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Introduction and Diffusion of Brainstorming in Japan

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*The purpose of this paper is to analyze the dynamic process of introduction of Brainstorming in Japan. The failure of technology transfer from advanced countries has been overcome by Japanese engineer with sense and knowledge of field science. Oversea expedition was the origin of Japanese method of creativity development. Japanese engineering sense, craftsmanship and **Kaizen** prepared the acceptance of Brainstorming after the war. Brainstorming was utilized only as infirm training method at the beginning. Mitsubishi Plastics Ltd. had succeeded to develop a unique type of Brainstorming (MBS) for the R&D practices. Today Brainstorming is very popular in Japanese business world.*

JEL Classifications: M12, M53

Keywords: Brainstorming, Technology Transfer, Creativity, Field Science, Mitsubishi Type Brainstorming, KJ Method. NM Method, Equivalent Transform Thinking

1. Introduction

Since the British Industrial Revolution, the pattern of international specialization is changing fundamentally from the vertical based on natural resources to the horizontal according to kind of a product. The lean production system which was original from *Kamban* (Just in Time) system of Toyota Motor Co. has spread exceeding the framework of industrial connection of a direct upper stream and down stream.¹⁾ Nowadays it is common that goods with required quantity and quality are supplied to suitable time and a place in response to consumers' needs.²⁾

The mass production system symbolized by "Ford Model T" in the early days of the 20th century realized an affluent society in advanced country. And the supply chain management combined with IT technology is going to meet advanced consumers' needs by large item small scale's production.³⁾ The 20th century type affluent society will be supported by extensive mining of natural resources, mass production, mass distribution, and mass consumption. As a result, mass consumption and waste of the

¹⁾Taichi Ono (1978) "Toyota Production System" (in Japanese) *Diamond Sha.*

²⁾James P. Womack, Daniel T. Jones, Daniel Roos & MIT(1990) "The Machine that Changed the World" Rawson Associates. NY.

³⁾Sunil Chopra & Peter Meindl (2007) "Supply Chain Management" 3rd ed. Peason/Prentice Hall.

astronomical order of materials and energy are continued. Earth environment is faced with the crisis approaching an irreproducible critical point.

The development of a new hard and soft product should make a principle saving resources, saving energy, and environmental preservation not raising entropy any more. And they have to contribute to construction of the new social system which can continue the existence of the human kind. In 1970s' Japanese companies developed the technology to control exhaust gas, air purification, water purification, and others to overcome the pollution. Moreover, facing with 2 times oil crisis in 1973 and in 1979, Japanese companies could find the way to overcome the energy problem by development of energy-saving technologies.

For the company in new business environment, it is necessary to promote R&D for innovation. Not only scientists and engineers of R&D division but also general workers of production field must be involved for creative activities. When "KAIZEN" and improvement on the workshop and a new idea from R&D will be combined effectively, the innovation will be begun.⁴⁾ Information and communication technology has checked a direct human touch and communication. The concrete jungle hinders inhabitants in the artificial space from touching nature directly. As a result, a mental health problem is aggravating in Japanese society. Creativity is the key at all the levels to create the new balance between mankind and the earth environment in the 21st century. Today the method of developing everyone's creativity is needed for solving many difficult problems in a crisis. The analysis of introduction and diffusion process of brainstorming will suggest the new possibility of creativity development in university education of Japan.

Purpose of Research

Brainstorming (BS) was developed by Alex. F Osborn of United States in 1939. It was translated and introduced to Japanese society Post World War II. The background of introduction and diffusion of brainstorming in Japanese companies is reviewed. This method has been utilized as infirm training at first. Brainstorming titled as "Applied Imagination" means a psychological approach. Since *Meiji* era Japanese creativity was connected with traditional craftsmanship, engineering mind and the method of endogenous field science. This paper will analyze that these are the foundation for diffusion and fixing of brainstorming. New field science methodology with new paradigm will be applied for solving of difficult problems in the 21th century.

The Framework of Research

Introduction of soft technology and the diffusion process are defined as

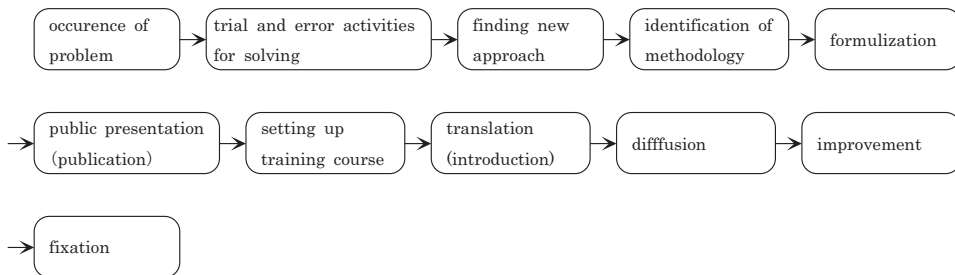
⁴⁾Masaaki Imai (1986) "KAIZEN" McGraw-Hill Pub.

following processes.⁵⁾ (Fig.1)

The method of research is based on;

- 1) Literature survey, documentary search
- 2) Free answer style interview with the persons contacted
- 3) Subjects Research: *Sanno* University, *Mitsubishi* Plastics Industries, Ltd., *Canon* Co., and *Nissan* Motor Co., Ltd. Survey period: from September 2004 to March 2005.

Fig.1 Framework of Research



2. Transferred Technology and Field science in Japan

Takato Oshima (1825-1901) succeeded in construction and operation of Western style blast furnace. He had done it only based on one technical book from Netherlands in 1857. This became the starting point of endogenous technical development in Japan. The *Edo Shogunate* built the *Yokosuka* shipyard in 1865 supported by French governmental finance and engineering. The technology transfer of modern shipbuilding industry was started at this shipyard. Young commoners were employed for general workers. Training course was designed for them. This course was the first modern OJT system in Japan. Here, it was decided that trainees must follow the directions of French engineers and skilled workers by office regulation. Expressing ones own opinion was forbidden. Japanese traditional ethics teaches that students to keep three steps behind not to step on the teacher's shadow. Such traditional life ethics of learning humbly was connected with office regulation during technology transfer from Western advanced countries. The *Meiji* government led the cultural policy of Westernization. This had promoted Japanese posture of blind obedience to the advanced Western science and technology.

