Artificial Intelligence and Organizational Learning
How can AI contribute to Organizational Learning?

Shigehisa Tsuchiya

Interdisciplinary Course on Advanced Science and Technology
The University of Tokyo
4-6-1 Komaba, Meguro-ku, Tokyo, 153 Japan
e-mail: tsuchiya@ai.rcast.u-tokyo.ac.jp

Abstract

Information technology assisted by artificial intelligence can support organizational learning and enable organizations to form and execute strategy effectively.

Organizational style is changing. Realizing the characteristics of social problems, more and more organizations are now loosening couplings so that their subsystems may have more chance to enact environment. As Weick (1976) suggested, loosely coupled organizations permitting considerable flexibility in the behavior of their subsystems are better able to adapt and survive. Traditional organization style —hierarchical tightly coupled system— is becoming out of date.

In formulating strategy, executives are now becoming aware of inevitable ambiguity in the real world. Traditional analytical strategy is based on two assumptions which often prove false: that the formulator is fully informed, and that the environment is stable, or at least predictable. Due to the absence of either condition these days, the importance of emergent strategy (Mintzberg, 1978) has become widely acknowledged among managers in the business world.

Because of these changes in organization and strategy, many organizations are having difficulties in making strategic decisions. Through intensive case studies of a private college, a typical example of loose coupling, I have developed and verified following new hypotheses:

information technology assisted by artificial intelligence can help organizations form and implement appropriate strategies by improving organizational decision making process through organizational learning.

Keywords. information technology; artificial intelligence; organizational learning; emergent strategy; loosely coupled system;

IBM has drastically restructured its organization from tightly coupled hierarchy to loosely coupled federation. Soviet Union died and Commonwealth of Independent States was created. Thus traditional organization style —hierarchical tightly coupled system— is becoming out of date and loosely coupled system seems to be the organization style in the future.

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Faced with frequent and drastic environmental changes, more and more organizations are now loosening couplings so that their subsystems may have more chance to enact environment. Sensitivity and flexibility to the environment are essential for their survival.

Loosely coupled system seems to be the organization style in the future. However, there is a big problem: strategy formation is difficult in a loosely coupled system. Weick (1976) suggests that loosely coupled organizations permitting considerable flexibility in the behavior of their subsystems are better able to adapt and survive. Yet, he admits that, when the changes in the environment are drastic, the organizations have to tighten up their couplings to survive.

Meanwhile, as for strategy, the importance of emergent strategy (Mintzberg, 1978) has become widely acknowledged. Traditional planning theory postulates that the strategy-maker "formulates" from on high while the subordinates "implement" lower down. This dichotomy is based on two assumptions which often prove false: that the formulator is fully informed, and that the environment is stable, or at least predictable. Due to the absence of either condition these days, strategy formation has become a learning process, whereby implementation feeds back to formulation and intentions get modified en route, resulting in an emergent strategy.

Many organizations are now having much difficulties in making strategic decisions because they are loosely coupled and adopt emergent strategies.

1 Strategy Formation

The term strategy has been defined in a variety of ways, but almost always with a common theme, that of a deliberate conscious set of guidelines that determines decision into the future. A typical definition of strategy is "...the determination of the basic long-term goals and objectives of an enterprise, and the adoption of courses of action and the allocation of resources necessary for carrying on these goals (Chandler, 1962)". All these definitions treat strategy as (a) explicit, (b) developed consciously and purposefully, and (c) made in advance of the specific decisions to which it applies. The basic assumption here is the environment is analyzable.

However, deliberate and analytic strategies such as PPM models, SBU, etc., have failed to be effective in the "real world", because the environment surrounding organizations is unanalyzable. By nature, human world is not rational nor systematic, but ambiguous, equivocal and liquid. The "real world" is composed of innumerable facts and characteristics, and the relationship among those components and causality are ambiguous.

Through empirical studies, Mintzberg (1978) defined strategy as " a pattern in a stream of decisions". Successful organizations in Japan have never adopted analytical strategies. Assuming the unanalyzable environment, they experiment environment by action and form effective strategies inductively. For them, strategy formation is a learning process, where emergent strategies play important roles. Emergent strategies

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are formed and implemented from the middle up, while deliberate strategies are formulated and implemented from the top down. Loose coupling is suited better for such "process type strategies" than tight coupling. .

