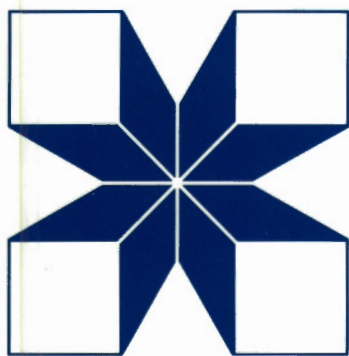


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C A N A D A

UNE STRATÉGIE DU DÉVELOPPEMENT DES RESSOURCES HUMAINES

COMMUNICATIONS DÉCOULANT
DU SÉMINAIRE-ATELIER TENU
À YAOUNDÉ, CAMEROUN,
DU 2 AU 5 FÉVRIER 1988

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Une stratégie du développement des ressources humaines

Communications découlant du séminaire-atelier
tenu à Yaoundé, Cameroun, du 2 au 5 février 1988

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UNIVERSITY/INDUSTRY RELATIONS
IN JAPAN :

IMPLICATIONS FOR HUMAN
RESOURCES DEVELOPMENT

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UNIVERSITY / INDUSTRY RELATIONS IN JAPAN : IMPLICATIONS FOR HUMAN RESOURCES DEVELOPMENT

INTRODUCTION

1 The purpose of this paper is to briefly delineate the characteristics of university/industry relation in Japan as well as recent development of it. This paper, however, does not deal with concrete measures, programs, projects, etc. carried out by the government and other organizations to promote collaborative works of universities and industry. Since the major focus of the Seminar is on human resources development policies especially in R&D, an effort is made in this paper to describe relationship and division of roles between universities and industry from the point of view of human resources development strategy.

2 As discussed in the following paragraphs, university/industry relation in Japan is deeply related to its human resources development policies. An effort is, therefore, also made in this paper to give an overview of historical development of human resources development policies in Japan.

NATURE AND IMPORTANCE OF THE ISSUE

3 Universities in most of the countries have twofold major functions ie. creation and transfer of knowledge, which are respectively called "research" and "education", while the function of the industry is to produce tangible and intangible goods, making use of the existing knowledge.

4 The transfer of newly created knowledge from the universities, which are the centers of excellence, to industry has been taking place in every countries, since long time ago at least slowly. However, in many industrialized countries, there has been increasing interest among people in more effective and efficient collaboration between the universities and industry.

5 There are some reasons for this increasing interest. Firstly, because of the recent economic stagnation which started by the "oil crises", it has become difficult for industry in general to keep their expenditure for their research and development works. Industry is, therefore, increasingly resorting to research capacities of universities as well as government research institutes.

6 Secondly, in many major promising fields of science and technology, the speed of development of knowledge has become so fast that the traditional style of creation and transfer of knowledge, such as "invention or discovery of something new in a university applied research work in a government industrial research institute or in an enterprise development work in an enterprise production of goods", may not catch up with the new knowledge or function sufficiently. Many private firms are now searching for new technologies through direct channels from the universities.

7 Thirdly, thanks to the new technologies, it has become possible for small and medium size companies to realize an incredible success through what is called "venture business" based on high-technology. Those small and medium size companies, which has long been devoted to humble and/or subcontract work and sometimes, dependent on big firms, have now more possibility and are seeking for new knowledge created in the universities.

8 Fourthly, because of the constraint of the university budget which had derived partly from the economic difficulties and partly from the decrease in the enrollment to the universities, there has been a increasing mood among the university people to be attracted to such industry-related research activities as testing, contract research, consultancy services, development, etc. in order to maintain and develop their activities under such economic circumstances.

9 The impacts on the university research caused by such collaboration and relation have long been discussed and argued in various occasions by many organizations. There has been a serious anxiety that the university research could be oriented too much toward short-term, problem-solving and applied and development research by more collaborative works with industry and that the excellence of universities, which should be based on the real intellectual curiosity of researchers, could be jeopardized. On the other hand, it is true that there has been a strong opinion that universities should make more efforts to help people cope with the problems in "the real world".

10 If the transfer of knowledge from universities to the industry is not functioning well, there seems to be theoretically three possible causes for the malfunction : a) the universities are not creating proper knowledge ; b) industry is not making enough efforts to introduce new knowledge for the production ; and c) there are communication problems between them. The recipe for the malfunction could be, therefore, prepared by identifying the cause among the three and taking appropriate measures targeting the specific sector with problems.

