Keynote Speech: Global Innovation Ecosystem

Chairperson: Prof. Yoko Ishikura

Prof. Yoko Ishikura: One of the objectives of this conference is to explore what do we mean by global innovation ecosystem (GIES)? i.e. definition of GIES. Defining the term, however, is only half the task. We also need actions to implement GIES. Hence, I encourage our presenters to discuss courses of action and the participants to ask questions and challenge the presenters.

Speech 1: Science and Technology for Sustainable Development

Prof. Nathan Rosenberg: Sustainability is not subject to measurement such as measuring the circumference of the earth. When we speak of the sustainability of natural resources we don't know how to quantify that. We must begin with "it all depends." It all depends on society's stock of knowledge. Only after society's stock of knowledge improves, we come to know the potential economic value of natural resources.

It is important that environmentalists, and we all are environmentalists now, not reject the role of the marketplace, as we often hear they do. Historically, rising costs of resources signal the need to find cheaper substitutes or to improve the efficiency of present resources. Sustainability cannot be achieved without market forces. This is self evident. Market forces have played a crucial role in new technologies.

Although nature imposes constraints on resource supply, many technological improvements vastly increase the resource base of the economy. The natural resource base is not fixed. Technological advances expand the resource base of the economy. We can deduce, therefore, that natural resources are not constant but are altered by technology.

The electric arc furnace has introduced a new dimension to the dynamic market economy and has expanded the kinds of usable inputs. It had existed in the 19th century but only for a few kinds of inputs. Eventually the arc furnace was able to use alternative inputs, which steelmakers could just dump into the furnaces, which would melt them and produce new sources of steel. Steel making in the US in the past 30 years now employs this technology. Therefore, we cannot talk about sustainability without talking about technology, because technology transforms the things we can use as inputs.

From a different perspective I want to talk about a feature of industrialization not discussed much in relation to sustainability. The key point is that as per capita income rises with industrialization, the composition of demand changes. The OECD countries in the 20th century show a striking trend: the continuous growth of the service sector. The growth of the service economy marks an extreme change but it is very difficult to measure the output of the service sector compared to the manufacturing sector. We don't know what the output is. Nor is there a good measure of inputs either. This is a new world. Economies that are service dominated require different inputs. But what are meaningful measures of this output? My point is that measurement procedures are difficult for the service sector compared to the manufacturing sector.

Advanced industrial economies now have different demands. We need to look at sustainability from the service point of view. The growing service economies demand fewer inputs than the industrial economies of the 20th century. The last 30 years, and particularly the last 15 years, have been dominated by information technology and this has influenced the productivity of the manufacturing world. What is still needed is empirical research on how knowledge gained through technology affects demand for natural resources. My intuition is that this has reduced demand for natural resource immensely but his requires serious empirical research.

Speech 2: Creating an Innovative Europe

Prof. Luke Georghiou: In 2000, Europe's leaders met in Lisbon and set a very ambitious target of becoming the most competitive and dynamic knowledge-based economy in the world. The role of R&D was emphasized in this later when the leaders met in Barcelona and set a target for investment in R&D rising to 3% of GDP by 2010. Most of this increase would come from business. In 2005, the strategy was re-launched in a more focused way, emphasizing the economic dimensions of growth and employment and asking countries to report in a much more formal way.

During the British presidency of the European Union, the Leaders Summit decided that something more needed to be done. They mandated a group of personalities to report to the European commission on how to reinforce EU research and innovation performance in the face of globalization. The report, "Creating an Innovative Europe" highlighted the need for new language and new ways of thinking. We began with very hard words for Europe: "We must break out of structures and expectations established in the post-World War II era which have Europe today living a moderately comfortable life on slowly declining capital." We talked about a sense of complacency and about the gaps between the rhetoric of the political system that applauds the knowledge society and the reality of budgetary and other priorities, which have not shifted.

We also noted negative trends: falling productivity, failing to capitalize on application of ICT, losing out on large firms' globalized R&D, locked into un-modernized traditional sectors and under-investing in services R&D, and rising demographic challenges. We agreed with the strategy of saying R&D and innovation are key pillars, but argued that accelerating the transition from a resource-based society to knowledge-based society requires mobilization of a broad range of actions beyond R&D and innovation.

Europe requires a new paradigm of mobility, flexibility and adaptability to allow R&D and innovation to create the value that can support our quality of life. Mobility, flexibility and adaptability are the three focuses of the paradigm. We developed a four-prong strategy: creation of a market for innovative products and services, provision of sufficient resources for R&D and innovation, improvement of the structural mobility of Europe, and positive attitudes and a culture favorable towards entrepreneurship and risk-taking.

Strategic markets are a central recommendation and we believe there is a coordination failure in innovation policy. Key areas include: e-health, pharmaceuticals, energy, environment, security, electronic entertainment and content, transportation and logistics.

