

# The Structure of Innovation

**Fangqi Xu**

*Kinki University, Japan*

**William R. Nash**

*Texas A&M University, USA*

## **Abstract**

Since the 1990s, research on innovation has been conducted energetically in Japan, but it has not yet reached a satisfactory conceptual level. Specifically, much research on the structure of innovation has been based primarily on theory derived from the literature of the dominant western paradigm. An examination of innovation practices and structures in Japan suggest a need for proposed refinements to prevailing theoretical frameworks.

**Keywords:** *innovation, Japan, technology, organizational change, organizational structure*

## **THE BACKGROUND OF THE RESEARCH**

Since the middle of the 1990's, the term *innovation* has been used in a variety of academic and industrial circles in Japan. A number of books that added the word to the title were published, and needless to say, many only used the word as a fashion item. In other words, research on innovation was not part of their contents. In this regard, interesting questions can be posed. For example, when was the word first introduced into Japan? What were the multiple uses? What was the social background of the time? How did the word influence research? Also, does the word only mean technological change? Some literature about such questions does exist. Most important, however, research on and practices of innovation require adequate understanding of the concept. Therefore, we have been exploring the concept for many years and shaping our opinion.

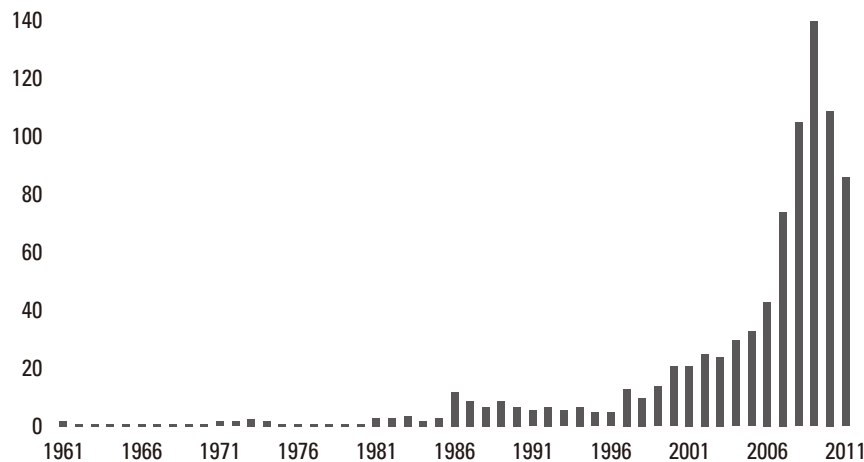
## **THE ORIGIN OF INNOVATION AND THE APPLICATION IN JAPAN**

The origin of innovation is Latin *innovatio* (renewal or renovation), based on *novus* (new) as in 'novelty' and 'nova'.<sup>1)</sup> Accordingly, we conclude innovation

means renewing or giving a new twist to that which is in existence. Our historical review suggests the word was used initially by the Japanese Government as technological innovation (in Japanese, it was translated as "gijutsu kakushin") going back to *Economic Survey of Japan* (1955-1956), although we were unable to identify exactly when the word was introduced into Japan.<sup>2)</sup>

In the resulting age of "to build up the nation by technology" and "to build up the nation by electronic industry," it was true that innovation mainly meant technological innovation in Japan. However, this was a limited interpretation of innovation.

With advancement of understanding and as participants after the Bubble Economy, Japanese companies had been looking for the rebirth of everything, not only technology, but also purchase, manufacturing, logistics, sale, after-service, strategy, human resources, organizational structure, corporate governance and so on. Thus, those who were using technological innovation began to decrease and the ones who focused on management innovation, human resource innovation, and logistic innovation began to increase. Specially, since Peter F. Drucker's book *Innovation and Entrepreneurship*



**Figure 1: The transition of the number of books which the title included *innovation***

Source: The author drew by the date base of NDL-OPAC.

was translated into Japanese in 1985, those who used innovation increased rapidly.

In order to verify the above-mentioned items, we have investigated the transition of the titles of books, which included the key-word “innovation,” by using NDL-OPAC, the National Diet Library’s collection of books reference system. As the result, we found something meaningful. Professor Kuniyoshi Urabe was the first scholar who used the word as a part of the title of book, *Innovation of Management*, which he published in 1961. After that discovery, we were unable to find any book using the key word in the title until 1970. We think it was a blank of research on innovation in Japan.