11 It seems necessary to note here that, in planning a measure or a policy to encourage and facilitate the collaboration and communication between the two different worlds viz. the universities and industry, it is a prerequisite to respect the essential roles of each sector involved. This means that it would be of no use trying to compel a sector to carry out a role which is not involved in its fundamental functions.

12 There is an example, in this regard, which took place in the United Kingdom a few years ago. The government of the UK launched a scheme to subsidize university professors who were willing to commercialize their inventions. This scheme did not seem working very well, because it aimed to make university professors do what they were not good at. The main strategy of the UK government at that time was to encourage the universities to squeeze their knowledge into the industrial sector by the initiative of the universities; side with the help of government schemes and organizations, rather than to encourage industry, to make more effort to find and commercialize new applicable knowledge.

13 It was quite natural for the government of the UK to take this kind of strategy because at least at that time the distribution of the intelligent people with university degrees were too much academic-and governmental-sector-dominant, and they could not expect much of industry to ameliorate the situation. They should have, however, taken more dynamic policies to improve human infrastructure in industry through human resources development policy targeting the industrial sector, because the problems did not lie in the British universities, which were rather well known for the excellence as well as a number of inventions, discoveries and technological breakthroughs, but in the industrial sector in the UK itself.

14 Here we can clearly see importance of well balanced intellectual human resources development for the sake of smooth transfer of knowledge among the different sectors and subsequently for academic, industrial and economic development of a country.

JAPANESE CASE

Start for modernization

15 It would be interesting to discuss various new schemes implemented by many governmental or quasi-governmental organizations in Japan for the sake of university/industry collaboration, since there has been a boom in increase of collaborative projects between universities and industry in Japan. This issue would be, however, discussed here in this paper from the point of view of human resources development strategy of Japan in to deal with this matter more profoundly as well as to contribute to the purpose of the present Seminar, rather than superficially exemplifying the new schemes.

16 In order to discuss today's university/industry relations in Japan from the point of view of human resources development strategy, it seems necessary to have an overview of the development of Japanese human resources development strategy, which started some 120 years ago when it was forced to open the country to foreign countries after 300 years of peaceful isolation. This section, therefore, deal with historical development of Japanese human resources strategy.

17 In 1853 a fleet of American Navy, which came to Japan to establish a base of whaling, awakened Japan, which had been enjoying three hundred years of closed-door policy to almost all the countries. Japan suddenly found itself far behind the Western civilization in terms of science and technology as well as political and social structure of the country. After the disturbance caused by the Civil war and the Restoration in 1867, Japan started its modernization by a new government under the reign of the Emperor.

18 Although they were aiming at accomplishing within twenty years what the European countries had done in one hundred years, they were aware of the importance of development of indigenous human resources, which would take a long time. In 1871 Ministry of Education was established and it inaugurated the

new comprehensive education system composed of elementary schools, secondary schools and colleges, by which some 26,000 elementary schools were established through the country in the following three to four years. In the beginning of this century the enrollment rate of elementary school (6 years) reached more than 99 %.

19 There seems to have been four characteristics of Japanese human resources development strategy in this period : firstly, they put emphasis on the elementary school level for the intellectual development of the general public. Secondly, contents of education were designed by pragmatic ideas eg. at the elementary level such basic skills as reading, writing and calculating were emphasized ; at the higher education level the first Imperial University established in Tokyo in 1886 consisted of six faculties : Law, Medicine, Science, Literature, Engineering and Agriculture, the last two of which did never exist in European eminent universities at this time because of their practical nature.

20 Thirdly, they made tremendous efforts for education in Japanese language even in colleges for the sake of general dissemination of education. They developed all the necessary textbooks and materials for schools written in Japanese. Fourthly, it was stressed in the educational activities that all the Japanese citizens should contribute to the nation to catch up with the Western countries as well as not to be colonized by those countries. This argument had realistic persuasiveness since the neighbouring country, China, which most Japanese had believed to be a gigantic strong country, had been invaded by European countries and in a quasi-colonial situation, and Japan itself was also suffering from unequal treaties forced by Western countries.

21 Through these strategies, Japan had succeeded in developing the intellectual infrastructure and subsequently realized industrial modernization incredibly rapidly. However, partly because it failed in social and political modernization it rushed into totalitarianism and imperialism, and finally experienced an unconditional surrender at the end of the Second World War.

Development after the Second World War and University/Industry relations.

22 After the defeat in the Second World War in 1945, Japan lost all the overseas territories and became again a small country. The leaders in Japan at this time had been strongly impressed by the abundance of natural resources of their former enemy, the United States, which had overwhelmed Japan, and realized again that Japan had no other natural resources than human resources to cope with those big countries and to rebuild the country from the ruins of the war.

