On the Future-Oriented Complexity and Adaptation Studies

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1 The Birth of FOCAS

My first participation in futures studies was in the 10th World conference of the World Futures Studies Federation (WFSF) in Beijing, Sept. 1988. Then I organized the Asian-Pacific regional conference of WFSF in Nagoya in the fall of 1989. Through these activities, I gradually began to feel a necessity to hold future-oriented seminars on a regular basis so that futures studies would become one of the major fields of interdisciplinary studies at a higher educational institution in a coming complex age of information.

An opportunity to propose this idea visited me three years later when I was invited to attend the UNESCO seminar on "Teaching about the Future", Vancouver, Canada, June 21-23, 1992. At the seminar, I proposed a series of World Futures-Creating Seminars to be held every summer in Awaji Island, Japan, with a hope that this seminar series will evolve into a core program of a higher educational institution for futures studies.

With an enthusiasm among local communities, the first World Futures-Creating Seminar was held on August 16 through 19, 1993 under the main theme: Renewing Community as Sustainable Global Village. And its proceedings was finally published in 1997 as *Sustainable Global Communities in the Information Age - Visions from Futures Studies* [3].

The second seminar took place in August 7 through 11, 1994, under the main theme of "Non-Linear & Chaos-Theoretic Thinking - New Scientific-Visionary Paradigm." Following the seminar, an intensive live-in workshop was held for 3 days, Aug. 11 - 13, 1994, to discuss a further development of this seminar series. Participants of this workshop were 12 resource people from the second seminar[1]. On the last day of the workshop, all agreed that

[1]Namely, they are Steven R. Bishop (UK), George Cowan (USA), Nadegda Gaponenko (Russia), Jerome C. Glenn (USA), Jerome Karle (USA, Nobel Laureate for Chemistry in 1985), Pentti Malaska (Finland), Kazuo Mizuta (Japan), Linzheng Qin (China), Tony Stevenson (Australia), Terushi Tomita (Japan), Theodore J. Voneida (USA), and Kaoru

the seminar should be renamed so as to reflect the content of what we want to pursue in this seminar series of future-oriented studies. In this way, a new research field is born for futures studies; that is, *Future-Oriented Complexity and Adaptation Studies (FOCAS)*. The FOCAS aims to

1. understand the interrelated wholeness and interdependence of future-oriented complex phenomena (such as natural, environmental, and socio-economic phenomena) which cannot be *linearly* predicted, and

2. use our brain and technology such that human beings (individuals, communities, and societies) will be able to get well adapted to them.

Ever since, the FOCAS seminar continues to be held every summer in Awaji Island, thanks to many devoted futurists, scientists and local volunteers. Simultaneously, a methodology of the FOCAS has been steadily developed. The aim of this paper is to introduce a basic idea of the on-going FOCAS.

2 Five Inseparable Fields of Studies

The FOCAS is based on a framework I presented in the above-mentioned first seminar in 1993, in which I posed the following five inseparable fields of study for future-oriented studies. For detailed discussions, see *Establishing a Higher Institution for Future-Oriented Studies* [3, Chapter 20].

1. Wisdom and Self-Awareness Studies

   - training for self-awareness and enlightenment through meditation
   - ecological awareness and new holistic philosophy
   - medical training for well-being

2. Future-Oriented Methodological Studies

   - a non-linear paradigm based on chaos, evolutionary and complexity theories
   - mathematical programming, statistical inference and time-series analysis
   - computer programming and simulations for system dynamics

Yamaguchi (Japan).

3. Human–Nature Interrelated Studies

   - ecologically sustainable natural and organic farming using effective microorganisms
   - creation of new eco-share regions and communities based on natural habitats
   - wholistic solutions for such environmental problems as global warming, acid rain, depletion of the ozone layer, tropical deforestation, and endangered species

4. Human–Technology Interface Studies

   - renewal of traditional technologies, for example making tofu and soy sauce
   - use of clean forms of energy, including solar, tidal and wind energies
   - new ecologically sound orientation for such high technologies such as info-communication, biotechnology, and new materials

5. Inter–Human Networking Studies

   - new information and network economics, beyond market economics
   - renewal of traditional and diversified cultures and histories
   - networking of economies, cultures, technologies and th environment.

