Session 2

What are international cooperative strategies to cultivate science based human resources and promulgate their contributions to global innovation ecosystem?

Chair

Takahiro Ueyama
Professor, Department of Economics, Sophia University

Yuko Harayama
Professor, the Management of Science and Technology Department, the Graduate School of Engineering of Tohoku University
Executive Member, CSTP

Discussion Leaders

Monte Cassim
President, Ritsumeikan Asia Pacific University

Richard Byrd Dasher
Director, US-Asia Technology Management Center, Stanford University

Sachi Hatakenaka
Independent consultant/researcher
Research Affiliate, Industrial Performance Center, Massachusetts Institute of Technology

Atsushi Sunami
Associate Professor, Director of Science & Technology Policy Program, National Graduate Institute for Policy Studies

Poh Kam Wong
Director, NUS Entrepreneurship Centre, Singapore

Summary

Takahiro Ueyama:

Welcome to Session 2: Creating Innovation Based on Science and Technology. The session will explore the international cooperative strategies to cultivate science-based human resources and promulgate their contributions to GIES with the aim of presenting a cooperative model for universities and government to harmonize national innovation policy. There are four agendas for the session: (1) Role of research universities in producing and circulating scientific human resources; (2) Global scientific skills and the development of international collaboration; (3) Expanding international collaboration and the emerging new phase in East Asia; and (4) The mobility of human resources: its difficulty and the contribution to the formation of global commons.

Richard Byrd Dasher:

Coordinating strategies really starts with the incentives for having global skills. Key to the incentives is a connection to mobility. To illustrate this point, a friend of mine with a PhD in physics from the University of Illinois was awarded an STA Fellowship postdoc at RIKEN in the early 1980s. He joined a good research group at RIKEN

and while being involved in interesting research, his expectations on what he would be doing fell far short of his actual experience. As RIKEN would not support him to go to international conferences, his time in Japan had the effect of disengaging him from the US job market. Upon his return to the United States, my friend had difficultly finding a job again and ultimately he had to settle for a position somewhat outside his field.

Some science and technology fields are relatively global in their thinking, namely the "Nobel Prize" fields of basic sciences, economics, and basic medical research. Within these fields a strong emphasis and level of importance is placed on publishing in world-class journals and going to international conferences. Those at the top of these fields make up a small and very powerful community. The problem, however, is that the very top ranks tend to ignore those below them and do not see the need to promote global skills. Moreover, within these ranks, there is an absence of serious consideration about the value of global experience in a science and technology career.

For the applied sciences such as engineering and clinical medicine, there tends to be less global focus on mobility. The norm is to publish in one's local language before translating to English. As well, despite there being international conferences, there is less mobility across national boundaries in job markets. Finally, there tends to be cultural differences about how research is conducted and evaluated, especially with respect to junior researchers.

Overall, the challenge to the development of global skills is the assumption that the best people do not need to develop global skills and the cost of developing such experience is the danger of dropping out of sight.

The very top rank of "Nobel" fields worldwide can be characterized by research hubs, but the percentage of research taking place is very small compared to total research. In response, there is a need to create more global research hubs and to pay more attention to the needs of broader segments of the science and technology workforce.

Those who are not in the very top ranks, the 95% who may not receive a job offer from a major research university, need more career counselling. Part of that counselling should be to provide information about what is going on worldwide. This is lacking except perhaps in the "Nobel Prize" fields. There also needs to be financial stimuli for global skills development, such as scholarships, travel grants for study, and research abroad. In addition, requirements and rewards should be set for participation in international conferences and publications. Finally, new types of cross-cultural education should be developed, with a focus on how to get things done and who is doing what where.

Takahiro Ueyama:

In the case of Japan, researchers also find it difficult to re-enter their field upon returning to Japan. The job market for them is almost closed, even for those with PhDs from top American universities.

Richard Byrd Dasher:

I would like to point out the need for Japanese professors to write better letters of recommendation for their students. Letters from Japan tend to lack concrete details to support the recommendation.If you do not know the person who wrote the letter, it is difficult to know how, how do you evaluate his or her recommendation?

Yuko Harayama:

Does the need for greater global skills cut across countries?

Richard Byrd Dasher:

Yes, the situation is the same across countries.

Kiyoshi Kurokawa (Cabinet Office):

In an OECD survey on how science and technology faculty see their role with respect to the value of education, Japan faculty members scored the lowest. They possess this mindset because to them, graduates are viewed as labor for top scientists.