23 They changed the basic strategy from the military to the economy and started to look for the means to survive. People in Japan were all disappointed in the pre-war values and in a confusion without political, cultural and moral identification. Tokyo, the capital city, was totally destroyed by repeated bombard-

ment and two of the major cities were literally burnt to the ground by atomic bombs. Industries were annihilated and people were all starving.

24 What was good for them, however was the fact that they did not lose their belief in education. Japanese new Government organized by the new democratic Constitution put emphasis on education to democratize the society as well as to rebuild the country, and reformed the whole structure of education, introducing American 6-3-3-4 system.

25 It is quite interesting that all the educational strategies in the pre-war period mentioned in paragraph 19-20 were kept after this reform. Firstly, they continued to put emphasis on the basic education, namely elementary level (6 years) and lower secondary level (3 years). Both of them became compulsory and the perfect comprehensive system and the nation-wide common core-curriculum were introduced in order to realize equal opportunity of education as well as to improve the general intellectual standard of the general public. Now virtually all the children finish the compulsory education and 94 % of them go up to the upper secondary schools and some 35 % up to the universities/colleges.

26 Secondly, pragmatic nature of education is still continuing. In the elementary and secondary schools special emphasis is put on education of science by the Science Education Promotion Act, and Japanese students are always ranked highly in mathematics and science in international comparative tests. In higher education level, engineering is the most rapidly expanding field of study in order to respond to the demand for qualified manpower.

27 Thirdly, although such pre-war ultranationalistic values as unconditional loyalty to the Emperor, infinite devotion to the country, etc. disappeared from the curriculum, it seems that pupils/students are continually taught the economic situation and environment of Japan and how it could survive and develop in the future. Teachers repeat that Japan is a very small and vulnerable country with no natural resources, which has developed only by excellent human resources and technology, and it could survive in the future only by further efforts of the people, further development of science and technology, and international trade. It seems that, at least partly through this kind of education together with the inherited ethnic homogeneity, Japanese children acquire an attitude to work hard, to contribute to the country and to positively accept and utilize new things.

28 Based on this kind of background, the relationship between the universities and industry in Japan has developed to a unique nature : firstly, the government and industry adopted a strategy to import and introduce foreign advanced technologies to rapidly catch up with the Western countries, and they did not intend to rely too much on the new knowledge created in Japanese universities. It used to be said that "Everything is invented in the United Kingdom, commercialized in the United States, and mass-produced in Japan".

29 Secondly, major part(70 %) of the research work in Japan, which has been applied/development research oriented, has been carried out in the industrial sector rather than in the government or university sectors. Since industry has always been aware that new technologies are the only means for them to survive in the domestic and international market they have made considerable efforts for research/development works directly related to the production of goods.

30 Thirdly, the major role of universities expected by industry was to supply as many well-trained manpower as possible to meet the demand of industry both in the fields of technology and social sciences corresponding respectively to engineers/researchers and management staff of the firms. For this sake, the government has expanded the capacity of higher education especially that in engineering. Partly because of the long tradition of in-service and on-the-job training in Japanese industry, even for researchers, and partly because of their strategy to put emphasis on application works of foreign technologies, industry has needed flexibility and adaptability of the researchers in their laboratories rather than specialized knowledge or ability in basic research. This lead to the fact that university graduates with the first or the second (bachelor's or master's) degrees have had better job perspective in the labor market than Ph. D.'s.

31 Fourthly, the relationship between universities and industry has taken the form of informal human relations between certain professors/faculties and certain private firms. Professors engaged in science and technology often have special contacts with private firms in the relevant fields, which are established mainly by supplying the graduates as the employees of the firms. The graduates sometimes ask their former teachers for some advice to carry out their research activities in their firms, in informal ways or by formal research contracts ; and the professors can get the latest information on the technological development in the field through their former students and sometimes donation from the firms. On top of this, strong alumini linkage covering academic, industrial and governmental organizations is working for cooperation and information exchange.

32 This kind of structure seems to have been working very well for the development of technology and industry in Japan. The biggest reason for this success was the fact that people in Japan laid the major responsibility of commercial utilization of knowledge upon industry rather than universities, and succeeded in keeping vitality and "technological frontier spirit" of industry. This has been done partly by creating enterprising spirit through basic education, and partly by increasing supply of university graduates to the private sector.