	UNDIRECTED VIEWING	ENACTING
Unanalizable	Constrained interpretations. Nonroutine, informal data. Hunch, rumour, chance opportunities.	Experimentation, testing, coercion, invent environment. Learn by doing.
ASSUMPTIONS ABOUT ENVIRONMENT		
	CONDITIONED VIEWING	DISCOVERING
Analizable	Interprets within traditional boundaries. Passive detection. Routine, formal data.	Formal search. Questioning, surveys, data gathering. Active detection.
	Passive	Active

ORGANIZATIONAL INTRUSIVENESS

(Weick & Daft,1983; Daft & Weick,1984)

Fig.1   Model of Organizational Interpretation Modes

2 Organizational Decision Making

Organizational decision making is governed by the mode of its interpretative framework. Organizations must make interpretations. Interpretation is the process of translating events surrounding them, of developing models for understanding, of bringing out meaning, and of assembling conceptual schemes among key members (Daft and Weick, 1984). The model proposed by Daft and Weick describes four *interpretation modes*: undirected viewing, conditioned viewing, discovering, and enacting (Fig.1). Each mode is determined by (1) management's beliefs about the analyzability of the external environment and (2) the extent to which the organization intrudes into the environment to understand it.

In order to cope with the new turbulent environment by loosening couplings and adopting emergent strategies, organizations must change the mode of its interpretative framework to ENACTING.

3 Organizational Learning

ORGANIZATIONAL LEARNING is defined as the process by which knowledge about action outcome relationships between the organization and the environment is developed (Duncan & Weiss, 1979). It is the process of evolution of *interpretation mode* of the organization.

Organizational interpretative framework is formed through interpreting the outcomes of its DECISIONS and ACTIONS. Organizational interpretation is defined as the process of translating events and developing shared understanding and conceptual schemes among members of organization. The organization makes decisions and actions based on its organizational INFERENCE. And organizational inference is limited by the mode of its interpretative framework because the organization will not perceive any information inconsistent with its *interpretation mode*.

Thus the three stages — inference, decision and action, and interpretative framework — are interconnected through a

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feedback loop in Figure 2. Changing organizational interpretation mode through organizational learning is a very difficult process because the organization has to cut the loop. According to my case studies, the key stage in evolution of interpretation mode is INFERENCE.
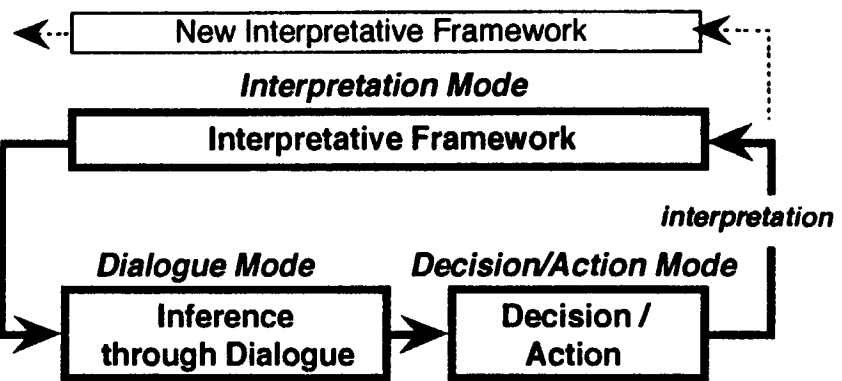

Fig.2 Organizational Learning

4 Inference

Organizations as well as humans make tacit and explicit inference in a simultaneous and integrated way to cope with problems in the ambiguous real world. Tacit inference is nonlinguistic and comprehensive thought, and explicit inference is linguistic and analytical thought.

Knowledge is fundamentally tacit. We know more than we can tell (Polanyi, 1966). All knowledge is either tacit or rooted in tacit knowledge, because, while tacit knowledge can be possessed by itself, explicit knowledge must rely on being tacitly understood and applied. All explicit knowledge, however crystallized in the formalisms of words, pictures, or other articulate devices, relies on the grasp of meaning through its articulate forms: on the comprehension that is its tacit root.