Ikegami:

I am interested in using global skills. Generally, though, Japanese people tend to look down on such skills or talents. What is your definition of global skills?

Richard Byrd Dasher:

First, it is the flexibility to recognize that research is done differently in different places. Second is the ability to work in a team where people are from different backgrounds. This involves cultural understanding and sensitivity. A third skill involves a world view, where you look at your career as being a part of global efforts.

Yuko Harayama:

It also can be seen as accepting differences and recognizing that we are all different and can do something together.

Ikegami:

Do Europeans not have global skills?

Richard Byrd Dasher:

The European Union is becoming a big country and there is certainly less job mobility between the EU and the outside than inside the EU itself.

Teppo Turkki (Art Universities of Finland):

Academics in Finland have good resources to send scientists to Asia but the problem is that people do not want to go. The reason is the family; the spouse does not want to go to Japan and be left alone while the other is working so much.

Richard Byrd Dasher:

Such aspects of the environment are very important. The other thing is not to look only at the impact a job will have on the next step in one's career but what will happen two jobs later.

Kiyoshi Kurokawa:

In a global world, what type of value are you adding to your students? That is the key issue. In Japan, there is not such a value-adding sense because students are considered to be just part of the labor force.

Takahiro Ueyama:

Is there a difference between the social sciences and natural sciences? In the social science discipline of economics, many Japanese students go the United States to get a PhD and then return to find a job. These people are very ambitious in going abroad and building their skill sets. In the natural sciences, however, the world is more hierarchical.

Richard Byrd Dasher:

The tendency inside universities is for a particular field to acquire a theoretical base that then gradually loses touch with practical problems. What happens is that the elite of the elite wind up talking about theory and the level of abstraction increases. This encourages a hierarchical approach and it really does not recognize that most people are not going to be the next set of Nobel candidates. My undergraduate degree is in music. There is a very similar atmosphere here. The focus in music is on finding that one prodigy while the other students receive much less attention and focus. There would be a greater impact on society, however, if the other 95% of students received more attention.

Monte Cassim:

I do not think students are fully utilizing their potential. The 95% are not receiving enough attention. We should focus on training and preparing this group and then helping the other 5% as necessary.

Richard Byrd Dasher:

In Japan, because of the custom of lifetime employment, the norm for a company is to hire a student after his or her Master's degree, as opposed to PhD degree, and then put them onto a project in the corporate research lab. This reduces industry's interest in Ph.D. research in the university.

Monte Cassim:

Universities need to find an appropriate funding balance in which they have the independence to conduct necessary research.

Richard Byrd Dasher:

Overdependence on MEXT funding is akin to a small company having just one customer; it is totally reliant on this one customer and thus has a dangerous

existence. Universities in Japan think that they keep their independence by paying for research from the MEXT budget, but with demographic changes this will become a dangerous strategy. Large state universities in the U.S. probably receive no more than one-third to one-half of their operating funds from allocated state budgets. Their U.S. government funding is all from competitive grants brought in by individual professors.

Rene Carraz (Tohoku University):

I have an MA degree from Kyoto University. I was told that while I could also obtain my PhD from Kyoto University, I would be unable to get a job in France upon graduation and even a job in Japan would be tough. The key is what you do with a degree after you get it. My colleagues who want to work in Japan often end up working for foreign firms. I want to do research in Japan but I need to keep my options open should I decide it is necessary to return to France.

Richard Byrd Dasher:

Why should we care about global skills? It is all about increasing the possibility for global success.

Takahiro Ueyama:

I am interested in how the US system is effective in establishing a system of universities. Let us now go on to the next presentation.

Sachi Hatakenaka:

I am going to focus on four separate questions: why should we encourage mobility/international collaboration, what is already happening globally, what are the neglected areas, and what should Japan do?

Why should we encourage mobility/international collaboration? There are four rationales/benefits. The first one is the quality improvement of the scientific community, through avoiding fragmentation and isolation and encouraging competition and dynamism. Second, it is important to internationalize the educational environment, to create a global outlook among new generations. Particularly in Japan, there is a need to encourage creativity and individuality. The third rationale is the linkages to global innovation networks, such as links to centers of excellence and links to emerging economies which can have a positive feedback. Fourth, it helps in developing a global scientific community for global challenges, for example climate change, energy, and poverty alleviation.