33 In 1985 more than 35 % of a cohort of the same generation continues their study to higher education level and universities and colleges are supplying more than 400,000 graduates to the labor market each year. Thanks to this number and to the fact that there has been no such idea in Japan as "graduate job", one can find university graduates even in small companies, who have enough intelligence and enterprising spirit. Now the number of the people graduating from faculties/departments of engineering in Japan each year is almost the same as that in the United States, while the population of Japan is a half of that of the United States.

34 Universities have been responding to such a demand of industry very effectively so far. One should know the very flexible structure of Japanese Higher Education System to understand this. There are now 460 universities and colleges with 1.8 million students in Japan, where one can find three major characteristics: firstly, among them 331 universities/colleges with 1.3 million students are private universities/colleges run by Education Foundations, which means that some 70 % of the higher education system belongs to the private sector. This fact has led to the quick response of the private universities and colleges to the changes in two markets: the market composed of universities/colleges and high school students, which is related to the "input" of students; and the labor market composed of employers and graduates, which is related to the "output" of students. In order to succeed in those markets, both of which reflect the current economic situation very quickly, the private universities/colleges are always monitoring and coping with the changes in economic and social situations as well as the changing needs of the clientele.

35 Secondly, there is a pyramidal hierarchy of the prestige of the universities/colleges, and all the universities and colleges are struggling to climb up the ladder up to the top level. The pyramid consists of the top class some 10 national universities with very high prestige, high class private universities, then the second class national and local universities, and the low class private universities. In order to go up in this hierarchy, it is necessary to succeed in the above-mentioned two markets as well as in the outcomes of the research works. This means that there is a tough competition among the universities and colleges just like that among the private companies.

36 Thirdly, among the 1.8 million students, some 1.2 million are studying social sciences or humanities, they belong to faculties of laws, economics, sociology etc. however, the contents of the study are not too specialised and those faculties are more or less like general arts colleges. Some criticize that this is one of the weak points in Japanese higher education system, but it is also true that this has given the flexibility of the graduates in terms of their employment perspective. The graduates of social sciences and humanities have been penetrating into every corner of the private sector including small and medium size companies and contributing to introduction of new idea and enterprising spirit to the firms.

37 Since industry has tended to rely on imported technologies, Japanese universities have been able to enjoy full autonomy for the sake of their research works. This does not, however, mean that industry has neglected new knowledge created in Japanese universities. Because of their enterprising ethos, people in industry have been looking for new and promising knowledge and its possibility of application everywhere through every possible channels including Japanese universities.

They receive information through specialised academic societies, academic journals, alumni societies, etc. Since the application is done very quickly by industry, researchers in the universities do not have to worry about such a

"vulgar" thing. Partly because of the tradition of alienation of university researchers from the real world, they tend to think more of academic prestige and not to think of making money by their inventions although the rights of inventors are fully protected by laws. So far, this division of labor has been working well.

39 Because of this kind of structure, university people are often surprised by the application and commercialization of their inventions, which are sometimes far beyond their imagination. Here is an example : a few years ago, a professor in a Japanese university invented a new "Shape-memory alloy", which could memorize the original shape and recover it by sensing certain fixed temperature even after being distorted. One month later, all the automobile companies in Japan had got a sample of this alloy and started application research.

40 Their idea was to use it to the body of the cars, whose dents could be repaired only by pouring hot water. Unfortunately they have not yet succeeded in this, however, one company succeeded in using it in ladies underwear and it is now commercialized and sold in the market. It sells very well because this underwear can recover its original idealistic shape by sensing the temperature of the human skin even after being washed.

41 The above-mentioned style of collaboration and division of labour between universities and industry seems to have been working well in Japan. However, there seems to be a big structural change happening in this situation, which will be described in the following section.

Recent development and structural changes

42 The above-mentioned style of collaboration and division of labour between universities and industry seem to have been working well in Japan. However, there seems to be a big structural change happening in this situation, and the expectation of industry to university research seems to be increasing. The factors pointed out in paragraph 5-8 all apply to the situation in Japan, however, there seems to be other factors unique in Japan.

43 The first factor unique in Japan is that it is becoming more and more difficult for Japanese private firms to import new technologies from foreign countries. Because of the success of many Japanese firms in the international market, foreign countries are becoming more restrictive of the export of technologies to Japan and the agreed extent of commercialization of their technologies under license. For this reason the expectation of Japanese industry to Japanese universities as the sources of new knowledge and technology is rapidly increasing.

44 The second factor is bigger than the first one. In not a few fields of technologies, Japan has virtually caught up with foreign countries and has nothing more to introduce to the system. This has made Japanese industry expect more of Japanese universities as the main source of new knowledge.

