

Twenty-first-century Management and the Complexity Paradigm

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WHAT IS "COMPLEXITY KNOWING"?

"Complexity" is becoming a keyword at the cutting edge of modern thought. In the vanguard of this movement are the Brussels school led by Ilya Prigogine, a Nobel laureate in chemistry, and the Santa Fe Institute in New Mexico. The latter, in particular, has attracted in recent years scores of researchers, from all over the world and from the natural sciences, social sciences, and humanities alike, who are passionately engaged in the study of chaos theory, self-organization, artificial life, and many other leading-edge topics with a view to breaking ground in these new realms of knowledge for the twenty-first century. Their enthusiasm has made its way across the Pacific and spread to Japan, where it has given rise to the current "complexity" boom.

As this boom heats up in Japan, however, serious misapprehensions and illusions are being generated about the nature of complexity—that it is some kind of "new theory," the use of which will make it possible to analyze the properties of even complex phenomena and predict their behavior.

Complexity, however, is not a new theory in that sense. It is a new paradigm of knowing, or, rather, a new way of conceptualizing knowledge.

Accordingly, what the keyword “complexity” will bring about is nothing less than a shift from old ways of thinking to new ways of thinking in all domains of knowledge.

Without understanding this fact, no matter how much managers may learn about such specialized topics as chaos theory or artificial life, this fragmentary knowledge will never be useful in actual management situations. The author’s aim is to define this new paradigm as “complexity knowing” and to discuss the resulting paradigm shift so that managers can put the “seven types of knowing” to practical use. In consideration of space limitations, I will attempt to describe the essence of these seven types of knowing and explain the paradigm shift that managers will be looking for in the twenty-first century.

*KNOWING THE WHOLE: AS SOMETHING BECOMES
MORE COMPLEX, IT ACQUIRES NEW PROPERTIES*

Why are such timeworn words as “complex” attracting attention once again? Because our traditional ways of thinking have come up against a huge wall. Up until now, whenever we encountered a complex object, in order to understand it we would first break it down into simple components of a readily analyzable size. We would then analyze each component minutely, and finally we would synthesize the results.

It is, of course, precisely analysis of this sort that has supported the present advances in science and technology. But as science and technology have developed, the limitations of the analytical method have become apparent—i.e., the fact that something important is lost when an object is reduced to its component parts. Why is this the case? Because it is a characteristic of the world we live in that, as something becomes more complex, it acquires new properties.

This means that, as the world increases in complexity, it begins to display new properties that had never existed before. When molecules of water are brought together, for example, they assume one of three forms: water, ice, or steam; when cells are brought together, they function as tissue, organs, and intestines. Likewise, when large numbers of consumers are brought together, they create hit products or fads, and when people are brought together, they exhibit crowd psychology.

Thus, the world intrinsically is a living system that cannot be reduced to a collection of its components, because the instant it is broken down into parts it loses its life force. In this sense, it resembles a fish, which, after being cut up, dissected and studied minutely, can be sewn back

together and restored to its original shape, but it can never regain its essential form as a living, breathing fish.

It is precisely because the methods of analysis and synthesis have come up against these limitations that the search is on for a way of “knowing the whole,” one that does not break down a complex object into its component parts but that comprehends it as a whole in all its complexity. This is the expectation behind all the attention that the keyword “complexity” is attracting.

What, then, is the method by which we know the whole?

“Knowing the whole” is shining a new light once again on the classic technique of old-fashioned intuition. Methods such as “intuition,” “hunches,” and “taking the broad view,” which were previously stigmatized as unscientific and denied “citizenship” in modern management studies, are now being revived and given new life.

For that reason, managers must study deeply the following paradigm shift that knowing the whole teaches:

Don't analyze, intuit the whole.

*KNOWING EMERGENCE: THE SPONTANEOUS
BEHAVIOR OF INDIVIDUALS PRODUCES THE NORM
FOR THE AGGREGATE*

What, then, is the best way for us to approach the living world in its totality? The method that teaches us this is “knowing emergence.” What do these words mean?

Bird simulation, for example, is an extremely interesting study in the field of artificial life. Merely by installing in each bird the simple property of preserving a certain distance between itself and the next bird, the property automatically becomes the norm that a flock of birds exhibits and part of their group behavior. The aggregate’s ability to form systems or create structures automatically as the result of the spontaneous behavior of its individual members is called “emergence.” And the ability to generate advanced systems and complex structures automatically from within rather than being acted on from without is called “self-organization.”