The *Meiji* government invested a large amount of capital to import equipments and industrial plants from Britain and built the *Kamaishi* iron works in 1880. Moreover, many engineers and skilled workers as "*Oyatoi*"

⁵⁾ Kikuji Yoneyama (1993) "Introduction to Science of Research" (in Japanese) *Bunshindo*.
 Kikuji Yoneyama (1996) "Development and Transfer of Appropriate Key Technology"
Economic Journal of Hokkaido University, Vol.25,1996.

(employed foreigner) were invited during the start-up operation. However, there were operation problems and the factory was shut down. *Kyutaro Yokoyama*, a civilian, developed a new method of materials processing based on Japanese traditional iron-making technology in 1877. This new method guided the success of operation at *Kamaishi* iron works. Furthermore, the *Meiji* government imported German equipments and steel making plants. Government operated *Yawata* Iron and Steel Works started in 1901. Although technical guidance by German engineers and skilled workers was given, the operation also had problems. Technology transfer had failed.

Kageyoshi Noro, a Japanese steel engineer, developed intensive field research, experiments at the plant and solved this problem. He did intensive field research on local climate, the conditions of materials, and the market situation in Japan. Stable operation was accomplished by applying newly developed technology combined with traditional craftsman's knowledge and skill. *Noro's* successful operation of governmental *Yawata* Iron and Steel Works was based on the tradition of Japanese craftsmanship.⁶⁾ The engineer's creativity was demonstrated through the improvement of imported technology in the production field in Japan. The *Meiji* government's industrial policy for industrialization put the most importance on imported technology and know-how from Europe and the U.S. Therefore, Japanese traditional craftsmanship was disregarded for a long time. Since *Meiji*, technocrats of major companies or in the government have considered catch-up as the utmost importance. Strong Euro-American influences imprinted Japanese to respect them without criticism.

On the other hand, craftsmanship has had a different way of thinking and behavioral pattern. Workers succeeded with spirit and skills by paying attention to raw materials and the production process itself. They usually do every thing by hand with craftsmanship and an engineer's mind. They have loyalty to their own product more than to the organization to which they belong. In Japan, *Kaizen* (improvement) is a fundamental posture to do one's own duty. But the traditional spirit of craftsmanship has a tendency to keep the most important portion of work secret. They would not explain the work to an unskilled man or the persons concerned by means of language. This type of skill is called "*Nenko teki Jukuren*" (skill based on the length of service) in Japan. Strict regulation existed in skill formation for those whom capability is not enough and do not study earnestly.⁷⁾

The principle of competition inside the workgroup was an act centering on *Kaizen*. During World War II, the production plants were faced with the shortage of manpower, especially skilled workers. The secret portion of

⁶⁾ Kikuji Yoneyama (1999) "Japanese Steel Engineers" *Economic Journal of Hokkaido University*, Vol.28,1999.

⁷⁾ Kikuji Yoneyama (1978) "Technological Innovation and Shop Management" (in Japanese) *Bokutakusha*.

skill of skilled workers had become a bottle neck of the productivity drive. Efficient work by unskilled workers was the most important target for production. The secret part was to be open to unskilled workers. “*Dai Nihon Sangyo Hokokukai*” (Industrial Patriotism Parliament) movement of the wartime period denied that skilled workers had secret portion of work. This movement recognized the importance of “*Kaizen*” (improvement) on the workshop level officially. On one hand requiring military order of the workshop, on another hand *Kaizen* was encouraged. However, under war-time regime all resources were in serious shortage. Concrete output was not able to be achieved. It was no concrete base. It was only fanatic driven to force the people to fight.

After defeat in 1945, GHQ’ policy was to promote democratization in the business world in Japan. Dissolution of the *Zaibatsu* and the approval of labor union were performed. Encouragement of *Kaizen* in wartime was connected with postwar democratization in business. TWI (Training Within Industry) and MTP (Management Training Program) was introduced by GHQ. Furthermore, the Civil Communication section of GHQ performed a survey of Japanese companies. Based on this result, the section judged that the first thing for improving quality was to teach managers the foundations of management. 8 weeks and a total 288 hours, business seminars were carried out by CCS (Civil Communications Section) of GHQ for top management such as manufactures of communication equipment in 1949.⁸⁾

These seminars became a starting point for the fast improvement of quality in Japan. After the war, Japanese traditional infirm training method was improved based on these methods. Apprenticeship style OJT, learning by following the example of others was improved. And TWI suggested a scientific approach to *Kaizen*. I.E. (Industrial Engineering) was simultaneously introduced widely into the production field. F.W. Taylor’s “scientific management” was introduced as an engineering method of work. I.E. advocated “standardization” instead of masterful performance. Its motto is that everybody will become a hero rather than respecting a god. The advancement of technical innovation based on technology transfer in the 1960s formed the basis for “Japanese Management.”

3. Field Science and Methodology of Creativity Development in Japan

“*Kan*” has occupies an important position in Japanese culture. “*Kan*” is a unique Japanese feeling and concept to catch the essence beyond the five senses. It is difficult to translate “*Kan*” into Western feeling and concept. There is not a rigid one to one correspondence between “*Kan*” and inspiration. It is only nearly equal to inspiration. However, “*Kan*” will be

⁸⁾Toshio Goto (1999) “Forgotten starting point of management-quality of management taught by GHQ” (in Japanese) Japan productivity Center.

used below as a word with a meaning similar to inspiration.

A craftsman thinks by hand represented by carpenter work and ceramist work. “*Kan*” is regarded as the most important skillful element in a craftsman’s world. It is the capability to predict the occurrence which may happen and to cope with it by problem solving immediately. It is a physical ability not expressed in words. In a craftsman’s world, “*Kan*” has been transferred as body feeling by long-term man to man apprentice training. It will be clear to see the process of a sword-smith work making a Japanese sword. There, it is not at all explained by means of language. Of course, neither a work standard nor a manual exists. A pupil continues polishing the senses intently in the practice over a long period. “*Kan*” is mastered as physical feeling. The strong influence of Western civilization was received after the opening of the country of *Meiji* in 1868. All products of Western civilization were formed by explaining with words. This made a strong impact on the Japanese way of thinking. Japanese came to be conscious of explanation of the matter which was not explained in Japanese till then.