We found only 15 books what were published from 1971 to 1985. However, 11 books, which included “innovation” in the title, were published in 1986. It was clear that Peter F. Drucker’s *Innovation and Entrepreneurship* has a big influence in Japanese society. About 10 years later, the number of the books was increasing again and reached a record of 139 books in 2009. (Figure 1)

As best we can determine, books including the word “innovation” in the title now numbers 382. Moreover, 263 books (69%) were published after 2000. Therefore, we think the history of real research on innovation has been only ten years in Japan.

## THE DEFINITION OF INNOVATION

Once we say innovation, many readers might recall J. A. Schumpeter, who is an Austria economist. When we open the Japanese dictionary *Daijisen*, we can find the following explanation: “(1) The introduction of a new good; (2) The introduction of a new method of production; (3) The opening of a new market; (4) The conquest of a new source of supply of raw materials or half-manufactured goods; (5) The carrying out of the new organization of any industry” (J. A. Schumpeter’s words).<sup>3)</sup> Thus, Schumpeter’s influence is very powerful in Japanese academic circles. But, it is very clear that Schumpeter only argued the five conditions in order to explain a so called new combination. Therefore, it is probably not correct that to define innovation with this limitation.

Peter F. Drucker said that, “‘Innovation,’ then, is an economic or social rather than a technical term. It can be defined the way J.B. Say defined entrepreneurship, as changing the yield of resources. Or, as a modern economist would tend to do, it can be defined in demand terms rather than in supply terms, that is, as changing the value and satisfaction obtained from resources by the consumer.”<sup>4)</sup> But the former only quoted J. B. Say’s definition of entrepreneurship and gave us an illusion of entrepreneurship equaling innovation. And the latter only emphasized demand terms rather than supply ones.

This does not seem to be a clear definition of innovation.

Michael A. West and Tudor Richards defined innovation as follows: "In informal use innovation concerns those behavioral and social processes whereby individuals, groups, or organizations seek to achieve desired changes or to avoid the penalties of inaction."<sup>5)</sup> This definition is worth evaluating, since it emphasizes behavioral and social processes, although it is not easy to understand what may be intended by "avoiding the penalties of inaction."

"It (innovation) is a highly individual process of personal and organizational self-renewal," according to Ikujiro Nonaka and Hirotaka Takeuchi, who add that, "The essence of innovation is to re-create the world according to a particular ideal or vision."<sup>6)</sup> This is the most concise definition on innovation that we have encountered so far. Some components of it are like the West and Richards's one. They involve the individual, organization and change (renewal). If we consider self-renewal as the process of behavior, the two definitions are more alike.

However, innovation must not only show change process, but should include results. If the results are undesirable, it is nothing but failed innovation. Therefore, we would like define innovation as a changing process that includes results.

## THE STRUCTURE OF INNOVATION

We know innovation involves both the processes and results of change. But change does not always happen at the same level. That is, there would seem to be several classes in innovation. Considering change in terms of difficulty and social influence, we can view it as product innovation, process innovation, business innovation and social innovation.

### 1. *Product innovation*

So-called product means goods and services. In the case of product innovation, effort is expended to change a product to improve it. For instance, improvement of quality, progress of function, decrease of cost, improvement of design and reduction of delivery day, involve product innovation. At the same time, we consider such organizational behaviors as product innovation, if a company that is providing services changes in order to improve the quality of those services. For instance, magnifica-

tion of service area, subdividing of customer, improvement of customer satisfaction and prevention of individual information are product innovation, too.

We can find many cases regarding product innovation everywhere. For example, the function of room air conditioning has been progressing from basic temperature control to time setting, no noise and adjusting the direction and strength of wind. Lately, a new type, which includes a function of sterilization, has appeared on the market. Also, the changing of e-mail service is product innovation. At the end of the 1990s, the number of e-mail boxes was limited by the provider, which resulted in an inconvenience for a large family. Now, such inconveniences have disappeared. Another case is the changing of the capacity of e-mail box. Several years ago, we were unable to send 3 photos to someone at once, because capacity was smaller. But, now we can send more photos at once.

For product innovation to exist everywhere, we must consider it as the first step of innovation. In other words, we can initiate innovation everywhere. At the same time, we often overlook the seeds of innovation through our own inertia, because we almost become too familiar with change everywhere. Even if something is wrong, we would not recognize it, because we have adjusted to expecting constant change. Therefore, if we are not mentally prepared sense the unfamiliar, we would not notice opportunities for product innovation, although the seeds exist everywhere.