What is already happening? On the global level, there has long been strong competition for fee-paying students and an emerging emphasis to attract bright students through scholarships. There has been insufficient emphasis, however, on graduate research students. There is also global competition for innovative academics for key leadership positions in centers of excellence. Indeed, some countries are beginning to "repatriate" their scholars particularly from the United States. Finally, global research collaboration has been taking place, characterized by thematic big projects such as ITER, increasing funding to support international research collaboration, institutional partnerships, and some initiatives for developing countries – though with some gaps.

There are several neglected areas. Graduate education is particularly important for creating future researchers who will take the innovation agenda forward. Greater attention must be given to structural changes, with institutions working harder to improve and internationalize graduate education, particularly at the PhD level. PhD education in Japan has some way to go before it can become established even for domestic industry; the tradition among employers has been to recruit bright MA students even for research positions.. Another neglected area is international collaborative research in Asia. The research funding programs in the European Union, for example, has no equivalence in Asia. Although there are many bilateral agreements, we must question whether sufficient efforts are being given to active collaboration. One other area of neglect is the innovation agenda of developing countries. There is a difference between rhetoric and reality. OECD governments tend to focus on global agenda relevant to them, and even though 'research' is receiving increasing attention in development assistance,

there is insufficient emphasis on the innovation needs of these countries.

Why should we focus on graduate students? Graduate students are a key ingredient for "brain-circulation." They also are a good target group for internationalizing researchers or enhancing mobility – particularly for countries such as Japan in which the language of instruction can be a barrier to entry. Graduate students are more likely to be internationally mobile than mid-career researchers. As the number of international graduate students rise, it will also become easier for foreign academics to operate in Japanese institutions.

The United States has long been popular as a place of study for graduate students, although there was a dramatic drop in the number of students, particularly from the Middle East, after '9/11'. The popularity of American graduate schools is based on key system characteristics, such as a simplified admission process based on globally available tests, readily available financial aid, the possibility to stay in the United States to work, and the course-based structure which is suitable both for interdisciplinary work and for students with diverse backgrounds.

Having international students has always led to questions from the public about whether it is prudent to be subsidizing the education of foreign students. Today, there is increasingly a unified voice about the need for "global talents." As such, the US has renewed its emphasis on global sourcing of graduate students through streamlined opportunities such as increased fellowships and financial support, particularly to support PhDs in interdisciplinary fields. I am not saying that Japan should do exactly the same – the Japanese system has different characteristics and different strengths. However, we do need to be aware of global developments and recognize that comparable efforts to strengthen graduate education may be necessary.

With respect to funding for international collaboration, Europe has been transforming itself through its research funding programmes that facilitate links among specialized centres of expertise in industry as well as universities, with greater international orientation and greater visibility. There are now denser networks between the United States and Europe. Under the new arrangement just announced, it has also become much easier for people in non-EU countries to receive support for their research. It is interesting that much effort is being made to reach out to China and India. There appears to be no comparable network developing in Asia, and Japan seems to be falling behind.

On global research for global challenges, in areas which are not of immediate interest to OECD countries, global efforts are emerging only slowly and sporadically. For instance, there has been concern that insufficient research and development is undertaken for drug discovery for diseases that are particular to developing countries. Today, public-private partnerships are making positive contributions in some of these areas – but they are supported by private foundations which are unlikely to provide long-term funding. The global community needs to develop a better framework for addressing such issues.

What should Japan do? First, there is a unique need for Japan to re-examine the lower levels of education (K-12) to ensure that future generations are appropriately prepared for globalization and innovation. Japan is well known for ranking high on international mathematics exams, but a more detailed look at the results show that Japanese students are good at solving structured problems but not as good in dealing with unstructured problems. The question is whether there are sufficient educational opportunities to foster creativity. Second, Japan should undertake a systematic and on-going review of its rationale and specific actions for international collaboration. This is what this group is doing today; it should not be a one-off exercise but should be part of an on-going process in which diverse inputs are sought. Third, there should be a focus on internationalizing graduate education with greater emphasis on improving the structure and content rather than just increasing funding. Fourth, Japan needs to pursue greater international collaboration in research, not just with Europe and the United States but also across Asia.

Fifth, Japan could do much more to promote international collaboration for the development agenda, particularly in areas of research.

Kiyoshi Kurokawa:

All of us here know that the generation of academics in Japan who have the power at the moment lack international experience. They often say things that they believe are correct, but in fact are wrong. They should humbly say: "My experience is very limited and I could be wrong." France and Germany, after WWII, began building the European Union. One key driver in its success was a student exchange program through which eight million students participated. In Japan, the majority of the establishment does not understand what those who have studied abroad realize.