Receiving and struggling with European philosophy, *Kitaro Nishida* (1870–1945) completed one book, “*Zen no Kenkyu*” (research of the good) in 1911.⁹⁾ This is the first book of philosophy by a modern Japanese. In the United States, Charles S. Peirce had created pragmatism in 1870s. In his philosophy, he developed new logic about the abduction of hypothesis. Hypothesis had an important position in scientific recognition in 1870. Clear thinking is a basic condition of problem solving.¹⁰⁾

Japanese academics studied mainly German idealism philosophy. For this reason, it was not influenced very much by American pragmatism until after World War II. Also after that, the main stream of philosophy research in Japan had excluded clear thinking, problem solving, and creativity issues. Influenced by psychology, research on “*Kan*” developed in 1930s. “*Kan no Kenkyu*” (Research on “*Kan*”) (1933) by *Ryo Kuroda* was probably the first distinguished work on creativity research in Japan.¹¹⁾

Research on creativity in Japan was produced out of practice in the pioneer work of overseas scientific expeditions. *Kinji Imanishi*, from *Kyoto University* led many overseas scientific expeditions from the prewar days. The expedition to “Ponape Island” (1941) and “North Tahsinganling” (1942) were the most well organized projects.¹²⁾ Such overseas scientific expeditions were pioneer works that came from *Kinji Imanishi*’s originality.

Jiro Kawakita and *Tadao Umesao* were members of that overseas sci-

⁹⁾ *Kitaro Nishida* (1911) “*Zen no Kenkyu*” (research of the good) (in Japanese) *Kobundo*.

¹⁰⁾ Charles S. Peirce (1878) “How to make our ideas clear” *Collected Papers of Charles Sanders Peirce*, Vol.I-VI, Harvard University Press.

¹¹⁾ *Ryo Kuroda* (1933) “*Kan no Kenkyu*” (Research of *Kan*) (in Japanese) *Iwanami Shoten*.

¹²⁾ *Kinji Imanishi* ed. (1944) “Ponape Island” (in Japanese) *Shoko Shoin*.

Kinji Imanishi ed. (1952) “Tahsinganling Expedition” (in Japanese) *Mainichi Shinbunsha*.

entific expedition party. They repeated experiences of scientific expeditions and sharpened keenly an awareness of the scientific methodology. The young members of the team had moved towards systematization of the methodology of “scientific expedition” greatly based on experiences of such pioneer works. This was established later as the original Japanese method of creativity development on the basis of field science.

Jiro Kawakita carried out scientific expedition of Nepal Himalaya in the 1950s. He wrote one book, “*Party Gaku*” (1964) based on his experiences of field work, scientific expeditions from his school days, and the experiences of this Nepal Himalaya expedition.¹³⁾ The outline of creativity and teamwork were discussed in this book. It was developed in detail and the contents were published as “*Hasso Ho*” (Way of Abduction) (1967) and “*Zoku Hasso Ho*” (Sequel to Way of Abduction) (1970). This method uses the author’s initials and is called the KJ method. This is a method of integrating various groups of cards of qualitative data obtained from field work, creating representative information, and developing it into a chart. A new hypothesis can be conceived in this visualizing process. This is a disposal method of qualitative data processing which is opposite to the HRAF (Human Relations Area Files) of Yale University. The database is organized by classification according to the category.¹⁴⁾

In addition to overseas scientific expedition with the *Imanishi* group, *Tadao Umesao* developed a new methodology from experience during his Mongolian expedition. It is a method of new idea making and story telling based on data cards. He published one book titled “*Chiteki Seisan no Gijutsu*” (technology of intellectual production) in 1968.¹⁵⁾ This title is developed from “it is a problem of a kind of technology isn’t it?” spoken by Dr. *Hideki Yukawa*, the Nobel Prize for physics winner.

Independent from the overseas scientific expedition of *Imanishi* group, new research on creativity was advanced by an electrical engineer in the Faculty of Technology, at Kyoto University. *Kikuya Ichikawa* completed “*Dokusouteiki Kenkyu no Houhouron*” (the methodology of original research) in 1944. This research was published as “methodology of original research” in 1960 after the war. This methodology is known as “*Touka Henkan Ron*” (Equivalent Transform Thinking).¹⁶⁾

Next, *Masakazu Nakayama*, graduate of the Hokkaido University’s

¹³⁾ *Jiro Kawakita* (1967) *Party Gaku* (Study of Party) (in Japanese) *Shakai Shisousha*.

Jiro Kawakita (1967) *Hasso Ho* (Way of Abduction) (in Japanese) *Chuokoronsha*.

Raymond Scupin (1997) “The KJ Method: A Technique for Analyzing Data Derived from Japanese Ethnology” *Human Organization*, Vol.56.No.2 Summer 1997.

¹⁴⁾ Murdock G.P. et al (1950) “Outline of Cultural Materials” 3rd revised ed. *Human Relations Area Files*.

¹⁵⁾ *Tadao Umesao* (1969) “*Chiteki Seisann no Gijutsu*” (Technology of Intellectual Production) (in Japanese) *Iwanami Shoten*.

¹⁶⁾ *Kikuya Ichikawa* (1960) “Methodology of Original Research” (in Japanese) *Mikasa Shobo*.
Kikuya Ichikawa (1970) “Introduction to Science of Creativity-Illustrated Equivalent Transformal Thinking” (in Japanese) *NHK Shuppan*.

Faculty of Science (physics), studied W.J. Gordon's Synectics after the war. He succeeded in actualizing the Japanese feeling "*Kan*" (inspiration) using an analogy based on hints from Synectics. He published a book titled "*Kan no Kozo*" (structure of inspiration) in 1968.¹⁷⁾ This method spread widely as an effective method for new product development in the manufacturing industry. This method attaches a developer's initial and is called the NM method. The results of research on Synectics continued from 1944 was published in the United States in 1961.¹⁸⁾ W.J. Gordon's Synectics affected the development of the NM method by *Nakayama*. Its Japanese translation version, "Synectics" by *Oshika* and *Konno* was published in 1964. Synectics was widely introduced in Japan side by side with brainstorming.¹⁹⁾ Also in Japanese universities, research on creativity started in earnest mainly from the discipline of psychology in the 1960s. The 1960s became the golden age of research on the "method of creativity development" in Japan.²⁰⁾

4. The Historical Background of Brainstorming in Japan

Psychology was imported from advanced countries after *Meiji* Restoration in Japan. Experimental psychology influenced by modern natural science had been a main stream of academic activity. It is difficult to measure and verify creativity research by experimental method. For this reason, creativity was removed as a research subject in Japan. Especially due to the "clairvoyance incidents" in 1910. *Tomokichi Fukurai*, a psychologist and Associate Professor of Tokyo University was banished by the University. Parapsychology has been identified with the occult since then. Insanity was connected to the occult. For this reason, research on creativity was identified with occult research. Research on creativity was seen as taboo in Japanese academic society lead by Tokyo University.²¹⁾

On the other hand, *Yoichi Ueno* (1883-1957) studied psychology at Tokyo University and graduated in 1908. He studied industrial efficiency as part of industrial psychology. He recited "*Noritsu Do*" (efficiency way) based on research in "scientific management" by F.W. Taylor. He set up a school for the diffusion of efficiency way in 1942. *Yoichi Ueno* was engaged in activities of full-scale diffusion of I.E.(Industrial Engineering) to Japanese companies after the war. At the same time, he was searching for his next subject. Therefore, he observed American trends keenly and stud-

¹⁷⁾ Masakazu Nakayama (1968) "*Kan no Kozo*(Structure of Inspiration" (in Japanese) Chuokoronn-sha.

