Business-University Forum of Japan

研究報告 No.3
Research Paper No.3

Business University Forum of Japan

Speech at the Third Forum Meeting, Fiscal Year 1999
(delivered on March 30, 2000)

# Business-University Collaboration in Human Resources Development

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November 2002

The Business-University
Forum of Japan

Published in November 2002



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*Printed in Japan*

## The quality of our products depends on the quality of our people

As an engineer myself, I believe that the future of Japan must be built on technology. I am sure you share this view. After serving as Chairman of Keidanren (the Federation of Economic Organizations), I am now with Toyota Motor Corporation.

In the Toyota Motor Corporation, we say that since it is people who make the products, we cannot begin to assemble our products without first developing the people for the job. The quality of our products depends on the quality of our people is the basic philosophy in our company, and we believe we give sound training based on this philosophy. Of course, this kind of thinking can be applied to other fields besides manufacturing. If Japan is to become a technological nation, we must develop a large number of competent engineers to support such a development. What then is the profile required of them?

## Intellectual creativity and intellectual skill are key factors in developing industrial technology

First of all, they must be independent-minded people with a sense of responsibility who can act on their own initiative. In addition, intellectual creativity and intellectual skill, to use somewhat academic expressions, are basic qualifications of those who are called on to support development of industrial technology.

Intellectual creativity refers to an individual's freedom from conventional thinking in the conception and development of new and original technology. On the other hand, intellectual skill is less to do with technology development than with the technical ability to improve productivity and quality at production sites -----and these are important factors in determining an industry's international competitiveness. Intellectual skill, then, is the combination of these factors that constitute on-site know-how.

Discussions on the kind of human resources required by the country tend to focus on one's ability to develop new ideas and technology and the personality and originality of individuals concerned. These are, needless to say, very important, but let us not forget the abilities of those who are responsible for overseeing the actual production sites. In addition to their competence in carrying out their assigned tasks, their ability to respond appropriately to the various changes that occur in everyday work, such as shifts in production volume, defective products or unexpected absence of employees is essential to minimizing adverse impacts on quality and productivity. The accumulation of on-site expertise is critical to corporate productivity.

Such expertise is not acquired in

a day. It requires experience, knowledge and deep insight. These attributes are not mere skills but can be considered high-level technology. When I refer to "engineers," I use the term in a broad sense to include not only engineers in the ordinary meaning of the word but also skilled workers with accumulated on-site know-how.

Of course, an engineer does not necessarily have to have both the ability to generate new and original ideas and the expertise to respond to changes in the field. On the contrary, an engineer is trained to become a specialist in one or other of these areas. The training they receive and the development they undergo will naturally differ. The important point is that if either of these is lacking, it is difficult to raise a company's technical competence and competitiveness or to aspire to significant progress in industrial technology.

## Fostering intellectual creativity

Fortunately, with respect to the accumulation of know-how in responding to changes on site--in other words, the formation of intellectual skill as discussed above--we have an excellent workplace culture and structure in place that allow this to occur spontaneously. This is a big advantage for Japan and one that needs to be further refined. On the other hand, with regard to human resources for generating new ideas and original technologies--in other words, people with rich intellectual creativity--I have thought for a long time now that not only corporate personnel management, but the country's educational system itself are not conducive to fostering these human resources.

Some years back during my tenure as chairman of Keidanren, we had organized a brainstorming group on human resources development led by Mr. Suematsu of Sakura Bank. In March 1996, the group published a set of proposals titled, "Fostering creative human resources." The basic concept of the proposals was to offer a multi- as opposed to a single-track system so that each person would be able to choose the type of education or career that was best suited to realizing his goals and fulfilling his potential. Instead of the common expectation of going to a well-known university and working for a well-known company, it was proposed that a wide range of working and living patterns be recognized, so as to realize individual potential and promote such a development through educational as well as corporate personnel policies.

Deregulation, diversification and individualized designing of education, and a review of university entrance examinations were proposed to educational institutions and government ministries concerned. Among recent proposals that have already been adopted are greater flexibility in school selection and single-subject university entrance tests for those with special abilities.

Professor Nishizawa, who is

sitting beside me here today, generously gave us advice on many of these ideas. For example, according to him, "The prevalent use by students today of 'examination skills' to solve mathematical questions quickly by applying set patterns is not good. The actual thinking process for arriving at an answer is more important." I absolutely agree. Rather than copying others, one should do one's own thinking. There is a need for a review of education that puts undue emphasis on cramming and memorization and achieving standardized scores. On the positive side, increasing discussion is taking place pointing generally in this direction.

To return to the subject of the Keidanren proposals, they did not only address educational circles and the government, but corporations as well. Specifically, we proposed that corporations should adopt a personnel selection system that did not require job-seekers to name their alma mater, expand year-round and mid-career hiring, and emphasize merit-based hiring. It is encouraging that an increasing number of companies are adopting these proposals. Although results differ from company to company we feel our proposals have been beneficial.