I am going to focus on four separate questions: why should we encourage mobility/international collaboration, what is already happening globally, what are the neglected areas, and what should Japan do?

Why should we encourage mobility/international collaboration? There are four rationales/benefits. The first one is the quality improvement of the scientific community, through avoiding fragmentation and isolation and encouraging competition and dynamism. Second, it is important to internationalize the educational environment, to create a global outlook among new generations. Particularly in Japan, there is a need to encourage creativity and individuality. The third rationale is the linkages to global innovation networks, such as links to centers of excellence and links to emerging economies which can have a positive feedback. Fourth, it helps in developing s achieving a global scientific community for global challenges, for example climate change, energy, and poverty alleviation.

On the global level, there is a competition for students, both for fee-paying students and scholarship students. There has been insufficient emphasis, however, on PhD students. Also on the global level, there is a competition for academics with key countries beginning to "repatriate" their scholars particularly from the United States and a trend toward appointing "foreign" leaders for centers for excellence and global universities. Finally, global research collaboration has been taking place, characterized by thematic big projects such as ITER, increasing funding to support international research collaboration, institutional partnerships, and some initiatives for developing countries.

From this discussion, a number of neglected areas can be identified. Among them, there is a lack of focus on global graduate education, especially at the PhD level. Thought really must be given to structural changes with institutions working harder. A PhD in Japan is not the road to employment. The trend among employers instead is to take bright MA students and mold them in workers the company can utilize. Another neglected area is international collaborative research in Asia. The framework in the European Union, for example, does not have equivalence in Asia. Although there are many bilateral agreements, we must question whether sufficient efforts are being given to collaboration. One other area of neglect is the innovation agenda of developing countries. There is a difference between rhetoric and reality. OECD governments focus on "national" competitiveness or a global agenda relevant to them instead of what is always in the best interest of developing countries. The initiatives emerging for developing countries are largely being supported by foundations.

Why should we focus on graduate students? Graduate students are a key ingredient for "brain-circulation." They also are a good target group for internationalizing researchers or enhancing mobility. PhD students are more likely to be internationally mobile than mid-career researchers. As the number of international graduate students rise, it will be easier for foreign academics to find work.

The United States has long been popular as a place of study for graduate students, although there was a dramatic drop in the number students from China and the Middle East post-9/11. The United States' popularity rests with the features of its system, such as a simplified admission

process based on globally available tests, readily available financial aid, course-base teaching which allows entry for those with diverse backgrounds, and the possibility to stay in the United States to work.

Having international students has always led to questions from the public over whether it is prudent to be subsidizing the education of foreign students, but increasingly there has been a unified voice about the need for "global talents." As such, America has renewed its emphasis for global sourcing of students through streamlined opportunities like providing a legal provision for increased fellowships and financial support for graduate students and increasing funding particularly to support PhDs in interdisciplinary fields. I am not saying that Japan should do the same but we at least need to recognize that this is the world in which we live and recognize that comparable actions may be necessary.

With respect to funding for international collaboration, Europe has been transforming itself through Framework programmes that facilitate links with specialized expertise, greater international orientation, and greater visibility. There are now denser networks between the United States and Europe. It is also a lot easier for people in non-EU countries to receive support for their research. What is interesting is that for China and India, Europe is reaching out to them for research collaboration. There is a sense in Europe that they need to reach out to China as opposed to Japan. In this regard, Japan is not even on the map.

What should Japan do? First, Japan has a particular need to think about how K-12 education prepares students for globalization and innovation. Japan is well known for ranking high on international mathematics exams, but when you look at the results, Japanese students are good at solving structured problems but they fall beneath the OECD average for unstructured problems. Second, Japan should undertake a systematic and on-going review of its rationale for international collaboration and specific actions, making sure to have diverse inputs throughout the process. Third, there should be a focus on internationalizing graduate education with a basic improvement needed in the structure and content as well as funding. Fourth, Japan needs to pursue greater international collaboration, not just with Europe and the United States but also across Asia. Fifth, Japan needs to promote international collaboration for the development agenda.

Richard Byrd Dasher:

At the graduate level, how do you handle the incorporation of new content into fields where the professor says the course content is already too heavy? How do you add new content without diluting the overall content? My other question relates to incentives for professors to see the value of benefiting students. In the United States, professors' research groups of say eight people may consist of seven different nationalities. How do you convince professors that their students will get better jobs if they receive a more diverse education?