So-called mental preparation implies a creative mental state. It is an inner impulse when one senses inconvenience or non-efficiency. It is also a psychological characteristic of the creative person. Of course, creativity is not limited to scientists, artists and theorists, but also salaried workers in organizational settings, shop owners, housewives and so on. Some product innovations are developed in engineering or research labs, while others arise from the process of selling, delivery, and talking with shop owners, deliverymen and customers.

Kao Corporation is a good case of product innovation. As the biggest maker of beauty care, human health care and fabric and home care business in Japan, the company often produced popular new products. For example, Atacc, which is a brand

of detergent, has maintained the top status in the country since it was sold in 1987. They accepted a lot of ideas and suggestions from customers both before and after the sale. We could describe it as an excellent example of cooperation on product innovation between an industry and customers.<sup>7)</sup>

## **2. Process innovation**

Process innovation is defined as making goods or providing services through improved methods. It usually involves new manufacturing engineering and methodology. For example, the power for coal mining has changed from animal power, water and steam power to electric. Also, the change of a motor manufacturing system is process innovation. It started handmade in the end of 19 century, moved to the Ford method in the beginning of 1920's, and, finally, the Toyota System in the 1970's.

In more recent years, the Sell System is a process innovation approach being used in the electronic industry in Japan. It was developed by Hitoshi Yamada, who is the founder of the PEC Industrial Education Center (a consultant company) and had accumulated a great deal of knowledge about manufacturing processes under Taiichi Ono. The latter was Vice President of Toyota Motor Corporation and is known as the father of the Toyota System. So far, many companies such as NEC, Sony, Sanyo, Canon, and Panasonic have introduced the methodology.

The so-called Sell System does not need a conveyor belt, and only one worker does everything in order to build a machine (telephone, copy machine, etc.). In comparing the Sell System with the conveyor belt, we know the reason why it was welcomed so widely. The Sell System has many merits, which include no plant investment, curtailment of machine maintenance, thrift of energy, dissolution of Hikakarihin (which is the stocking of parts between tow workers at conveyor belt), efficient using of storehouse space, exaltation of employees' motivation, up of productivity and so on. As an example, Canon, Inc. removed conveyor belts amounting to 20 km at 54 factories in the world. Also, they moved 48 automatic storehouse systems and gained the space of 869,000 m<sup>2</sup>. They additionally cut down the personnel expenses of 10,000 employees by employment adjustment. Furthermore, they need not

engage the expense of 29 storage facilities. Canon has not changed the product; they simply changed the manufacturing process. It is a typical case of process innovation.<sup>8)</sup>

This change has not only occurred in the manufacturing industry, but also in the service one. For example, Seven-Eleven Japan has been engaging in process innovation in their convenience stores in order to meet customer needs. Although, their services started with the sale of goods, they have subsequently added the ability to pay for public utility charges, parcel delivery, reservation of ticket, information service of events, ATM banking, copy, facsimile, development of digital camera and so on. That is, the company has been offering new services that are suitable for changes of the environment. They maintained their original service for customers, but they changed the business process to enable them to offer additional services.

Carlos Ghosn who is the CEO of Nissan (also the CEO of Renault) brought about change that focused on process innovation. He set up the Cross Factional Team (CFT), "Revival Plan", "Nissan 180 Plan" and so forth, all aimed at improving the process of design, development, manufacturing, marketing, selling and the like.<sup>9)</sup>

## **3. Business innovation**

The next topic is business innovation. Product innovation directly involves altering goods and services for improvements, while process innovation is a change in methodology for producing goods and providing services. However, business innovation is a change that relates to both the manufacturing and service industries from the standpoint of a modification of the business model. According to Michael E. Porter (Porter, 1999), while competitive strategy means maintaining competitive advantage regarding business fields, corporate strategy focuses on the selection of business fields and deciding how to best manage divisions. Therefore, product and process innovation are more related to competitive strategy, and business innovation is more attentive to corporate strategy.

Yamato Transport is a good example of business innovation.<sup>10)</sup> The traditional business model of truck transport involved receiving many items at the same time and place and delivering them to an-

other place (BtoB). It means that, the base of the business is large things and a single delivery place. Therefore, the firm that has many big trucks and big corporate customer has a competitive advantage. But, Mr. Masao Ogura (deceased) who was president of Yamato Transport foresaw the prospect of the home delivery market and decided to develop it, although contrary to the common sense. As a result, he created a new home delivery business (BtoC or CtoC). Now, Yamato Transport is ranked number one in Japan and is spreading their business to overseas markets. The business of home delivery includes collection and delivery of cargo, calculation and collection of cost, issuing the slip, and preparation of trucks and deciding routes both day and time. As it is different from the traditional system, a new business model was needed.