3 Building Blocks of the FOCAS

Having identified these five inseparable fields of future-oriented studies, I have to show, as a next step, how they interrelate one another wholistically. For this purpose, I have renamed these five fields simply as Mind, Model, Nature, Technology and Economy as if they constitute five building blocks of the FOCAS. Among these, moreover, I have selected Mind, Nature and Economy as the most fundamental building blocks of the FOCAS, then arranged them in a matrix form as shown below in Table 1. Nature is placed in the center and Mind, which observes Nature, is located on the top left, while on the bottom right is placed Economy that extracts natural resources from Nature for its reproductive activities.

Whenever Mind comprehends Nature, it presumes some form of Model, and Model, once built that way, begins to influence the way Mind captures

Mind	$\longrightarrow\downarrow$	
$\uparrow\longleftarrow$	Nature	$\longrightarrow\downarrow$
	$\uparrow\longleftarrow$	Economy

Table 1: Fundamental Building Blocks

Nature in turn. In this way, Model needs to be created as an another building block of the FOCAS. On the other hand, people need tools to extract natural resources from Nature and sustain their economic activities. Eventually the knowledge and skills to make these tools are advanced as Technology. Technology, once obtained this way, begins to regulate the way Economy relates with Nature. Hence, Technology becomes another building block of the FOCAS. In total, Mind, Model, Nature, Technology and Economy constitute five essential and wholistic building blocks of FOCAS. Their interrelations are shown in Table 2.

Mind	$\longrightarrow\downarrow$	$\longrightarrow\downarrow$	$\longrightarrow\downarrow$	$\longrightarrow\downarrow$
$\uparrow\longleftarrow$	Model	$\longrightarrow\downarrow$	$\longrightarrow\downarrow$	$\longrightarrow\downarrow$
$\uparrow\longleftarrow$	$\uparrow\longleftarrow$	Nature	$\longrightarrow\downarrow$	$\longrightarrow\downarrow$
$\uparrow\longleftarrow$	$\uparrow\longleftarrow$	$\uparrow\longleftarrow$	Technology	$\longrightarrow\downarrow$
$\uparrow\longleftarrow$	$\uparrow\longleftarrow$	$\uparrow\longleftarrow$	$\uparrow\longleftarrow$	Economy

Table 2: Feedback Relations of the Five Building Blocks

4 Positive and Negative Feedback

A complex whole is formed by the interrelations of these five building blocks. How are they interrelated one another, then? Their interrelations are set up through positive and negative feedback mechanism. Positive feedback interrelates building blocks one another so as to expand and flare up their relations, while negative feedback regulates and stabilizes them.

Example 1

As an example, let us consider internet technology. When we consider its future development, we usually tend to think its technological aspect per se. However, if we want to understand it wholistically, we have to consider it as an interrelated feedback technology with the the remaining four building

blocks. For a simplicity, let us select Mind and Economy. Then, questions we have to pose may become as follows:

1. What is an internet technology per se? – (intrinsic questions to Technology)
2. How does it influence our mind and economy? – (interrelated questions to Mind and Economy)
3. How do our mind and economy, in turn, react the internet technology positively or negatively? – (feedback questions to Technology)
4. How does the internet technology evolve against these feedbacks positively or negatively? – (reversed feedback questions to Technology)

Then, questions 2 through 4 are repeated in an evolving or converging fashion. Figure 1 below shows these feedback interrelations.