Sachi Hatakenaka:

In the US, universities put in a lot of institutional energy in creating and improving curricula and course structures. In Japan, there is less of a tradition to do so. .

Poh Kam Wong:

This problem is universal. From my experience, first you must have your top leaders, including the president, act to impose the right priorities. Second, there must be external pressure. Third, the private sector must effectively communicate the type of graduate qualities they need. This will put pressure on the faculty to respond.

Kitagawa (NIER):

It is also necessary to build up research capacity in countries and conclude research exchanges when students return to their home countries. Why do Japanese people not stay abroad as long as other students do?

Sachi Hatakenaka:

I have visited many universities worldwide, but in developing countries, I have often been surprised to find detailed and conscientious research assistance being provided by Japanese researchers. For instance, Japanese

researchers were active in research in water quality in Jordan or agriculture in Indonesia. These researchers may not be visible in grand partnerships, but they contribute directly to the local research agenda. I often think that these 'less visible' but essential research implementation tasks are something that Japanese researchers do very well, but since there is no framework to facilitate them, they tend to remain invisible and isolated instances.

Monte Cassim:

These people are outside the normal system.

Teppo Turkki:

At my university, we have been receiving Chinese design students. For India, they are poised to become the next wave in outsourcing design. I have heard that Indians are going to benchmark our university for the creation of a new university in India. Activities are happening very quickly. In this sense, the concept of the university is what is being consulted. Japan, I am told, is closed in this regard.

Ikegami:

Japanese universities like to make umbrella agreements but nothing ever is followed up.

Atsushi Sunami:

The globalization of Japanese universities is still lagging behind the United States. In recent years, while Japanese universities have increased the number of memoranda of understanding with foreign universities mainly in Asia, the actual content of collaboration is very limited.

Monte Cassim:

It is a question of where the university structure places importance.

Yuko Harayama:

There are a few cases of things being done outside the usual manner of running universities. We need to be more visible in this regard.

Takahiro Ueyama:

There is not so much difference in terms of government funding in the United States and Japan. The difference lies in the governance of the universities. Central figures in Japanese universities have so much power in how funding is allocated.

Richard Byrd Dasher:

I have to disagree a bit. In the U.S., more than the provosts being able to allocate money, money is almost always brought in by individual professors. Moreover, university advisory councils from industry have an impact on the direction of university research that is not found in Japan.

Poh Kam Wong:

I think one of the problems with Japan and some European countries is that there is not enough competition. The United States has a lot of competitive pressure to drive universities to be responsible in their funding allocations.

Takahiro Ueyama:

National universities are in some ways more competitive than private universities.

Kiyoshi Kurokawa:

People must think and act; if not, nothing will ever happen. "Innovation 25" needs to be put into action now rather than later.

Poh Kam Wong:

Competition should not just be domestic; it needs to be international as well. Japanese universities tend to be less mobile and in a way are protected from foreign universities. Their pressure is mostly domestic.

Richard Byrd Dasher:

I agree: except for the elite in a few fields, professors in Japan do not see themselves as engaged in international competition.

Sachi Hatakenaka:

What is the source of the state of insularity in Japan? There are many interdisciplinary research centers in American universities that have led to new research fields.

Richard Byrd Dasher:

It is impossible to be insular and obtain sufficient research funds. There is a lot of pressure from funding sources in the United States to do interdisciplinary research with multiple investigators, and to engage in multi-university

research consortia. One step beyond this is to have appropriate funding mechanisms.

Kiyoshi Kurokawa:

With international collaboration, Japanese PIs will suffer because they will be exposed to the talent of younger researchers.

Ikegami:

The Japanese funding system is becoming better and better, but problems remain. To work together in big groups is not easy for Japanese universities.

Kiyoshi Kurokawa:

RIKEN is a premier program but no one ever speaks about it in Japan.

Rene Carraz:

Competition works if the market is perfect. Education, however, is the farthest from a perfect competition market that I know of. In addition, in France for example, people want all universities to be at the same level. If you have good incentives, it is a good way to improve the system. I do not believe in the competition argument.

Kiyoshi Kurokawa:

Education has in fact become a marketplace. If you remember, Newsweek last year had an article on global universities. I was interviewed for the article but my comments were not used because, despite having 28 pages of text, Japanese universities were not focused on. Education has become a global issue and students see this. Japan is the second largest economy in the world but it only has 11 of the top 200 ranked universities.

Poh Kam Wong:

Global science and technology is becoming a club. The challenge for a latecomer country is how to join this club. This is a challenge for Singapore.