Dell, Inc is also a good example of business innovation.<sup>11)</sup> As a challenger in the PC market, it consistently has been taking business from rivals and has become the number two PC maker in the world. It is clear that Dell's competitive advantage is the direct model created by Michael Dell, who is the founder of the company. They started with some advertisement, but depended heavily on mouth-to-mouth referrals in the early stage of the company. Once they accept an order from a customer, they send it to an assembly plant for swift production. When the PC is completed, the assembly plant will send the PC to the customer directly. And then, Dell's after service force will start working in order to solve any problems smoothly. This Direct Model is certainly a business innovation.

#### 4. Social innovation

Social innovation involves changes that have an influence on society, and we consider it as the highest form of innovation.

Peter F. Drucker considered Japanese movement from the Meiji Restoration of 1867 to become an economic superpower as social innovation. He emphasized that, "This meant that social innovation was far more critical than steam locomotives or the telegraph. And social innovation, in terms of the development of such institutions as schools and universities, a civil service, banks and labor relations, was far more difficult to achieve than building locomotives and telegraphs."<sup>12)</sup>

After the second world war, German, Italian and Japanese economic reconstruction; NIES' (Korea, Singapore and so on) rising; ex-president of USA, Ronald W. Reagan's adjustment of industrial structure and employment emphasis; realization of the EU, the former Soviet Union's Perestroika and the economic reform and the opening to the world by China are all social innovation. After 1980s, the most successful social innovation would have to be the change in China. The effect of social innovation has been crossing the border and influencing the worldwide economy.

By the argument above, we know social innovation involves the behavior of federal or local government, not a change of individuals or organizations. We should now point out that we view the four types of innovation as the structure of innovation, but it is not one after another. Some cases begin with product innovation, although others may be initiated by process innovation, business innovation or social innovation. And the relationship is closed.

### THE CHARACTERISTICS OF INNOVATION

#### 1. Coexistence of success and failure

We argued above that innovation is a process and results in changes of the behavior of the individual or organization in order to do things better. But it is not always successful. That is, it is possible to fail. To except conditions bankruptcy, a company could survive even if they do nothing. Therefore, people will be apt to be satisfied with present conditions. But, if someone wants progress or development, s/he must change that condition. So, s/he must meet the problems of restructuring of system and redistribution. In other words, the risk of imbalance and ambivalence will develop. People have to change their consciousness at first, in order to avoid this risk. When Carlos Ghosn came to Nissan in 1999, he identified the problem as a perception issue. That is, the employees of Nissan had not sensed a crisis. So, he quickly started solving the problem with great zeal. As he said, "The true of Nissan Revival Plan (NRP) is consciousness revolution."<sup>13)</sup>

One judgment that must be made is whether or not success is the result of innovation, and that is dependent upon the marketplace. In this regard,