¹⁸⁾ W.J.J. Gordon (1961) "Synectics" Harper & brothers Pub.

¹⁹⁾ Yuzuru Oshika & Tadashi Konno(1964) "Synectics" (in Japanese) Lattice.

"Synectics" also called Gordon method did not spread in Japan. Because it is abstract and not operative enough.

²⁰⁾ Tadato Akiyama, Hiromiti Hori and Yosie Koga(1968) "Handbook of Creativity Research" (in Japanese) Seishinshobo.

²¹⁾ Ryu Terasaka (2004) "Fluoroscapy and sense copy is also a fact" (in Japanese) Soshi-sha.

ied them by collecting literature and documents. He thought that wisdom is more important than knowledge to attack and solve a problem.²²⁾

Alex F. Osborn (1888.5.-1966.5), the inventor of brainstorming (BS), was graduated from the University of Hamilton. Osborn established BBDO, an advertising agency with his friends. As vice president of BBDO started “brainstorming” as a method which will develop a new idea systematically in 1938. The staff was mainly composed of university graduate. This team’s main subject was to create new plans at the office work. The team made a great deal of effort to make a new plan which appealed to consumers’ hearts and needs. For that purpose, every preconceived idea must be smashed by thinking flexibly and a new idea must be created. The principle was realized through long term trial and error by specialists who overcame such a difficult subject. This team’s long term trial and error of the challenging difficult problem solving was realized in empirical principles. “Applied Imagination” by Alex F. Osborne was published in 1953. The principles of “brainstorming” are (1) Criticism is ruled out (2) Free-wheeling is welcome. (3) Quantity is wanted. (4) Combination and improvement are sought.²³⁾ This group-thinking method was applied to meetings for new idea making. This method was not invented by university staff doing research. It was invented by business men who faced with new business practices. Osborn recognized the importance of creativity development education in business practices. He set up the “Creative Education Foundation” for creativity education in all social sectors. He also established creativity training courses at the University of Buffalo in 1954.²⁴⁾

The United States lagged behind in the space race due to the successful launch of the Soviet Sputnik 1 in October, 1957. Americans had their pride damaged. In order to win the competition with the Soviet, Americans became absorbed in the method of creativity development and training. For this reason, the creativity development boom arose in the United States. “Applied Imagination” by Alex. F. Osborn published in 1953 became a best seller. Japanese researchers were quick to observe new trends in the United States. University researchers were looking for effective methods that would be helpful for Japanese companies to catch-up to U. S. companies.

Also *Keio* University and Japan Industrial and Vocational Training Association held together the “Harvard Management Course” (for six days) in September, 1957. A Harvard professor was invited to teach this course. 87 persons from the business world participated in this course. This is the first case of direct training of brainstorming by an American

²²⁾ *Sangyo Noritsu* Junior College ed.(1967) “The Life of Yoichi Ueno” (in Japanese) *Sangyo Noritsu* Junior College Press.

²³⁾ Alex F. Osborn (1953) *Applied Imagination* (3rd Revised Edition) p.156, Creative Education Foundation Press.

²⁴⁾ Creative Education Foundation, Buffalo, New York.

Professor.²⁵⁾

5. Introduction of Brainstorming in Japan

Yoichi Ueno established “Creative Thinking Course (CTC)” at *Sangyo Noritsu Junior College* in November, 1956. He had already researched creativity for several years. *Yoichi Ueno* passed away suddenly in October, 1957, and *Ichiro Ueno* took over after that. *Ichiro Ueno* was faced with a school management crisis due to financial difficulties. In order to overcome this, he analyzed thoroughly the literature and documents of infirm training about creativity which his father *Yoichi Ueno* collected. He made an effort to identify the real needs of the business world. He decided to enrich “creativity development course” based on these materials. He explained as follows about the background of the introduction of brainstorming.²⁶⁾ “I planned and wrote a letter to Alex F. Osborn, the originator of brainstorming. In the letter, I asked for translation permission of “Applied Imagination”. His positive reply came back immediately. Osborn wrote that he would send anything to help spread creativity education in Japan. Moreover, he said that he would give the half of the royalties of the Japanese version to *Ueno* and asked him to come to Buffalo, NY somehow. He expressed the opinion that it is necessary to come to Buffalo and to participate in the seminar to learn brainstorming directly. In this way, Japanese translation of “Applied Imagination” was published in October, 1958. *Sangyo Noritsu Junior College* prepared to open the “Creativity Development Course” in 1958.

Ichiro Ueno visited the United States for 75 days by Osborn’s invitation in June 1959. He met Osborn and attended the creativity development seminar during this visit to U.S. and studied deeply “Creativity Training Course (CTC)”. He attended the class of “Value Analysis (VA)” in Buffalo. Later one course titled “VE workshop seminar” was opened by *Ueno* at *Sangyo Noritsu Junior College* in 1964.

Next, he met Dr. Winschuller at California University to study sensitivity training. He decided to introduce sensitivity training (ST), a new creativity development method to Japan. The sensitivity training course was also opened in 1962. These methods became the main program of training courses at *Sangyo Noritsu Junior College* in Tokyo. *Ichiro Ueno* did the Japanese translation publication of “Applied Imagination” in 1958. The foundation of advocate activities of brainstorming was hardened by this Japanese text and the training course at *Sangyo Noritsu Junior College*. The course name “Creativity Development Course” was changed to “Creation Engineering Course” and the contents were revised every year.

²⁵⁾ *Toshio Hiraoka* (1957) “Brainstorming-miscellaneous impressions about Harvard management class” (in Japanese) *Economist* (in Japanese) 1957. September 28 Issue.