Between 1960 and 2000, Singapore achieved a GDP growth rate of 8% per year, driven by the manufacturing sector and sustained by its development as a major regional business and commercial hub. Since 2000, Singapore has turned toward a new phase of development: a knowledge-based economy incorporating high-tech innovation and manufacturing, knowledge intensive business services, and creative content production and distribution. This has been mirrored by a shift in the primary focus of the national innovation system toward the creation of IP-based knowledge and commercialization of innovation, development of entrepreneurial mindsets and capabilities, and becoming an integral node in the global innovation network.

Recognizing this, the National University of Singapore has expanded upon its two main traditional focuses of providing excellent education to the nation's population and contributing to the creation of new knowledge through engagement in R&D activities geared primarily towards scientific publications to include: contributing to the creation of new knowledge-based industries; attracting foreign talents; and fostering an entrepreneurial mindset.

A new president was brought in to push this expanded focus. The vision of the president to pursue a global knowledge enterprise is (1) to become a globally-oriented university, open to and competing for students and faculty globally, and benchmarking practice and performance against global leaders; (2) to make NUS a knowledge hub for industry and enterprise; (3) to inject an entrepreneurial dimension to NUS education and research; and (4) to be a key node in the global innovation network.

One example of new NUS initiatives in international cooperation in S&T human resource development is the so-called NUS Overseas College Initiative, which has an aim to send 200 NUS undergraduate students per year to five high-tech entrepreneurial hubs around the world. Through this initiative, we want to immerse students in a learning environment to promote experiential education. We send the selected students to work as interns in high-tech startups for one year. They take entrepreneurial-related courses in leading universities in the host region and then return to NUS to complete their final semester/year of study. With this initiative, we aim to infuse an entrepreneurial and global mindset, influence

the students' future career choices towards entrepreneurial and innovative pursuits, establish social networks with overseas entrepreneurial communities, and serve as a catalyst for mindset change among these students' peers in NUS upon their return. We do not think they will become entrepreneurs right away but the idea is to plant a seed, so that even if they work for big companies, they will bring with them the skills to think about being an entrepreneur maybe five or six years in the future.

Similarly, three others initiatives are raising innovative capacity through international cooperation: the Singapore-MIT Alliance program; Building Global R&D Links: the International Campus for Research Excellence and Technological Enterprise (CREATE) initiative; and Building Nodes of Global Excellence: the Research Center of Excellence (RCE) initiative.

Singapore has been a major hub in the global business, trading, and communications/transportation system in the 20th century. The country is now aiming to become a major hub in the global innovation ecosystem in the 21st century with the result being that we attract global innovators to the country, nurture globally competitive indigenous innovators, and build connectivity to other global innovation hubs. We also believe that NUS can play a significant role in this vision of Singapore through our "Open Innovation, Entrepreneurial University" model.

Kiyoshi Kurokawa:

Even if you award fellowships to foreign students and they return home upon graduation, this is fine. These people may become business leaders in their home countries and the contacts and awareness of your country that they cultivated while studying is beneficial.

Yuko Harayama:

We are all contributing to foreign human resources but we are also users of human resources.

Poh Kam Wong:

There is a heated debate over whether we should be giving spots in universities to foreign students at the expense of our own students. The government is not very popular over this issue, but their answer is that we need to compete for global talents. We need to have globally competitive national universities. Each set of universities needs to be focused on a segment of the human resources; all universities cannot be all things to all the people.

Teppo Turkki:

From where does the money come for your initiatives?

Poh Kam Wong:

From last year, we were corporatized. We entered into a contract with the government and now receive a budget every three to five years. Any additional funding we must raise on our own.

Richard Byrd Dasher:

Is Singapore worried about a brain drain?

Poh Kam Wong:

Singapore has a system in which the top students are given government scholarships and they get bonded for five to seven years upon graduation. There have, however, been students who have gone overseas and broke the bond. In the case of one student, the government retaliated by publicizing his name and shaming his parents.

Richard Byrd Dasher:

Is that a reason for the success of the Overseas College Initiative? There must be some reason for the benefits given.

Poh Kam Wong:

We want to change the mindset of the students, making them more entrepreneurial than just being focused on solving well-defined problems.

Takahiro Ueyama:

What is the status of research collaboration with other East Asian countries?

Poh Kam Wong:

Our focus is not just on signing cooperation agreements. We want to focus on a small number of much more intense cooperation arrangements. One such project relates to infectious disease with the idea being to encourage international collaboration because many of our researchers

are foreigners.