However, formalization of tacit knowing immensely expands the power of the mind, by creating a machinery of precise thought. It also opens up new paths to intuition. When knowledge is expressed in language in a broad meaning through articulation, sign manipulation of knowledge becomes possible. It includes storage, reproduction, transportation, and rearrangement. Man's intellectual superiority over the animals is almost entirely due to the use of language. But, tacit knowing is still the fundamental power of the mind, which creates explicit knowing,lends meaning to it and controls its uses.

5 Information Technology ad AI

Information technologies assisted by artificial intelligence can support organizational learning and make interpretative framework to evolve by improving organizational inference.

5.1 Substitution of Human Activities

Traditional view of the contribution of information technology in inference is that information technology can substitute a part of human activities so that we may spend more time in creative activities which is innate in human beings.

Using information technology is difficult. Due to the characteristics of managerial problems, flexibility is essential for the system, which makes building an effective system difficult and expensive. In addition, because the benefits of the system are intangible, a high initial investment is difficult

to be justified. However, in spite of those difficulties, several companies are now using information technologies to let employees have more time for creative work.

5.2 Support of inference

However, my case studies have made it clear that information technology assisted by artificial intelligence can directly support and improve inference. When thinking, humans make tacit and explicit inference simultaneously and interactively. It is an integrated process. Although knowledge is fundamentally tacit, formalization of tacit knowing immensely expands the power of the mind.

Sign manipulation of knowledge immensely improves human thought. Human intellectual superiority to animals comes from the ability of articulation and sign manipulation. As long as sign manipulation is concerned, computers surpass humans by far. Human beings are strong at intuitive thinking, but weak at calculation and logical reasoning. Therefore, information technology can support inference through effectively replacing the explicit side of human thinking process.

Individual tacit knowledge, which is the fundamental source of organizational knowledge, needs to be shared and legitimated before it becomes organizational knowledge. Transmission of knowledge becomes possible when knowledge is expressed in language (in a broad meaning) through sense-giving. Communication is an interactive process of sense-giving and sense- reading: endowing ones own utterances with meaning and attributing mean-

ing to the utterances of others. As the language used in communication includes facial expression, gesture, atmosphere, etc., nothing is better than face-to-face communication. However, it has limitations regarding time, space, and organization. Information technology can overcome such problems and supplement face to face communication, because articulate knowledge in communication can be processed by information technology.

AI plays a very important role here. Explicit inference including sign manipulation creates knowledge only when tacit inference gives sense to explicit inference. Therefore, decision makers should control their own development and operation of information systems. What is most important in inference using information technology is intuitive interaction between the computer and the end-user. Consequently, a simple but flexible user interface is indispensable. AI can contribute to improve organizational inference by providing user friendly interface.

5.2.1 Interpretation Tools

By providing interpretation tools, information technologies can help proper manipulation and reading of sign. They improve the process of internalization of articulate knowledge, and assist sense-reading of events surrounding individuals, groups, and organizations. For instance, raw data can hardly mean anything, but statistical analyses using information technologies can endow data with meaning.

5.2.2 Metaphors

Individual knowledge is fundamentally tacit and can only be expressed and

transferred indirectly by metaphor. Information technologies can assist sense-giving or articulation, which is the other important process of thinking, by providing effective metaphors such as words, data, graphs and images. These metaphors also assist sharing knowledge which is the essential process of inference at group level.

5.2.3 Shared Field

Information technologies can assist inference at group level by providing shared field. In discussion, group members often use a blackboard or a piece of paper because they know visual expression complementing language is effective in sharing knowledge through sense-giving and sense reading process. A large display with many terminals in a conference room will be much more efficient than a blackboard.

Although nothing is better than face-to-face communication to have a shared field, it is often not possible. Information technologies such as electronic mail and electronic blackboard can overcome limitations inherent in face-to-face shared field, regarding time, space and organization.