45 It is interesting to note here that the factors mentioned in paragraph 5- 8, which are more or less common among the industrialized countries, caused more expectation of Japanese industry, especially of local small and medium size firms, towards applied research works done in universities just like in other countries, while above-mentioned two factors, which are mainly affecting large size and export-oriented firms, caused more expectation of those big companies toward more basic research carried out in universities in so-called strategic fields for the sake of technological breakthroughs. This is one of the most prominent natures of the recent increasing industrial demand towards universities in Japan.

46 Planning of new strategies to cope with this new situation started only recently, and it is too early now to discuss it. There seems to be, however, two major directions emerging from planning and discussions in government agencies and councils. The first direction is "back to the basic education again". It was already mentioned that education in elementary and secondary schools has contributed to form enterprising spirit and team spirit and that it was the most fundamental part of Japanese human resources development strategy. It has been working very well to improve the general standard of intelligence of the people in general and to supply manpower with scientific knowledge and enterprising spirit to carry out R-D works as researchers or engineers or to promote R-D works as managers.

47 However, this elementary and secondary education system has often been criticized, being said that it is too rigid and puts too much emphasis on uniformity, standard and efficiency, and that children are just like the stereotyped products of a factory under a severe quality control system and their personalities and creativities are suppressed in schools. This seems to be one of the negative effects of Japanese education system designed to supply manpower to catch up with Western countries as rapidly as possible.

48 Partly to respond to this criticism, within the general framework of the overall educational reform, which is taking place now, and partly to increase scientific creativity of the people, it is being planned to reorganize the curricula of elementary and secondary schools, putting more emphasis on diversity, personality and creativity of pupils/students. Nobody knows if this project will work well in the future, but it could be argued that at least the direction of the effort for the reform is appropriate.

49 The second direction of the reform is improvement of higher education. Although the quality of Japanese elementary and secondary education has often been appraised highly through various reviews including those done by the OECD in 1970 and by the United States educational authorities last year, Japanese higher education system has always been criticized in terms of its contents and quality. Those criticisms are not always fair because Japanese universities have unique functions in the whole educational system ranging from pre-school education to higher education and then further to in-house education/training of private firms and adult education in various facilities.

50 However, it is true that the main emphasis of Japanese universities in terms of science and technology has been put on supply of high level engineers and middle level researchers with high adaptability and flexibility, who can carry out R&D works in private enterprises, and that education for high level researchers has not been in the center of the scope. Now the government is planning to improve this situation, starting with planning reforms of graduate courses, which is still in a planning stage.

51 Those reforms are difficult to carry out because they are related to the culture of the nation and the value system of the people. It is, however, strongly intended by the Japanese to realize this reform for the survival in the next century.

SUMMARY AND CONCLUSION

52 The relationship between the universities and industry in Japan has had a unique nature. Under the circumstances where the Japanese science/technology and industry were far behind the Western countries and it was of the top priority to catch up with them, the Japanese have taken a strategy to have industry carry out major part of the R-D works, importing foreign technology and knowledge, and to have the universities supply manpower to industry. This system seems to have been working well until recently.

53 This kind of strategy has been largely dependent on the success of the human resources development policy, since it has been a prerequisite to keep the vitality and enterprising spirit of people in industry both in R-D works and management. For this sake, basic education in the school system has been playing an important role in building up an ethos composed of enterprising spirit, team spirit, etc. and higher education has been playing a role to supply more than enough amount of manpower with intelligence to private firms including small ones.

54 Japan is now, however, facing a new stage of development and necessity to strengthen the role of the universities as the sources of new knowledge, mainly because it has already caught up with the Western countries in many fields of technologies. In this situation, they consider that it is necessary not only to reform education and research in the universities but also to change the whole human resources development strategy in order to cope with this structural change and to survive in the next century.

55 They are now, therefore, planning to carry out a large scale educational reform to change the whole system from one to put emphasis on uniformity and high efficiency to another to put more emphasis on diversity and high creativity, starting from the elementary school level.

56 Human resources development strategy of a given country seems to depend largely on the historical background and the culture of the country, and it is, therefore, sometimes useless to try to learn blindly from the experiences of other countries. However, if it could be possible to draw some lessons from the Japanese experiences, they would probably be as follows : firstly, it would be better in the long run, if possible, to try to improve the general educational standard of the people in general as a sort of human infrastructure for any kind of human resources development strategy rather than to try only to create small number of elites, even though the former would take much longer time. Secondly, the ethos and the attitude of the people are equally important as the knowledge and skills which they have although they are difficult to be taught.