²⁶⁾ *Ichiro Ueno* (1980) “History of *Sangyo Noritsu University*” (in Japanese) pp.141-142,147-148 *Sangyo Noritsu University*

In this way, brainstorming spread quickly in the Japanese business world through the training course and translated version of “Applied Imagination.” More than 4000 persons participated in this course as of October, 1974.²⁷⁾

6. The Diffusion of Brainstorming

Full-scale diffusion started into the business world. First, changes took place in Japanese companies through the introduction of “brainstorming.” Creativity training started in electrical machinery, machinery, steel industry in the first stage. Then, industries such as chemistry and textiles followed.

A survey about the necessity for creativity in 56 companies was conducted in 1964. Company departments recognized that creativity was needed were as follows: (multiple-choice answer). They were R&D (44), planning (27), business management (20), design & advertisement (10), and sales (8).²⁸⁾

Sangyo Noritsu College developed a “CTC questionnaire survey” of (82 companies participated) in 1964.²⁹⁾ Practical training methods cited were brainstorming 89.0%, check list method 47.6%, and Gordon’s Synectics method 21.9% as practical techniques used. Thus, brainstorming was widely used in the mid 1960s.

Nikkeiren (Japan Federation of Employers’ Associations) conducted 1061 affiliated company survey’s published a report “Current situation of personnel management in Japan” in December, 1963.³⁰⁾ One core of Japanese infirm training was training according to job type. “Professional training” (for staff) is included in this training. As for the content, the quality control course is 16.6%, OR training course, 10.7%, IE basic course, 9.4%, office rationalization course, 8.8%, and creative power development training

²⁷⁾ Interview with Mr. *Ichiro Ueno*, Senior advisor *Sanno* Institute of Management (September 28th, 2004) “Applied Imagination” Japanese Translated version “*Dokusoryoku o nobase*” Diamond Corp.

Alex F. Osborn’s work “Your Creative Power—How to use Imagination” (1948) was also translated into Japanese by *Aisaku Hayashi*. Translated version “*Sozoryoku o ikasu*” was published in 1950. But at that time Japanese were still in poverty. Thus this book was not popular.

Charles Clark (1958) “Brainstorming—How to Create Successful Ideas” was translated into Japanese. This translated version was used as a sub-text book for Osborn’s translated version “Applied Imagination.” The author, Charles Clark was deeply moved by Osborn’s “Your Creative Power (1948).” He joined BBOD.

²⁸⁾ *Akira Onda* (1966) “Creativity Development Training in companies” (in Japanese) “*Shokugyo Kunren*” July 1966 issue.

²⁹⁾ *Sangyo Noritsu* Junior College Creativity Development Group (1973) “Present Condition of Creativity Development in Company” and “Management Guide” (in Japanese), 1973 July issue.

³⁰⁾ *Nikkeiren* (Japan Federation of Employers’ Associations) ed. (1963) “Current Situation of the personnel management in Japan” (in Japanese) *Nikkeiren*.

course, 8.7%. Many training courses for productivity development are conducted during high economic growth. In addition, the implementation of the training of "creative power development" included brainstorming.

In the 1970s creativity development technique was combined with other management techniques such as VE, IE, and QC.³¹⁾ New business management techniques were required for creating new value in addition to designing of efficient production process, standardization of work, and quality control of product. Brainstorming in particular was positioned as a basic method for obtaining new ideas. New ideas could be combined with other hard and soft technology for concrete problem solving. Creativity development techniques containing brainstorming and KJ method began to be applied to group activities as an effective tool for problem finding and solution. The diffusion stage had changed from individuals who had interests or were in charge of specialized jobs e.g. R&D to general members in 1971.

The creativity development group of *Sangyo Noritsu* Junior College conducted a "creativity development survey" (300 company random sampling, 91 companies replied) in 1972.³²⁾ According to the report the techniques utilized were KJ method 75.4%, brainstorming 71.3% NM method 36.3%, problem finding techniques 25%, check list method 22.5%, PERT 20% and *Tokahenkanron* (Equivalent Transformatinal Thinking) 3.8%.

The KJ method, original soft ware was developed by a Japanese scholar based on the methodology of overseas scientific expedition. The teamwork which performed creative intellectual production existed in the foundation of this method. Brainstorming as the most basic method for idea making became popular among Japanese. The NM method affected by Gordon's Synectics was highly regarded as a technique for new product development. For this reason, it spread widely in the manufacturing industry.

"*Toka Henkan Ron*" (Equivalent Transformatinal Thinking) was originally developed by a Japanese electric engineer. It is a method of discerning the essence of a phenomenon by utilizing analogy and performing problem solving. These three popular methods were taught by amateurs and showed that development and execution was possible. These methods changed the Japanese recognition about creativity. The historical process of development of three methods was understood with familiarity and sympathy. The creativity development methods utilized not only in infirm training but also personal study changed diffusion trends in Japan.

Nippon Consultants Group developed a survey (100-company object) in

³¹⁾ *Sangyo Noritsu* Junior College Creativity Development Group (1973) Present Condition of Creativity Development in Business company "Management Guide" (in Japanese) July, 1973 issue.

³²⁾ *Nihon IE Kyokai* ed. (1968) "IE Methods Handbook" (in Japanese) p.567, *Maruzen*.
Sangyo Noritsu Junior College Creativity Development Center (1974) "Symposium-Creativity Development in Future" "Management Guide" (in Japanese) October 1974 issue.

1973.³³⁾ According to this report, the training methods used in all industries were as follows: lecture was 26.1%, discussion, 19.7%, practice, 10.9%, case study, 8.8%, writing paper, 7.2%, workshop family training, 5.6%, KJ method, 4.7% and brainstorming, 2.8%. This showed that methods of creativity development were diffusing.

Nihon Sangyo Kunren Kyokai (Japan Industrial and Vocational Training Association) investigated “the present situation of the infirm training in Japan” (transition for these five years and problems) in 1975.³⁴⁾ The weight of the method for “problem-solving training” utilized for infirm training as compared with the last 1970 investigation changed as follows. The fast diffusion of “problem-solving training introducing brainstorming etc which picked up the workshop’s problems not touched by staff and specialist. Focusing on management levels, increasing was clear that the manager level (11.8%⇒45.4%), core employee (18.4%⇒45.8%), and foreman (unknown⇒44.3%). In this way, brainstorming, KJ method, and NM method combined with other management techniques diffused deeply and widely in the industrial world in 1970s.