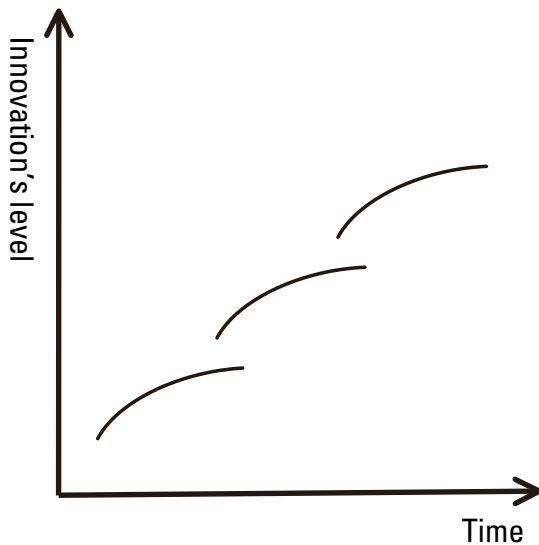


Figure 2: A Type

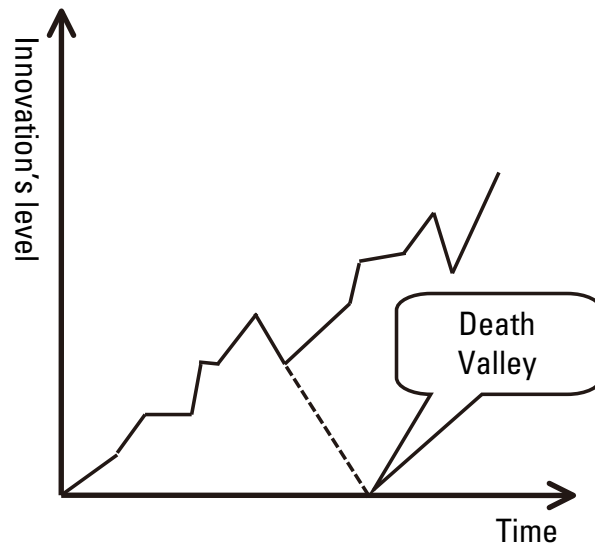


Figure 3: B Type

Peter F. Drucker's argued that, "The test of an innovation, after all, lies not its novelty, its scientific content, or its cleverness. It lies in its success in the marketplace."<sup>14)</sup>

## 2. Coexistence of inside and outside factors

For individuals and organizations who are determining how to promote progress, it is clear that innovation is a behavior from the inside. Of course, there are cases where innovation comes from the outside that are the result of competitive pressure, law or government regulation, although the innovator is not always aware of it. For example, the appearance of a new competitor with huge capital is a large menace for firms that have been doing same business. In that case, the choices are limited. One is starting innovation and competition with the new challenger. The other position is to begin to trail in the market by do nothing. It is like sailing against the current, either you keep forging ahead or you keep falling behind. M & A maybe a way of surviving, but once an identifiable brand is incorporated by a purchaser, the brand eventually disappears. By official announcement of the Law of Product Liability or, for example, the regulation on exhaust gas and noise emission with automobiles, the companies have decisions to make. For innovation, there is no difference between inside and outside.

If a company developed by innovation with its

own technology (including hard technology and soft technology), we consider it as an innovation based inside factors. On the other hand, if the company pays attention to the market and grows through innovation, we consider its innovation as based on outside factors. Generally speaking, we currently consider a technological company as having stronger inside factors, and a non-technological company as having stronger outside factors. Needless to say, inside and outside factors have a closed relationship. If a company has not emphasized inside factors, it is impossible to increase innovation, even it paid attention to the marketplace. On the other hand, if a company only focused attention on their own technology and ignored outside factors, it would be difficult to translate their innovation into success.

## 3. Coexistence of continuation and intermittence

A company has been producing innovation for progress of function, convenience, small size, cost cuts and so on, the characteristic of continuous innovation is stronger. But if a company entered into a new market as a challenger, innovation often takes on the characteristic of intermittence. For example, once the maker of the transistor TV was born, the maker of vacuum tube TVs was driven out quickly from the marketplace. Also, the maker of the transistor TV would be driven out by the maker of liquid crystal TV. Such innovation has a characteristic



of intermittence and will bring about a destructive effect to market. Clayton M. Christensen who is professor of the Harvard Business School named such innovation as destructive innovation.<sup>15)</sup> The innovation which has a characteristic of intermittence is related closely with the use of new technology or new material, and the operation of new law and policy.

We named intermittent innovation as A Type innovation. The image is depicted in figure 2. It is mainly shown in product innovation. But process innovation is not always the same. In the case of Nissan, Carlos Ghosn's "NRP" and "Plan 180" all set up the objectives, including the three years' plan. Every year's objective is the base of the middle development plan. At the same time, the middle development plan is the continual result of every year's objective. As a whole, process innovation also has a characteristic of clear continuation. Also, continuation is possible for business innovation and social innovation. Otherwise, the expected result will not appear. Therefore, we think that continuation and intermittence of innovation are coexistent. Figure 3 presents the image of continuous innovation. We named it as B Type innovation. However, continuation does not mean the process is very smooth like a straight line. In fact, the vector always goes up and down, but the flow is orthogonal, i.e. upward and forward to the right. If the flow is down forward to the right, it represents nothing but failure. That is, it has fallen into what could be called "death valley."

## SUMMARY

This paper started to survey the origin of innovation in Japan and, hopefully, made some things clear. These are: 1) Kakushin (Japanese for innovation) was applied as a key-word on a book's title first in 1892; 2) the former Economic Planning Agency was the first government organization to use the word innovation; 3) the history of research on innovation is about 20 years in Japan; and then, we examined the famous scholars' definitions on innovation and studied the structure of innovation as a priority. We argued the nature of innovation based on the perspectives of product, process, business and social. Of course, we based our argument on companies and business firms from beginning

to end, although we argued the issue of social innovation. At last, we investigated the characteristics of innovation and attempted to depict the images of continuous innovation and intermittent innovation.