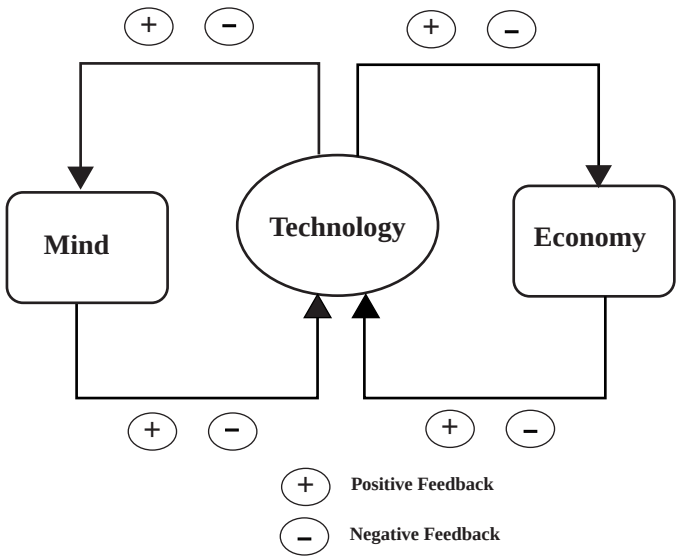

Figure 1: Feedback Figure

Example 2

Let us now consider a chaos theory as a Model, and extend only a similar kind of question as the question 2 in the above example 1 to the remaining four building blocks. Then, questions to be raised may become as follows.

1. How does a chaos theory help understand our brain recognition processes? – (questions to Mind)

2. How does a chaos theory explain population dynamics and bio-diversity? – (questions to Nature)

3. How can a chaos theory help avoid engineering catastrophes? – (questions to Technology)

4. How can a chaos theory help explain unpredictable market prices? – (questions to Economy)

Then, for each question, a feedback question like the question 3 in the above example 1 has to be raised in turn, followed by a reversed feedback question like the question 4 in the above example. In this way, the analysis of chaos theory covers all five interrelated building blocks wholistically.

5 Missing Fields of Study

Once building blocks of the FOCAS are arranged in a matrix form of 5 rows and 5 columns as in Table 2, we can easily observe 20 blank boxes or elements of the matrix. Since the opposite side of the elements have the same interrelations with the building blocks one another, only half of these elements constitute 10 missing fields of interdisciplinary studies in the FOCAS, which eventually have to be filled in.

To specify such missing fields, consider an interrelation between Mind and Economy as an example. Two opposing attitudes of mind towards the Absolute create two different types of belief systems and religions; the one which accepts its existence such as Christianity, Muslim, etc. and the other which does not accept it or is indifferent with it such as Buddhism, Taoism, etc. These different attitudes begins to reflect on the universal economic activities with different manners and customs and these differences begin to cultivate economic activities differently – a birth of culture (Western and Eastern). In this way Culture emerges as a next stage of the FOCAS matrix to fill in an missing element of interrelation between Mind and Economy (Table 3).

Once Culture is augmented in the FOCAS matrix, another interesting feedback questions arise as follows.

- How does different cultures affect economic activities differently – for instance, market economic workings in the West and in Asia?

- How does an economy such as a capitalist market economy or a new information (digital) economy begin to change cultural differences between the West and Asia?

Mind	$\longrightarrow\downarrow$	$\longrightarrow\downarrow$	$\longrightarrow\downarrow$	Culture
$\uparrow\longleftarrow$	Model	$\longrightarrow\downarrow$	$\longrightarrow\downarrow$	$\longrightarrow\downarrow$
$\uparrow\longleftarrow$	$\uparrow\longleftarrow$	Nature	$\longrightarrow\downarrow$	$\longrightarrow\downarrow$
$\uparrow\longleftarrow$	$\uparrow\longleftarrow$	$\uparrow\longleftarrow$	Technology	$\longrightarrow\downarrow$
Culture	$\uparrow\longleftarrow$	$\uparrow\longleftarrow$	$\uparrow\longleftarrow$	Economy

Table 3: Missing Fields of Study Augmented

We are still working along this line of thinking to fill in the missing nine more fields. When they are filled in, the FOCAS matrix of the interrelated wholeness or complexity will be completed, which we like to call *FOCAS Mandala*. This mandala map becomes very effective to locate where our specific research (a part) is located in the entire world (the whole matrix), and how our worldview based only on such specific research tends to be narrowed down and doctrinaire.