Human power development center investigated “the situation of infirm training and training media” (10 companies of 10 types of industry) in October 1978. Brainstorming and KJ method are evaluated as effective methods in this investigation.³⁵⁾ Human power development center investigated in 1981 “the enforcement and the new direction of man-power development in companies” (102 companies listed on the 1st and 2nd market of Tokyo Stock Exchange replied).³⁶⁾ According to this investigation, KJ method (60.8%) and brainstorming (46.1%) were well-known training for problem-solving. Many companies had continuous implementation of these two methods. They were regarded as the typical methods required in the future. Creativity Development Training Course for engineers in *Nissan Shatai* was periodically carried out from around 1961. The purpose is to support the engineer’s flexible thinking and idea making capability. This course mainly aims at acquisition and practical use of brainstorming.³⁷⁾

Research Institute of Creation Development investigated “present situation of creativity development in companies from April to June of 1983.”³⁸⁾ 70 of 300 companies listed 1st and 2nd market of Tokyo Stock

³³⁾ Nippon Consultants Group ed. (1976) “Business Manual of Education and Training within Industry,” Revised edition (in Japanese) p.127, Nippon Consultants Group.

³⁴⁾ *Nihon Sangyo Kunren Kyokai* (1975) “Present Conditions and Subjects in Business company” (in Japanese) 1975 issue *Nihon Sangyo Kunren Kyokai*.

³⁵⁾ *Nihon Romu Kenkyukai* ed. (1981) *Labor Yearbook* (in Japanese) 1980 issue *Nihon Romu Kenkyukai*.

³⁶⁾ *Nihon Romu Kenkyukai* ed. (1983) *Labor Yearbook* (in Japanese) 1982 issue *Nihon Romu Kenkyukai*.

³⁷⁾ *Nihon Romu Kenkyukai* ed. (1985) *Labor Yearbook* (in Japanese) 1984 issue *Nihon Romu Kenkyukai*.

³⁸⁾ *Nihon Romu Kenkyukai* ed. (1986) *Labor Yearbook* (in Japanese) 1985 issue *Nihon Romu Kenkyukai*.

Exchange replied. According to this survey, following methods were used as problem finding and creativity training. Brainstorming 57.1% and KJ method/TKJ method 48.6% were utilized outstandingly. The check list method and the NM method were utilized about 20%. "It is difficult to adapt for actual problems" (37%) and "too much time for application (30%)" were pointed as problems with these methods. In the manufacturing sector of Japanese industry after the war, standardization of work was performed by Industrial Engineering(IE)Method and Training Within Industry(TWI). Subsequently, statistical quality control (SQC) was introduced by GHQ. Especially Dr. Deming contributed to developing new training course for engineers and skilled workers with *Nihon Kagakugijutsu Renmei* (UJSE: Union of Japanese Scientists and Engineers).³⁹⁾ Skilled workers guided and trained by engineers started QCC(Quality Control Circle) in-side firms. This new industrial movement had developed new methods that were "Seven Tools for QC." The craftsmanship spirit in the workshops in Japan had a tradition which emphasized *Kaizen* and improvement. Japanese top management and factory engineers attached greater importance to workshop community character of the company rather than governing by official authorities. These methods were used to "control" quality of products at the early stages of introduction. In the following stages in order to produce a high quality product, it was used as a method of improving the quality.

Furthermore, the Japanese work way oriented to groups was combined with "seven tools for QC." The seven tools are: Pareto graph, histogram, control chart, scatter chart, Ishikawa Chart or Fish bone chart, check list, graph. The concrete results of the production activity in the spot is observed and measured, and concrete original data are created. Analysis and synthesis of this data is carried out. Ideas for concrete solution were proposed in a group. Brainstorming was the key method of idea making for every method.

A simple business cycle model {Plan-Do-See} introduced from USA has been improved by the practice activities at workshops in Japan. The step of enforcement of an improvement (*KAIZEN*) was newly added. A new model "Plan-Do-Check-Action" was developed. Development of this model was furthered simultaneously with the development of quality control circle(QCC), employees' small-group activities. This "QCC" activity contributed to making the quality of Japanese industrial goods stand world class in the 1970s.

The Ishikawa chart was developed by Prof. *Kaoru Ishikawa* at Tokyo University. His name was used to express respect for his originality. In the workshops of Japanese companies, it was called "Fish-bone chart." QCC is Japanese style employee participation in management. Production

³⁹⁾ *Nihon Kagakugijutsu Renmei* (UJSE) ed. (1997) "50 Year History" (in Japanese) *Nihon Kagakugijutsu Renmei*. Frank Voehl ed. (1995) "Deming: the way we know him" Delray Beach, Fla. St. Lucie Press.

of high quality products by QCC attracted attention from the world. QCC activities in Japan were introduced to the world. Fish bone chart was the method of QCC which gained attention from the world. Japanese experiences with QCC activities teach us that new know-how is developed by the two steps. The first is the development of a new method by a smart man like *Ishikawa*. The second is a lot of practices for concrete problem solving in the workshop in a wide range by many people.⁴⁰⁾ Innovation is promoted by the two elements that are an original individual's idea and practice by many people who commit to the new ideas. This was the result of practicing of brainstorming in group dynamism.

7. Development of MBS: *Mitsubishi* Plastics Industries type Brainstorming

The Japanese business world paid keen attention to brainstorming and tried to introduce it in the field to improve productivity. But there were many difficulties in practical use in the field. In *Mitsubishi* Plastics Industries, Ltd., such difficulties were overcome and original MBS (*Mitsubishi* Plastics Industries type brainstorming) was developed. In this company, newly developed brainstorming was combined with the KJ method, creativity development method and PERT (Program Evaluation and Review Technique) and project management method. The company succeeded in activation of R&D and organizational development (OD). This case will be discussed.

The company established *Shohinkenkyujo* "New Product Research Institute" at the head office during the 1965 depression. This research institute consists of *Nagahama* research section, *Hiratsuka* research section, and research integration office. *Sadami Aoki*, the research integration office general manager, studied Osborn's brainstorming. He tried to put it into practice in R&D activities. Finally he developed a modified brainstorming (MBS) through much trial and error in 1969.⁴¹⁾ The method has the step which checks the obscure words and meaning of ideas by brainstorming. Using this method, the new product, "plastic drainboard" was developed in February 1968 following "air churning type septic tank." "Plastic drainboard connection implement" was registered as a utility model right (April, 1971, and then "plastic drainboard" was registered with a

⁴⁰⁾ *Kukuji Yoneyama* (1996) "Innovation and *Jishu Kanri* Activities in the Japanese Steel Industry" (in Japanese) Japan Society of Human Resource Management (Annual Report. 25th conference).