Richard Byrd Dasher:

Do you have a lot of researchers going to MIT?

Poh Kam Wong:

Yes, that is one of our aims.

Kiyoshi Kurokawa:

How do you evaluate incentives?

Poh Kam Wong:

There are two ways. One is we have an international advisory panel, of whom more than half the members are senior executives from industry and the other half is top scientists. The other way is through publishing in international journals, etc.

Sachi Hatakenaka:

I have watched with fascination the emergence of Singapore's international partnerships – where partners were 'cherry-picked' to develop certain capabilities in Singapore. The question is whether these partnerships have been successful and what lessons have been learned as a result of such experience. Also, previous comments suggest that the limited understanding on the part of government and leaders in Japan may be a bottleneck. If that is the case, should we also focus our discussion on how to inform and foster better understanding in government and with other leaders?

Kiyoshi Kurokawa:

I have been saying these things for 23 years. How can a person like me be appointed science advisor by Prime Minister Shinzo Abe? The reason is that I speak up when necessary. I am being evaluated not by my peers but by higher society.

Poh Kam Wong:

Unfortunately, we do not do a good enough job with communicating to the public what we do. Our government culture emphasizes action, not openness and transparency to outsiders. We can be quick in making adjustments internally to amend programs and correct mistakes, but we do not always explain to the public our reasons for doing so.

Ikegami:

In Japan, we are now facing a kind of innovation syndrome. People should focus on innovation. Does innovation on the part of researchers require an entrepreneurial mindset? In that sense, I am very interested in how to advance the "open innovation, entrepreneurial university" model.

Poh Kam Wong:

We cannot change faculty to develop an entrepreneurial mindset; it is too late. You must attract new professors already possessing that way of thinking. NUS needs to project that we support entrepreneurially-minded professors so that we can attract such professors. We must think beyond the boundary of the university.

Atsushi Sunami:

I just visited the Waseda campus and I have never seen anything like that in Singapore. I think the university helped itself by creating that environment as those who set up institutions around it get into that mode. That is also what Stanford did.

In the interest of time, I will just state my main conclusion, that is if one looks from here in Japan, the world is not so flat as one might see from US. Most of the foreign researchers in Japan are coming from China but not so many from India, for example. When we talk about globalizing activities by the Japanese universities, you can see some of them active in Beijing—but it is still too little, and too late. So, the overall impact on Japan's innovation system from the globalization's perspective is very limited. From my surveys of foreign researchers in Japan, most of them said that the reason why they are in Japan is the research facilities are relatively good. But for younger postdocs, many said their advisors sent them here. In conclusion, one can see the importance of social networks in attracting young researchers to Japan. Hence, we need to focus our energies on building a social network rather than just building research infrastructures, etc.

Monte Cassim:

What are the international cooperation strategies to take

the national innovation ecosystem further and what can we do to achieve this? The first thing is to define what the global innovation ecosystem is. Understanding ecosystems and sustainability is cyclicity, self-restraint, and diversity. In addition, there must be mechanisms for the transmission of knowledge and experience across generations. All of this gives you a certain amount of knowledge of how to run the system. But there must be a way to bring this across generations.

The university is at the root of a global innovation network initiative. Up to what level should technology creation take place? It is best to set up a corporate venture with someone who is good at it. There also has to be a source of funds. From there you begin to create wealth. There will be some feedback groups.

The next level is to take the utilization to commercialization. This will involve wealth-sharing mechanisms. Once that happens, again the university as a technology creator can become a monitor of the process. It is important to archive the technology. This will give you the standards and if it is done collegially these archives will build the seeds for good standards and good practices. From here, we have all the elements on where the technology focus will be. This is the foundation for technology cooperation. How we do this both nationally and globally is a challenge to discuss later on.

What does the system do for us? First it can help us nurture talent. What I found in the most successful cases and when you bring partners together is that you have a shared sense of mission. That becomes the basis of all partnerships. Behind that, there must be a very solid foundation. Unless you realize that your interest is much a part of a larger thing you will not succeed. Talented teachers are an absolute essential and a driving force for university reforms. The campus environment is important. On and off campus you can create learning laboratories. Working in the real world is important. All my students who have this experience get good jobs. The secret is catching the human resources at an early age. Six to 12 years old is a critical age. We must bridge the arts and sciences. Next year, we plan to have a creative and arts and science camp for high school students with laureates as the instructors and university students as the bridge. Finally, the job of discovery is so important in nurturing talent.