## NOTE

- 1) Alan Williams (1999). *Creativity, Invention & Innovation*, St Leonards: Allen & Unwin. p. xvii.
- 2) The argument is below. "So-cold technological progress that became the driving force of such investment is Gijutsu Kakushin (innovation) what made the peaceful application of atomic energy and automation as representation" in chapter 3 of *The Economic White Paper* (in Japanese), Tokyo: Shisei Do, 1957, p. 34.
- 3) Akira Matsumura (ed.) (1995). *Daijisen*, Tokyo: Shogakukan. p. 180. But the English translation was quoted from J.A. Schumpeter (translated from the German by Redvers Opie) (1934). *The Theory of Economic Development*. Boston: Harvard University Press. p. 66.
- 4) Peter F. Drucker (1985). *Innovation and Entrepreneurship*. New York: Harper & Row Publishers. p. 33.
- 5) M.A. West & T. Richards (1999). Innovation. in Mark A. Runco & Steven R. Pritzker (eds.). *Encyclopedia of Creativity*, Vol. 2, San Diego: Academic Press. p. 45.
- 6) Ikujiro Nonaka & Hirotaka Takeuchi (1995). *The Knowledge-Creating Company*. New York: Oxford University Press. p. 10.
- 7) Chiharu Hirabayashi & Kuninobu Hirokawa (2004). *The Secret of Kao's Power* (in Japanese). Tokyo: Jitsugyo no Nihon Sha. pp. 137-145.
- 8) Fujio Mitarai (2004). *Canonism* (in Japanese). Tokyo: Toyo Keizai. pp. 137-140.
- 9) Carlos Ghosn (translated by Haruko Nakagawa) (2001). *Renaissance* (in Japanese). Tokyo: Diamond. pp. 179-181, pp. 197-198.
- 10) Masao Ogura (1999). *Management* (in Japanese). Tokyo: Nikkei BP. pp. 57-115.
- 11) Hiroshi Fukino (2005). *Dell's Direct Model Management* (in Japanese), Tokyo: Kanki. pp. 28-64.
- 12) Peter F. Drucker (1985). *Innovation and Entre-*

preneurship. New York: Harper & Row Publishers. p. 32.

- 13) Carlos Ghosn (translated by Haruko Nakagawa) (2001). *Renaissance* (in Japanese). Tokyo: Diamond. p. 217.
- 14) Peter F. Drucker (1985). *Innovation and Entrepreneurship*. New York: Harper & Row Publishers. p. viii
- 15) Clayton M. Christensen. (translated by Yuko Sakurai) (2001). *The Innovator's Dilemma*. (in Japanese). Tokyo: Shoei Sha. p. 17.

#### REFERENCES

- Gordon, W.J.J. (1964). *Synergetics* (in Japanese, translated by Oshika, Y. & Konno, T.). Tokyo: Rateisu.
- Porter, M. E. (1999). *On Competition* (in Japanese, translated by Takeuchi, T.). Tokyo: Diamond.
- Runco, M. A. & Pritzker, S. R (Eds.) (1999), *Encyclopedia of Creativity*, Vol. 2, San Diego: Academic Press.
- Schumpeter, J. A. (1998). *Entrepreneur* (in Japanese, translated from the German by Kiyonari, T.). Tokyo: Toyo Keizai.
- Tokiwa, F. (2000). *Management of Shitsu* (in Japanese). Tokyo: Diamond.
- Xu, F. & Rickards, T. (2007). Creative Management: A Predicted Development from Research into Creativity and Management. *Creativity and Innovation Management*, September, 16, pp. 216-228.
- Xu, F. (1998). A New Consideration of Creativity Research in Europe (in Japanese). *Journal of Japan Creativity Society*, 2, pp. 84-93.
- Yamada, H. & Kataoka, T. (2001). *Object Creation by Noncommonplace* (in Japanese). Tokyo: NHK Press.

Dr. Fangqi Xu is professor of management administration, Kinki University, Japan. [fxqjo@bus.kindai.ac.jp](mailto:fxqjo@bus.kindai.ac.jp)  
Dr. William R. Nash is professor emeritus of Educational Psychology, Texas A&M University, USA.