S. Cameron (1991) "The MBA handbook" pp167-169, Pitman. As effective visualization method, Fish-bone Chart and Mind Map are suggested.

⁴¹⁾ *Takashi Matsuo* (1969) "Problem-solving method to revitalize an organization" *Management* (in Japanese) July 1969.

Kinya Ninomiya (1973) "*Mitsubishi* Plastics Industry has gotten the results of creativity development by MBS-KJ system. (in Japanese) *Kindaikeiei* July 1973 issue.

patent (March, 1972). This became the precious intellectual property of the company.⁴²⁾

Aoki, the chief of R&D division explains about the development process of MBS as follows.⁴³⁾ In fact, I read “*Dokushoryoku wo nobase*” the Japanese translated version of “Applied Imagination” published in 1958 and I adopted brainstorming (BS) in team work with my co-workers’ in a tentative way in 1958 or 1959. However, I found that many difficulties exist in bringing up ideas to achieve the end product. Although there are many ideas indeed, it is very difficult to evaluate the value of an idea. Then, I continued to think about any effective path. Brainstorming has many good points. Therefore if we would develop a new combination with some other method, we will be able to have some success. Having such a subject, I had continued to search for some good method. At last I just met with KJ method in 1966.

“By Osborn system, shortly after a leader shows a theme, “stormers” will start to make ideas at random. In MBS, a 10 minute session to take notes of an idea is set up beforehand. Next, “stormer” will present ideas in order, looking at the own memos. In the Osborn system, speakers are one-sided and extraction of creativity is not enough. Moreover, “stormers” cannot fully explain their own ideas because of sudden thinking and short sentences. For this reason, extraction of an inspiration is difficult.

“Stormer” has a remaining desire to ask others’ opinions in detail and to point out and criticize a weakness. When brainstorming is carrying out in a company, “stormer” group and evaluation group are organized separately. Usually an expert belongs to an evaluation group in many cases. Evaluation groups are organized by people who know task best in the company. However, it is a big loss that they cannot present their own ideas. Finally the reason why an idea was rejected was not clearly understood by “stormer.” In these cases, dissatisfied feeling remains inside the group.⁴⁴⁾ (Fig.2)

The result is mentioned as follows in the company history. Indirect cost was targeted at *Hiratsuka* Research department in order to improve the productivity of company. The method of group thinking, how to find out the same direction of research and method of practice were examined. As a result, MBS-KJ-PERT method was adopted. No less than 70 new de-

⁴²⁾ *Mitsubishi* Plastics Industry ed. (1996) “50 years history of *Mitsubishi* Plastics Industry” (in Japanese) *Mitsubishi* Plastics Industry.

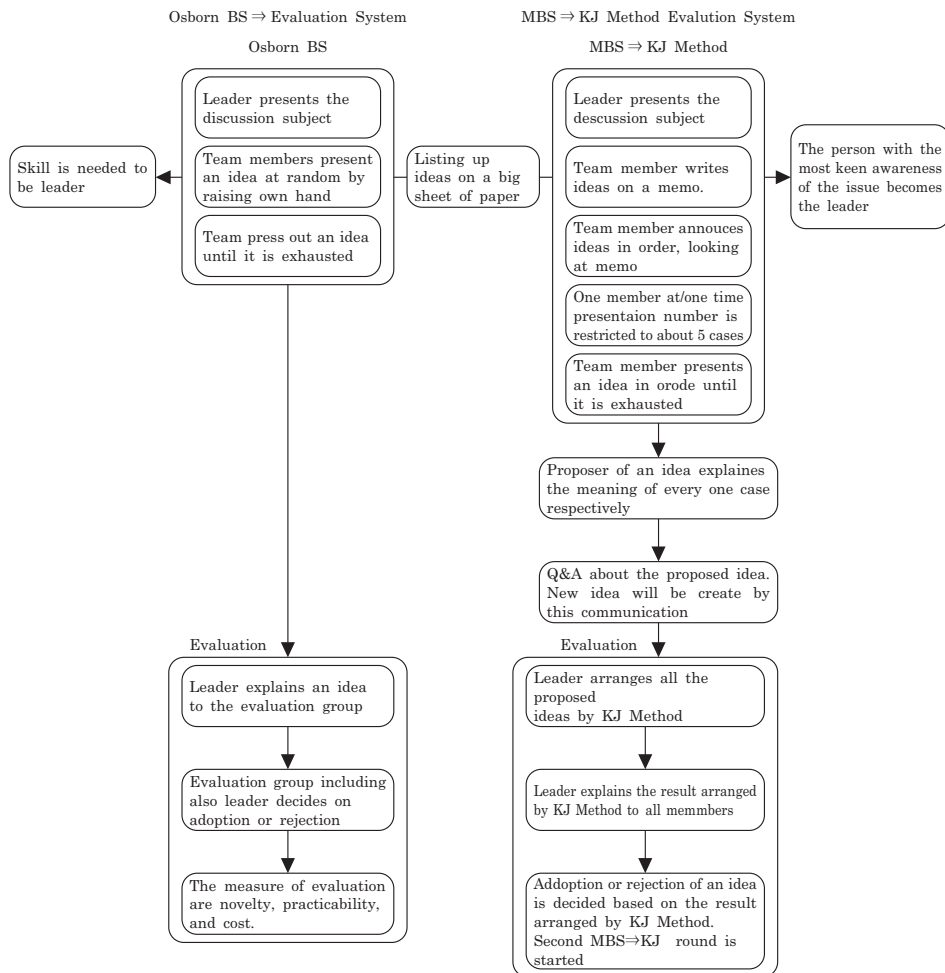
Mr. Toshiyuki Aritake, general manager of Osaka branch, *Mitsubishi* Plastics Industry (reply to mailing question, November 29th, 2004).

The Patent Office Report (1971) *Jitsuyo Shinan Koho* (Utility model right) (in Japanese) April 3, Showa 46 issue, Utility Model Right Advertisement Showa 47 issue.

Patent Office (1972) “*Tokkyo Koho*” (Patent Journal) (in Japanese) March 7, Showa 47 issue.

⁴³⁾ Sadami Aoki (1985) “Stagnation of Quality Control Circle Activities is overcome by KJ method” in “Reclaim the virgin land of business” (in Japanese) *President*.

⁴⁴⁾ Brainstorming by memo presentation was called “Brainwriting” originally popularized in Germany in the 1970s. MBS took the lead in new brainstorming trends.