> A complex system is one whose component parts interact with sufficient intricacy that they cannot be predicted by standard linear equations; so many variables are at work in the system that its overall behavior can only be understood as an emergent consequence of the holistic sum of all the myriad behaviors embedded within. Reductionism does not work with complex systems, and it is now clear that a purely reductionist approach cannot be applied when studying life; in living systems, the whole is more than the sum of its parts. [1, p.8]

6 Future-Oriented Studies

Now the analysis of the interrelated whole or complexity has to be extended into the future. When the analysis of the complexity is oriented to the future, the time arrow has to be irreversible and, hence, a concept of evolution becomes effective. Accordingly, it also becomes important to specify a future time for a foreseeable future (though these specifications need not be seriously considered) . Without a time specification, futurists' arguments often get astray. This specification of time, however, should not be confused with a *linear* prediction of the future.

Moreover, the specification of time becomes crucial for a preparation of adaptations against unpredictable natural, environmental and socio-economic phenomena. The aim of FOCAS is to get well adapted against these unpredictable complex phenomena.

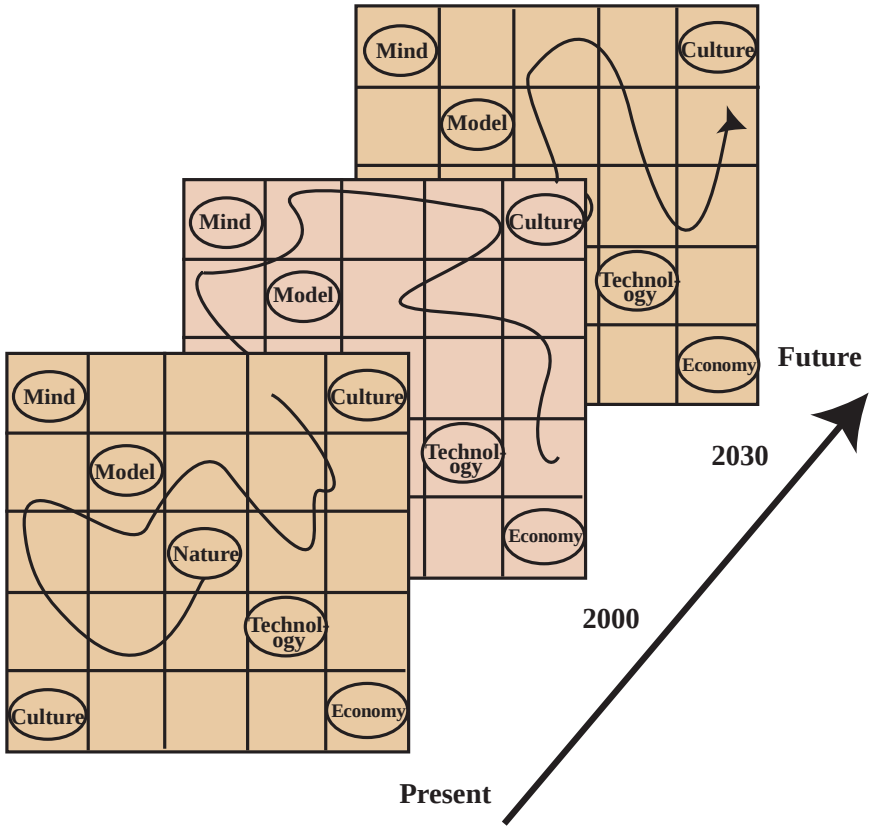

Figure 2: Future-Oriented Studies

7 Structures of Future-Oriented Dynamism

Generally speaking, the establishment of a concept itself produces, as its negation, its opposite concept or antithesis. To see an opposing concept of FOCAS, let us reinterpret it as Future-Oriented Complex and Adaptive *Systems*, instead of *Studies* as defined above. Then, the opposite concept of FOCAS would be considered as Future-Oriented Simple and Evolving Systems (FOSES).

When a system gets complex, three possible states develop in general; it

stabilizes, collapses or evolves. Similarly, the FOCAS transforms itself into these three states. Let us consider FOCAS 1 in Figure 3. Then, it may

1. Stabilize as a Static Adaptive State (FOCAS 1),
2. Collapse to the original FOSES (FOCES 1), and later reorganize itself to FOCAS 1 again, or
3. Evolve to a Higher-Level FOSES (FOSES 2), and eventually develop to a more complex FOCAS 2.