Once discoveries start coming, it is important that they are rewarded. The nail that sticks out needs to be nurtured. Japan praises hard work but not excellence. Innovation cannot be achieved in such a society. "Human resources" is not a good term; rather we must focus on human capability. The heart and the head must both shine. Collaboration, creativity, and cost are also factors in rewarding creativity. Some of Japan's brightest and most creative minds are NEETS and freeters. They are creative but outside the mainstream. In addition, the "mansion makers" were actually the ones who planted the seeds of Japan's fashion industry. There is something in Japan that does not reward excellence. Why does society not provide patronage for the creators? This is the key point.

Wealth should be created for all. We need to marry technology and artisanship, "high tech" and "high touch." If we can define and shape a collaborative culture that will allow us to understand the innovative ecosystem, we can cooperate in designing the system, rewarding talent, and work on creating a system for creating wealth for all. However, it will not be easy.

The most important thing in innovation is recognizing that it takes courage to walk the road less traveled.

Atsushi Sunami:

Does it help having a campus outside Tokyo?

Monte Cassim:

Actually, I was against putting Ritsumeikan University in Kyushu; I had wanted it in Osaka. I also wanted to have a science faculty. To be fair, I am glad that I was wrong and that it was not in a metropolitan area. USC and Stanford thrive because the world comes to them. I want to bring the world to Ritsumeikan. This inspires the students. Also, the students create their own culture. Moreover, Kyushu has what is good about Japanese traditions. Although students

are shocked upon their arrival, they quickly change and see the value in the campus and its location.

Richard Byrd Dasher:

With respect to nurturing talent, it is important to have a common sense of mission especially when dealing with -heterogeneous groups; otherwise everyone looks out for their own budgets first.

Monte Cassim:

One thing I have noticed is that you have to keep redefining your mission. For faculty, I brought in new blood. For each of the institutes I redefined the missions so that there was a connection. Five-year institutes comprise 25% of the total faculty at Ritsumeikan and they were the early adopters.

Kitagawa:

With global innovation, how do you ensure that it becomes the commons?

Monte Cassim:

One requirement is that all must subscribe to it.

Teppo Turkki:

There is an enormous need for a different kind of approach. As noted by Nokia's chief executive officer, we do not need any more engineers; we need designers. Finland ranks first in education internationally but one thing that is changing in Finland is the mindset of teachers. Teachers have a high level of education and are skilled.

Kiyoshi Kurokawa:

We know the problem so we must act, not complain.

Atsushi Sunami:

Japan's policy communities for ODA, education, and science and technology are all independent from each other. I am trying to bring these communities closer to have more effective innovation policy.

Yuko Harayama:

There are several points that we have identified through the discussion today. Among them are more emphasis on transforming the university system; creating framework research projects initiated by international collaboration; creating networks; focusing on implementation; and the role of Japanese government, universities, and industry.

Unidentified speaker:

Graduate education is the nexus of the science and technologies communities.

Sachi Hatakenaka:

There is not enough thinking about structure.

Ikegami:

We have enough funding in universities; the issue we face now is implementation and structure.

Monte Cassim:

There is a new model coming out; it is much more intensive collaboration with industry and society.

Poh Kam Wong:

One problem for science and engineering is that the focus is too narrow. The challenge is how to broaden it.

Richard Byrd Dasher:

Would everyone agree that looking at this as an education problem may be more important than just talking about joint research? Everything has a place and we are really talking about fundamental issues.

Poh Kam Wong:

I agree with having cross-cultural education programs. We have a lot of bilateral programs but these lack diversity and economies of scale. A better approach is a multilateral approach.

Rene Carraz:

It is better to focus on Southeast Asia. It would be good if undergraduates could engage in studies across the region easily.

Richard Byrd Dasher:

The key is experiential learning.

Poh Kam Wong:

One of the challenges to building a multilateral network is where to locate the coordinating hub. One way to deal with it is to have a rotating hub system, so that different universities get to host the multilateral networks at different time.

Richard Byrd Dasher:

Does APRU still exist?

Takahiro Ueyama:

The problem is that it is a club of presidents so nothing gets done.

Richard Byrd Dasher:

Then the problem is that there is a disconnect to the working level. The effort to drive and sustain a vision needs to come from the top. Focusing on implementation must come from the top.

Kiyoshi Kurokawa:

Professors should be elected on a committee basis.

Yuko Harayama:

Thank you very much for your comments. We will have to cut short the meeting due to the start of the next session. We will try to finalize your comments.