For that reason, approaches to the world that make use of emergence and self-organization are called self-organized or emergent methods. These methods, however, are completely different from the ones

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we normally use to plan structures or manage systems.

Up until now we have benefited from the machine culture that science and technology have created. Thus, we tend to forget that the world we live in is also alive; unconsciously, we tend to regard it as though it were a mechanical device. We are, therefore, under the illusion that other entities that also have the qualities of life, such as corporations, markets, and societies, are somehow like machines. We sketch out ideal conditions in the form of plans and imagine that we can control or manage events to attain these conditions.

In contrast, “knowing emergence,” as an approach to the world, teaches us the importance of not trying to plan or manage things artificially, but emphasizes instead ways to stimulate the process of self-organization.

For that reason, managers must study deeply the following paradigm shift that knowing emergence teaches us:

Don't plan or manage, stimulate self-organization.

KNOWING COHERENT ENVIRONMENTS: COHERENCE STIMULATES SELF-ORGANIZATION

What, then, is the best way for us to act that will stimulate the processes of self-organization and emergence in the living world? The method that teaches us this is “knowing coherent environments.” What do these words mean?

Ilya Prigogine, an international authority on research into self-organization, has made clear the three conditions under which self-organization is generated in systems in the natural world.

The first condition is that a system be open and allow exchanges of energy, matter, and information with the outside world. The second condition is that it be dynamic, far removed from a state of equilibrium. The third condition is that within the system there is feedback that enables special processes to make rapid progress.

Prigogine has pointed out that, in order for the third condition, in particular, to come about, it is important that information sharing develops within the system and that the system as a whole produces coherence so that a coherent environment can be generated.

These three conditions, which are prerequisites for self-organization in natural phenomena, provide valuable hints for thinking about self-

organization in social phenomena. Companies too, for example, definitely fulfill these three conditions. A self-organized corporation is one in which (1) employees show a high degree of spontaneity; (2) plans and projects are generated from the bottom up; (3) new goods and services are developed; and (4) marketing activities can be adopted that respond to a rapidly changing market.

First, this sort of company is an open company that actively engages in exchanges of personnel and information with the markets and with other companies. Second, it is a dynamic company with a corporate culture that is always seeking innovation and change. Third, it is a coherent company, whose corporate vision, strategy and other valuable information are shared with all employees, thereby creating coherence between one employee and another and expanding the sphere of its activities.

During the current information boom, the importance of information sharing has been pointed out. What is truly important, however, is that the information being shared generates coherence among employees and creates a coherent environment in which information coherence can develop.

For that reason, managers must study deeply the following paradigm shift that knowing coherent environments teaches:

Generate information coherence not information sharing.

*KNOWING THE ABILITY TO PRODUCE COHERENCE:
FLUCTUATIONS AT THE MICRO LEVEL CAN SWAY
MACROSCOPIC TRENDS*

What, then, is important for generating self-organization from a coherent environment? The method that teaches us this is “knowing the ability to produce coherence.”

These words are explained by Prigogine in his research on self-organization. Translated freely into the language of corporate management, they mean that the most important entity for generating self-organization from a coherent environment in a corporation (macro level) is the individual (micro level).

In other words, it is precisely those individuals who can articulate an attractive vision and act with passion to make that dream come true who will draw in many other people around them through their ability to

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produce coherence. And it is precisely this process of involvement at the micro level that such individuals generate that stimulates self-organization and emergence in a company and determines the macroscopic trends of the corporation as a whole.

In corporate behavior, entrepreneurship is essentially nothing more than the process by which the ability to produce coherence, and the process of involvement that such an individual generates, determines overall trends in a corporation, market, or society. And what determines trends in today's rapidly changing and evolving corporations, markets, and societies is increasingly becoming the individual's ability to produce coherence. The age in which a company could rest secure in being a "big business" or an "all-round company" is already over; the curtain has come down on the era in which an organization's collective strength swayed the marketplace.

For that reason, managers must study deeply the following paradigm shift that knowing the ability to produce coherence teaches:

It is not an organization's collective strength but the individual's ability to produce coherence.