Fig.2 Comparison Osborn BS and MBS

[Source]Sadami Aoki(1985) "Stagnation of QCC Activities is overcome by KJ Method" p.174

signs were made for the septic tank development project. Moreover the automatic measurement system increased the efficiency. The new method of pipe resisting pressure test was developed by using this MBS-KJ-PERT method. The test took 1/5 the time as in the past.

Futhermore, improvement of automatization also of the heating needle on pipe test was completed at a low cost. MBS-KJ method is very useful as a technique of pulling out and summarizing many people's ideas. Except for the R&D division in the company, it was utilized and was useful of a new plan or making problems clear.

8. Fixing Brainstorming in Japan

According to the "9th Survey of Industrial Training" (2000), the

following method were used as techniques of group training: Group discussion 22.4%, lecture 21.6%, case study in-basket 13.0%, study by observation and practice 8.7%, using audio-visual equipment 6.2%, business game simulation method 5.6%, KJ method and NM method (9th place) only 1.9%.⁴⁵⁾ There is no way to ask the style of dairy work in social common sense. It can be assumed brainstorming is utilized for training of “group discussion/meeting system” (1st place). It is assumed that brainstorming has been already diffused widely without mentioning the name of Brainstorming.

Actual business activity of Japanese representative companies will be explained. New management methods one after another following MBS has been introduced in *Mitsubishi Plastics Industries, Ltd.* over the last 30 years. These days, Σ K activity (*Mitsubishi* style movement for cost cut) is developing linked the whole company TPM (Total Productivity Management) activities as a technique for R&D's efficiency and speed. The technical training course of infirm training in *Mitsubishi Plastics Industries* consists of 8 courses of basic technology, common technology, safety and environment, management methodology, quality control engineering, the elemental engineering, computer technology, control technology, and equipment technology. Levels are divided into 4 ranks. Introductory course: Workers master general basic knowledge. Basic level course: Workers study about fundamental phenomenon in each field. It is preparatory study for mastering technology besides ones own special field. Middle level course: Workers deal with their own major technical field. Furthermore, it requires advanced special abilities. Upper level course: Worker can teach others about advanced technology. Employees will be able to discuss issues with those outside the company. “Creativity development (foundation)” is prepared in the basic level course of common technology. Education and training of the basic methods for creativity development is opened to every employee.⁴⁶⁾

Next, *Canon Co.*'s infirm training system will be discussed. *Canon* has a training program for strengthening business skills. “Communication power, bargaining power, innovative power, problem-solving power, and leadership” are listed as the requirements of capability. Training of brainstorming and creative thinking are taught in the beginner's course of problem-solving power and innovative power. Moreover, middle level training of creativity development is carried out. This helped lead the high corporate-earnings achieved through innovation.⁴⁷⁾

Team across section boundaries (cross functional team: CFT) was or-

⁴⁵⁾ *Nikkeiren & Nihon Sangyo Kunren Kyokai* ed. (2001) “9th Survey of Industrial Training” (in Japanese), *Nihon Sangyo Kunren Kyokai*.

⁴⁶⁾ Mr. *Kimoto Hiromichi*, general manager of Plan Research Division, *Mitsubishi Plastics Industry*, Head Office (interview September 29, 2004).

Koichi Nakazawa (2004) Innovative Cost Reduction (in Japanese) *Nihon PM Kyokai*.

⁴⁷⁾ Mr. *Shigehira Kitami*, General Manager of Human Resources Development Center, *Canon Inc.* (interview December, 2004).

ganized in *Nissan Motor Co., Ltd.* from July, 1999. As a method of management of CFT, (1) benchmark (collection of information, investigation of other companies, decision regarding direction, setting high targets which should be aimed at). (2) Brainstorming (utilization of members' wisdom, coping with the complications among members, true integration, achieving win-win). Brainstorming is a basic method of CFT. And training is also conducted. CFT became a foundation of the Carlos Ghosn's *Nissan* revolution.⁴⁸⁾

9. Conclusion

The spread of brainstorming to the Japanese business world corresponded with the development of "Quality Control Circle Activities" which utilized seven QC methods. Management innovation has stagnated in the collapse-of-the-bubble economy. However, high performance companies are continuing to utilize brainstorming regardless of R&D division, planning and the workshop. They are challenging problem solving in severe international competition.

Originator Alex Osborne says that brainstorming is only one step of creative problem solving. This spirit is inherited by innovative companies.

The 21st century is a time filled with many difficult problems. Creative problem-solving capability is not only needed for in work life. It is also dispensable in order that each individual may live a better quality of life. University education must have a social responsibility to develop human abilities of young people to become leading figures in the future. The core is to develop creative problem-solving capability. Before problem solving, the process of discovery, identification and formation of the problem are necessary.

In today's society, people pay attention only to the speed and efficiency of problem solving. However, if we examine only the surface of the changing phenomenon, the essential solution of problem is unrealizable. Deep insight and imaginative power and logical capability are required. At first, we have to observe the situation in the field using our five senses and intuition. It is no good to approach a situation from a certain special predetermined viewpoint. Such a viewpoint observes only a part. It is necessary to understand the whole picture in problem solving. In today's society, specialization means division of work. The main approach is to decompose the whole into a part and analyze it from a unique perspective. Ordinal specialist's way of thinking is on the assumption that it is possible to solve a problem by optimization of a partial system.

Brainstorming is group-thinking beyond the specialty. It is a method

⁴⁸⁾Mr. Yukinobu Kodama, General Manager of Personnel Management *Nissan Motor Co.* (interview December 10, 2004).

Carlos Ghosn/Philip Eris (2004) "Carlos Ghosn talks about management" (in Japanese) *Nihon Keizai Shinbunsha*.

of trying to understand the total picture of the problem through an image. Brainstorming with 360 degree is an effective method, to create the total image of a problem. A technical term is easily connected with a preconceived idea. It hinders man from thinking about the problem without prejudice. This is an important method also in order to abduct the hypothesis which smashes a preconceived idea. The diffusion of brainstorming was linked with the Japanese method of creativity development derived from field science and engineering. For the development of Japanese creativity, brainstorming must be connected with other particular technologies to solve problems in the field.

The acquisition of basic knowledge has been the main focus at Japanese universities. Students acquire basic knowledge from standard textbooks. For creative problem solving, it is necessary to make hypothesis abduction based on original data. The power of idea making is a key in all parts of life. Therefore young Japanese people must forgo the traditional catch-up way of thinking from the *Meiji* era. To encourage student's creativity is one of the most important issues. University education has to set up a new curriculum to develop creativity.

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