Several years ago, our company decided not to ask job-seekers the name of the university from which they had just graduated. Candidates, we found, worked that much harder to make a good impression, while employment officers had to work harder to discern the caliber of each candidate. Independent efforts at educating students and employees to have creative minds have just begun, but the question remains as to how our society as a whole should develop such human resources. On this subject, there are three things I would like to say.

## The importance of manufacturing in a knowledge-based age

Firstly, let me emphasize above all the importance of manufacturing. It is something I believe all of you gathered here today fully recognize. Earlier, I referred to intellectual creativity and intellectual skill as the two indispensable qualifications for future engineers. In July last year, as Chairman of the Economic Council, which is an advisory committee to the Prime Minister, I was responsible for preparing a report titled, "A Desirable Economic Society and a Strategy for Economic Revival." The report stated that we were living in a knowledge-based age.

It is regrettable that whenever I speak of intellectual creativity, the knowledge-based age or knowledge-intensive industry, more often than not people associate them with a service or software-centered economy or the information business, a typical knowledge-based industry. Even though Japan is in recession, it remains the world's second largest economy and has a population in excess of 100 million. Whichever way you look at it, it is quite apparent that a country such as ours cannot survive on service,

software and information industries alone.

The recent upturn of the U.S. economy is often explained in terms of the flourishing service industries including the information and telecommunications industries as well as the development of businesses geared to temporary employment. We should not overlook the success with which the U.S. manufacturing industry has overcome its temporary sluggishness and made a strong recovery. To take the example of the automobile industry with which I am involved, the U.S. auto industry around 1980 appeared to be very concerned about the possible decline of its competitiveness vis-à-vis Japanese cars with respect to quality and price among other factors. Japan was told to exercise voluntary restraint on exports to the U.S., and UAW union members were seen breaking up a Japanese car with hammers.

Under these circumstances, the U.S. industry, government and universities made a joint effort to address the issue by benchmarking the auto industries of Japan, the U.S. and Europe. One result of this effort was a paper by an MIT research team titled, "The Machine that Changed the World." It said in so many words that this machine was Toyota's production method. "Lean production," to be sure, was a fair description of it.

The other day, I happened to meet Professor Daniel Ross who was one of the key members of the study team. I thanked him for making Toyota's production method famous by giving it the epithet 'lean production'. Professor James Womack, who had worked with Professor Ross, later established the Lean Enterprise Institute to spread 'lean production' in the U.S. and Europe and is working energetically to organize Lean Summit seminars around the world. In those early days, however, there was hardly anyone in the U.S. who could provide instruction in lean production. Its introduction in the U.S. was unthinkable without the model and cooperation of the Japanese.

The Toyota Motor Corporation was happy to establish a Supplier Support Center in Kentucky to offer U.S. parts companies, regardless of whether they were business partners or affiliated companies of Toyota, help in improving their productivity and quality at no charge. At the Lean Summit, US parts manufacturers who had received the support of the Supplier Support Center expressed their appreciation and gave reports about their experience. We were pleased to think that we might have contributed in some small way to the revival of the U.S. auto industry.

## Dr. Deming's achievements

In addition to lean production, it is clear that TQC and other quality management methods were keys to the success of Japanese companies. In Japan, Dr. Deming, as represented in the Deming Prize, is almost synonymous with quality control. Dr. Deming is a professor at New York University but for a long time was recognized in the US only

as a statistician with hardly anyone doing him justice. Total Quality Control developed by him was barely known or practiced in the U.S.

But as soon as Japan's success had become evident, Dr. Deming was rediscovered, and despite his advanced age of eighty he worked energetically at the forefront of quality control activities across the U.S. at such companies as Ford. The U.S. Congress, on learning how competition in Japan to win the Deming Prize had raised the level of quality control there, created the Malcolm Baldrige National Quality Award, named after the then Secretary of Commerce.

One of the most successful efforts by U.S. companies in quality control was the case of the Florida Power and Light Company. The company had a close relationship with the Kansai Electric Power Company in Japan, and although both companies undertook measures for quality control and other improvements at the same time, a large gap in their levels of performance and quality developed in a matter of five years. During this time, the Kansai Electric Power Company had won a Deming Prize.

Seeing this, the management at the Florida Power and Light Company decided to introduce as closely as possible the Japanese style of quality control utilized by Kansai Electric, and invited a number of Japanese advisers including Professor Asaka of the University of Tokyo, one of the highest authorities on quality control. Under the guidance of Professor Asaka, the Florida Power and Light Company made steady progress in quality management and was awarded Japan's Deming Prize in 1989. As exemplified by Professor Asaka as well as Professor Ishikawa and Professor Mizuno, Japanese made notable contributions to the revival of the U.S. industry in the field of quality control.