KNOWING CO-EVOLUTION: THE WHOLE AND ITS PARTS CO-EVOLVE

What sort of strategic thinking is thus needed for individuals to change a corporation, market or society? The method that teaches us this is "knowing co-evolution." What do these words mean?

When a corporation, a market, or a society evolves, this evolution becomes a process of co-evolution. To put it another way, a process develops in which each part interacts with and influences the other parts, thereby stimulating their mutual development. What is even more important is that this process of co-evolution also develops between the parts and the whole.

This means that when an individual acts on a corporation, market, or society, the following two types of strategic thinking are important.

The first is to act simultaneously on the complex parts that make up co-evolution. Imagine, for example, that we are trying to develop a process of information sharing in a company. We would have to change at least three parts—the information system, the management process, and the corporate culture—all at once. We call this kind of strategic

thinking a “horizontal integration strategy.”

The second is to act while simultaneously taking into consideration the co-evolution of the superior whole and its subordinate parts. Such things as corporate vision, strategy, tactics, or action plans, for example, co-evolve as the upper and lower levels interact with and mutually influence one another. What is important, however, is to think about and make decisions about the whole and its parts in a way that integrates them vertically. We call this type of strategic thinking a “vertical integration strategy.”

Up to now most strategic thinking has either been from the bottom up or from the top down. Knowing co-evolution, however, teaches us the importance of a horizontal integration strategy and a vertical integration strategy.

For that reason, managers must study deeply the following paradigm shift that knowing co-evolution teaches:

Neither top down nor bottom up.

KNOWING HYPER-EVOLUTION: THE PROCESS OF EVOLUTION ALSO EVOLVES

How, then, should we think about rules in these types of strategic thinking? The method that teaches us this is “knowing hyper-evolution.” What do these words mean?

They mean that in evolution, the process, i.e., the rules themselves, is also evolving. Thus, the rules formed in a corporation, market, or society evolve.

Bill Gates and most of the world’s outstanding entrepreneurs did not only take up the challenge of the existing market where the rules are already established, they have also actively generated new rules by ambitiously creating new markets.

The age in which it is possible to win by learning the rules, following them, and using them to advantage is over. We are now entering an age in which we must recognize that the rules are changing and that we must seek success by actively changing them.

For that reason, managers must study deeply the following paradigm shift that knowing hyper-evolution teaches us:

The rules are changing, and so they can be changed.

*KNOWING SINGULARITY: THE FUTURE OF
EVOLUTION CANNOT BE PREDICTED*

How, then, should we think about predictions in these types of strategic thinking? The method that teaches us this is “knowing singularity.” What do these words mean?

Prigogine’s dissipative structure theory demonstrates that it is impossible to predict beforehand what systems or structures will be produced as a result of evolution. In addition, chaos theory shows that, in nonlinear systems, the smallest differences in the initial state can lead to very large differences in the final outcome. In short, in these two senses, it is impossible to predict the future in a complex world.

What principle of behavior should we then adopt for an evolving world—i.e., a corporation, market, or society—in which no absolute rules exist and in which it is impossible to make any certain predictions about the future? This principle is clearly stated in the word of Alan Kay:

The best way to predict the future is to invent it.

These words tell us how we ought to go about making decisions and acting when confronted with a one-time-only situation that cannot be predicted because the rules do not repeat themselves. They teach us the profound lesson that knowing is an art, not a technique.

For that reason, managers must study deeply the following paradigm shift that knowing singularity teaches:

Do not predict the future, create the future.

*MANAGEMENT AS THE MOST EVOLVED
FORM OF COMPLEXITY*

Experienced managers, however, already have a profound understanding of these seven types of complexity knowing in the form of “gut feeling” or “tacit understanding.” Why? Because management is the most highly evolved form of complexity and because managers continually grapple with complexity in their day-to-day operations and continue to acquire the wisdom, in the form of experience, that allows it to evolve even further.

In retrospect, one of the serious diseases of the twentieth century was the disjunction between thought and action. If we thoroughly understand this fact, we must remedy this illness and bring about a new synthesis of thought and action in the twenty-first century. In order to do so, managers, who are in the position to “act,” must now take an interest in cutting edge “thought,” study it deeply, and put it into practice. Moreover, in their efforts to put it into practice, they must embody it and talk about what they know in words that are full of vitality.

Now is the time that managers ought to be talking about “knowing.”