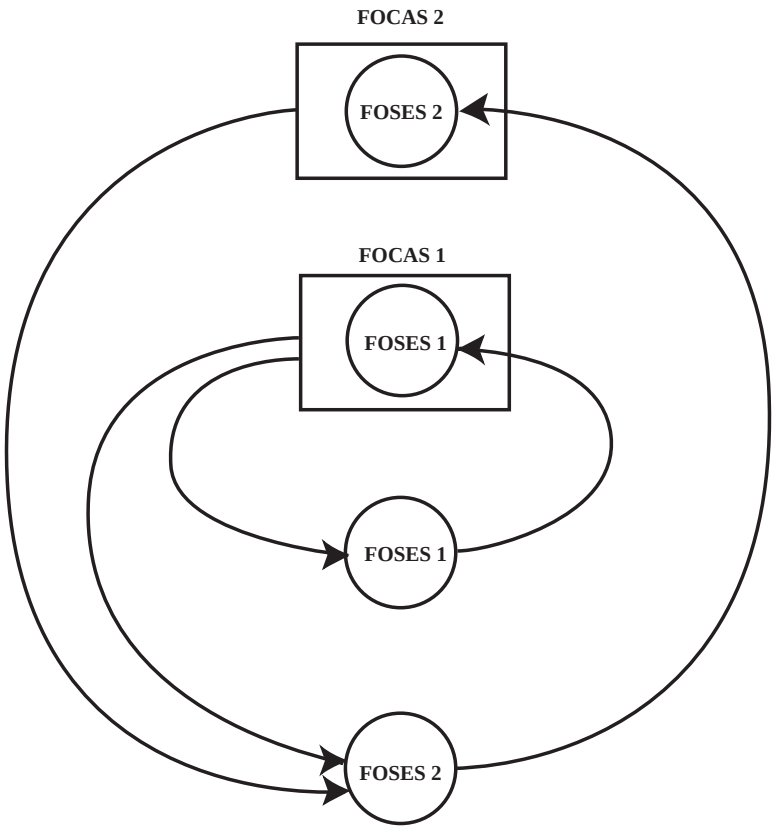

Figure 3: FOCAS Figure

Once FOCAS 2 is attained, it may repeat similar transformations as above. As an example, let us consider a business organization like a partnership (FOSES 1). As its business activities expand, it is forced to establish branches or divisions to cope with these activities – a process toward complexity (FOCAS 1). It may manage to maintain this complexity as they are.

However, it may be more probable that the organization may evolve into a higher level of a new simple organization successfully like a stock company (FOSES 2), and develop its activities overseas as a more complex organization (FOCAS 2). Or it may collapse to a previous small organization like a family business (FOSES 1), and evolve into a lower level FOCAS 1 once again.

Another example may be our conceptualization process itself. As things get complex, we may try to live with this complexity for a while. However, we may rather try to overcome it by grouping them into a simpler category, or break down into a more manageable simple scale once again. In this way, a complexity evolves into a higher-stage of simplicity or collapses into a lower-level simplicity. The highest level of FOCAS we presume as our research objective is the Planet Earth itself as a Gaia.

8 Wholistic Solutions by the FOCAS

We are now facing many socio-economic and environmental problems such as population explosion, a polarization of people into the rich and the poor, breakdown of capitalist market economy, global warming, water shortage, depletion of the ozone layer, acid rain, etc. Traditional approaches to solve these problem are to find solutions within their own fields of academic specialties. These searches for solutions, in turn, have caused another problems.

Recently we begin to realize that environmental problems are cross-regional, cross-national, and cross-disciplinary, and need international cooperations and interdisciplinary analysis.

A methodology of the FOCAS we have presented here, though it is still very abstract and at an infant stage of development, will help understand these problems in a wholistic fashion. In other words, all we nee for better understanding and better solutions is to break down these problems into the FOCAS matrix and analyze (and synthesize) them along the line of thinking presented in this paper.

References

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3. Yamaguchi, Kaoru. ed. *Sustainable Global Communities in the Information Age – Visions from Futures Studies*, Adamantine Press Limited, England, 1997.