## Improving manufacturing methods to generate new added value

I may have digressed a little, but what I would like to say is that the U.S.A. today is by no means a postindustrial society. It is a society in which the information, service and manufacturing industries have maintained vigor and a competitive edge in accordance with each industry's stage of development. Of course, I do not deny the importance of information technologies and the software industry that uses such technologies. There is hardly any doubt that such technologies and industries will become the locomotive of the future economy.

Nor am I trying to say that all will be well if only we continue to make persistent efforts at improving our manufacturing skills. Rather, what is important is for the manufacturing industry to utilize such new technologies and software to generate new added value and create new industries and employment. Manufacturing is also challenged to change. It is in that change that there will be development of new industrial technologies.

On the topic of technological development in our country, some have said recently that the era is over for Japan to simply improve on technology from the U.S. and Europe, and that we should now pour our energies into developing advanced basic technology. One agrees with the importance of developing a sophisticated level of basic technology. However, these comments tend more often than not to make light of the art of product making, in other words of development and manufacturing skills. This I cannot agree with.

Essentially, basic and applied technologies do not develop independently. The two develop in tandem, at times stimulating each other and at other times merging with each other to exchange needs and swap seed ideas. Prototypes must be built to give form to technology for verification, and sophisticated skills are necessary to conduct experiments. These are in fact elements of the manufacturing process itself. It follows that if Japan is to seek its future as a technological state it is essential that we do not lose the foundation of manufacturing.

## Emphasize "real" rather than "virtual"

Secondly, emphasis should be placed on actual circumstances and real products, or to put it in today's language, on the "real" rather than the "virtual." Having spoken about the need for intellectual creativity in the knowledge age, I feel a little awkward in expressing my concern because I sense in those terms a nuance of doing business, moving the economy and conducting research and development using only our heads without working with our own hands.

With the notable advances in the performance of computers and the development of excellent software programs, it is now possible to perform many areas of research through computer simulation without conducting actual experiments. But I have some doubts about leaving everything to computer simulation. Sakichi Toyoda, my grandfather, used to say the same thing. In the old days, it was always said that one should never launch an untested product.

What I mean to say is that it is important for us engineers to have our own set of knowledge and skills as well as those we simply borrow. And in many cases these things cannot be acquired in front of a computer screen. One needs to be at the production site, to see the product with one's own eyes, to think with one's own head, to touch the product, get grease on one's hands, and personally consider how the product can be improved on and how the cost of making it lowered. It is only in this way that one can acquire the skills that one can call one's own. I feel that when we stop making such efforts, the foundation of Japan as a technological nation will be lost. Some people might think this old-fashioned, but it is my honest conviction as an engineer who has been involved in manufacturing for many years.

Nowadays we frequently see crash tests in TV commercials. Crash tests use cars that are actually assembled according to

designs for normal use. Today it is possible to use computer simulation to gauge the damage caused in a collision. By inputting data on body shape and structure and characteristics of the materials used, it is possible to measure how much damage a car would receive when exposed to a certain impact at a certain angle. The measurements are quite precise, and we are consequently reducing the number of actual crash tests.

In the past, many prototypes were produced, but we make fewer today. For a model called “bB” launched recently, no prototype was made. We also have that kind of experience. However, much vital information is obtained by conducting actual experiments that cannot be obtained by computer simulation. There is a lot to be learned in the real world that cannot be found in the virtual world. The ability to perceive and pursue these possibilities is required of an engineer, and that in some respect is a measure of his technical ability.

## Engineers are expected to be independent-minded and have high moral character

Thirdly, engineers must have integrity and high moral standards. Last year, there were a number of shocking accidents in Japan that resulted from scandalous conduct, negligence, oversight and slipshod management by engineers, including the accident in the fast-breeder reactor Monju, the collapse of a concrete slab in a Shinkansen bullet train tunnel, the failed launch of a domestically produced rocket, and a critical accident at a nuclear power facility in Tokaimura. In many areas of work that engineers are involved in, a minor slip may lead to an accident that can have a significant impact on the environment as well as the lives of people living nearby. Even a spacecraft equipped with the best that advanced technology has to offer can crash because of one loose screw. Such is the nature of engineers’ work.

Therefore, it is indispensable that engineers possess an independent character and high moral qualities marked by a strong sense of responsibility and mission. It is clear that we owe the development and prosperity of our country to the excellence of our technical expert groups. However, should our engineers lose the confidence of their fellow citizens, it will hardly be possible to build a successful techno-state. In order to restore the confidence of our people in our technology and engineers, the industry and the universities must work individually and collectively to encourage the independence and high moral integrity of our engineers.

I would like to request universities and colleges to provide sufficient time for what we call ‘technology ethics’ and to instil a sense of responsibility, mission, and morality in students. We in the business are committed to doing our best.

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