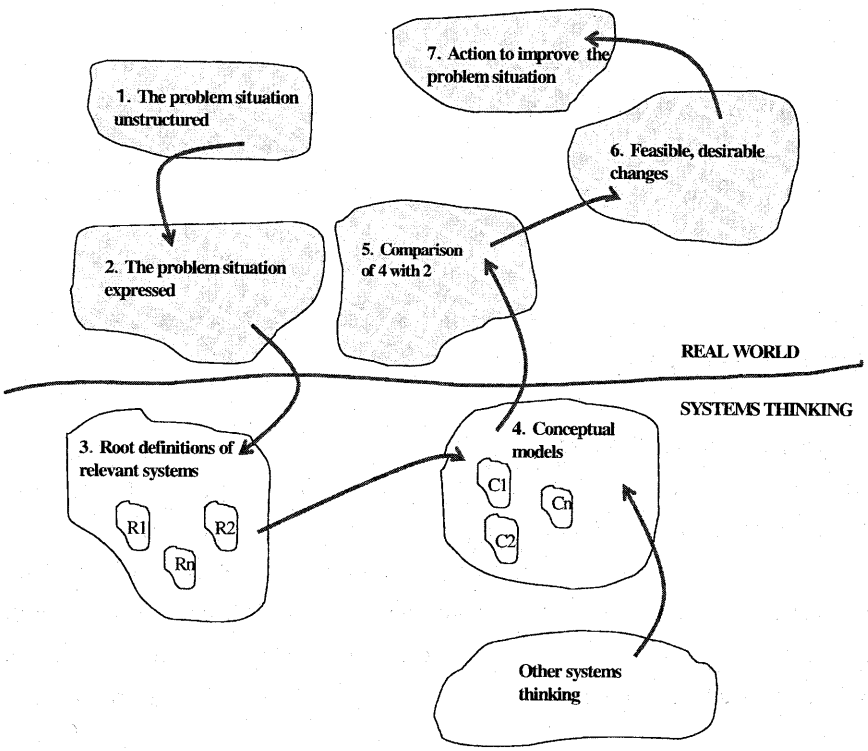

Fig.1 SSM, based on Flood and Jackson (1991)

Actually, there is no correct order to start or finish; we will explain in numerical order, though.

Stages 1 and 2: Finding Out and Drawing a Rich Picture

Finding out is about to gather information through observation, collecting secondary data, and through informal interviews with people involved in the issue; then considering also political and cultural aspects draw a rich picture of the issue.

Stage 3: Formulating Route Definitions

From the rich picture, elaborate well verbalized statements, test them through stages 2-5, and synthesize an idealization of the issue. A guide to elaborate the statements is the mnemonic CATWOE, which stands for customers, actors, transformation, weltanschauung (worldview), owners, and environment.

Stage 4: Building Conceptual Models

Set of verbs that represent the minimum activities that can carry out tasks named in the root definition. For Flood and Jackson (op. cit) those verbs should include operations of the system as well as aspects of monitoring and controlling.

Stage 5: Comparing Models and Reality

Each of conceptual models must be carefully compared with current perceptions; it is a reality check, which means to check if activities proposed are really feasible in the real world, or desirable concerning cultural aspects.

Stage 6: Comparing Models and Reality

Differences between expected outputs and desirable outputs, when comparing models and reality should inspire changes. Also those activities that were proven to be unrealistic should be changed.

Stage 7: Action

Action, implement feasible and desirable changes; this stage can also mean start the cycle again and enrich the understanding about the issue.

3. SSM FOR EXTERNALIZATION:

Gao et al (2002) proposed methods for knowledge conversion, specifically proposed SSM as one of 13 possible methods to be used for knowledge externalization. Yoshida (2002a and b) made a decisive connection between SSM and the theory of knowledge creation, which ultimately inspired this article. According to the author, when an unstructured issue is expressed in a rich picture, for example, tacit knowledge is made explicit, externalization. This is certainly the essence of the connection between SSM and externalization that we are proposing, although we will try to outline more aspects.

First of all, considering the four principles of SSM, the methodology is basically a learning system. The aim is to learn more about the issue every time the methodology is used, rather than to search for the optimal solution. This could be restricted to world of explicit knowledge if aspects of

culture and participation would not be considered. Cultural aspects are related to how actors perceive and represent reality, mental models. Participation has to do with seeing reality from different viewpoints, inherent for each individual, and build a shared understanding of the situation, shared visions. Notice that, consequently, the idealization created by SSM already incorporated tacit aspects or knowledge. Mental models and shared visions are two of four disciplines the compound system thinking, the discipline of organizational learning from Senge (1990). Second of all, considering the steps of SSM, drawing a rich picture by finding out about the problem could also reveal tacit aspects of knowledge when cultural and political aspects are considered. Instead of pure objective facts, contextual information is also brought up. Steps from 3 to 7 assure that the ideal representation built in steps 1 and 2 is accurately verbalized, even if several loops have to be conducted to achieve it. Additionally, CATWOE reveal contextual aspects of what is brought up when applying SSM. Reality becomes contextual depending on actors, customers, owners, etc. That contextualizes knowledge and learning. Summarizing, SSM brings up explicit aspects of an issue, from a multifaceted perspective, plus cultural and contextual aspects of it. Ultimately, creates an ideal representation of tacit and explicit aspects of the issue, then making easier to verbalize and compare to reality, and finally assures its verbalization accuracy, externalization. By what was said above, we believe that including the perspective of tacit knowledge in SSM is possible to expand its scope from the original learning system to a wider knowledge creating system.

4. DISCUSSION

Since the publication of The Knowledge Creating Company by Nonaka & Takeuchi in 1999, a huge number of researches, papers and books have been made considering knowledge conversion a very important aspect of business practices, fundamental for innovation and competitiveness. Additionally, system thinking, more specifically soft systems, is believed to be a dominant approach in social sciences and management in general. Thus, the objectives of this paper where achieved because in our proposal we could relate those two important theories in business practices; opening a wide field for further deployments. Also, we propose a concrete and systematic alternative methodology to the process of knowledge externalization in addition to the use of metaphor and analogy. Moreover, we pointed out tacit aspects of the knowledge brought up by the use of SSM expanding its scope from organizational learning to knowledge creation.

These findings are limited to the theoretical field and future works should explore practical aspects of what was proposed. More specifically, we believe that a method for externalization based on SSM should be developed, adjusted and validated through case-studies.

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