5.2.4 Appropriate Process

Information technologies can assist inference at organizational level. Group knowledge becomes organizational knowledge only when it is regarded to be legitimate. Legitimacy often depends as much on the appropriateness of the process as it does on the outcomes (March and Olsen 1986). Information technologies help make knowledge legitimate by facilitating forecast, simulation, analysis, etc. which are regarded as appropriate processes.

6 AI and Organizational Learning

Information technology assisted by artificial intelligence can improve organizational decision making process through organizational learning and assist organizations to form and implement appropriate strategies. Organizational learning is a difficult process for all organizations, because the feedback loop among inference, decision and action, and interpretative framework has to be cut. Especially in a loosely coupled system, it is extremely difficult because organizational learning process is inherently incomplete. However, information technologies can assist organizational learning by helping organizational inference as follows:

(1) Information technologies are able to improve the process of inference and make *dialogue mode* evolve.

(2) As a result, a divergence is generated between *dialogue mode* and *decision/-action mode*, which makes *decision/action mode* change.

(3) As the *decision/action mode* changes, existing interpretative framework becomes incapable of making sense of the environment. And the interpretative framework of the organization shifts to a new mode through reinterpretation of experiences. .

(4) The improved *interpretation mode* makes it possible for the organization and its members to perceive what they have so far been unable to see. Consequently, tacit knowledge in the organization is enlarged and reconstructed.

(5) It makes *dialogue mode* change, generating a discrepancy between

dialogue mode and information technologies. This discrepancy urges information technologies to develop.

(6) Such development of information technology in return helps *dialogue mode* improve further.

Through such spiral dynamism, *interpretation mode* changes and strategy formation process evolves as shown in Fig.3.

The most successful corporation of the 1990s will be something called a learning organization (Fortune Magazine). The organizations that will truly excel in the future will be the organization that discover how to make and keep its interpretation mode *enacting* through organizational learning.

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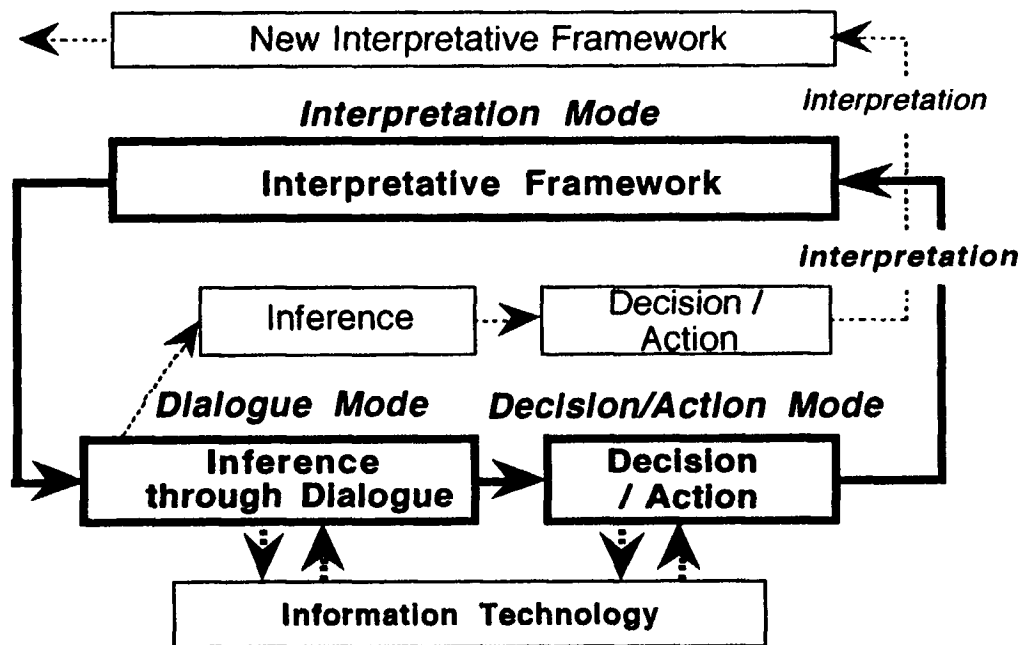
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Fig.3   Information Technology and Organizational Learning

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