The leaders received our report in the spring and endorsed it. They asked the Commission to start taking actions. They have committed themselves in a policy paper to make lead markets a main theme of the EU competitiveness policy. European business associations have supported the report very vigorously.

Speech 3：Developing the Biomedical Sciences Sector in Singapore

Dr. Swan Gin Beh: The biomedical research community in Singapore is about the size of a major academic medical center in the US such as Johns Hopkins or Harvard so the Singapore experience is perhaps relevant to some cities but not necessarily to countries or regions. Singapore decided in mid-2000 to develop the biomedical sciences sector. Over the past five years, we have focused on strengthening a number of core capabilities including bio-processing, chemical synthesis, genomics and proteomics, molecular and cell biology, bioengineering and nanotechnology, and computational biology. These are relevant to the pharmaceutical, biotechnology and medical technology areas and also help to advance our healthcare services industry.

Singapore takes an integrated and comprehensive approach towards the development of biomedical research with the government involving all stakeholders. Our activities involve the three Cs of human capital development, intellectual capital development, and industrial capital development. Human capital is the critical success factor and we adopt a pro-global and pro-local approach by welcoming international talents and also encouraging young Singaporeans to pursue science careers. As for intellectual capital, the development of new capacity in the areas above has been accompanied by big increases in government funding for science.

This year, the government formed the new Research, Innovation and Enterprise Council, chaired by the Prime Minister, to advise the cabinet on research, innovation, and enterprise strategies. The public R&D budget is set to more than double from $5 billion in 2001~2005 to $12 billion in 2006~2010.

In industrial capital, companies that have come to Singapore include Novartis, which is conducting research focused on TB, dengue fever, and malaria. There are now 25 companies involved in drug discovery and development in Singapore. Venture capital is very important in biomedical sector. As such, the government had also set up a S$1 billion fund under Bio*One Capital.

Singapore is more interventionist than some countries in its innovation policies because of its small size. The next phase of the biomedical sciences initiative will be about building links and exploiting synergies, towards more translational and clinical research.

Speech 3: Interplay of National Innovation System and Corporate R&D in Asia

Dr. Ku-Hyun Jung: I view global innovation systems as being made up of national innovation systems and corporate R&D systems or corporate innovation systems. For a system to be called an "ecological system," it should have the following characteristics: diversity of species, open system, interaction among actors and feedback, co-evolution, and self-selection processes (survival of the fittest). I would like to suggest that the global innovation ecosystem does not meet some of these characteristics and it may be too early to be called as an "ecosystem."

Is the global innovation system truly global? It is becoming more so, but it is still not global. NIS tends to be closed, and corporate R&D system tends to be intra-corporate and not open to the outside. National innovation systems tend to be of stand-alone type. Corporate innovation systems are becoming global, but interaction among them is restricted due to the proprietary characteristics of corporate research.

In East Asia, the total amount spent on R&D by Korea, Japan and Taiwan is high, although Japan accounts for the biggest portion. The share of corporate R&D in national R&D expenditures is proportionately high in East Asia, with the region becoming more attractive as an R&D location.

China is the country that gets the most attention in terms of trade and growth. In R&D, it is still relatively behind and productivity seems to be low. Universities account for a small share of national R&D, government research institutes are slow to adjust to market incentives, and industry's output is low, but China has a large number of science and engineering students. This will be its biggest asset in the future. Multinationals also play a large role in R&D in China. A recent survey in *Global Entrepreneur* found that of the 25 excellent R&D centers in China, 20 were run by multinationals. Sixteen of these multinational centers reported that they are doing research for the world market, not just the Chinese market. There are many collaborative projects with Chinese universities: 97 multinationals reported 202 R&D projects with 36 universities.

To conclude, both national innovation systems and corporate R&D tend to be closed systems rather than open, except for basic sciences. Technology is a source of competitive advantages for nations and companies. Corporate innovation systems are highly corporate-specific and not amenable for sharing knowledge. Corporations are spending their R&D money to gain competitive advantages. The global innovation system is rather fragmented and compartmentalized. There are many artificial and institutional barriers for the system to become an open system.

Speech 4: International Conference on Science and Technology for Sustainability 2006

Mr. Junichi Murata: I believe technology develops over many years and flourishes against the social and cultural background of a particular region. When Japan opened up in 1868, we were stunned by the technological gap with Western countries. Most key sectors were comprised of state run companies, which were then sold to private interests. Some nine zaibatsu groups moved into managing banking, trading, machinery production, shipbuilding, etc. These groups were able to match the production volume of Western countries but the quality was inferior.

Product quality was poor until the 1960s and we imported technology from the US. In postwar Japan there was frequent labor unrest, and so management's top priority was labor relations rather than quality control and other production issues.

Quality started to improve when companies achieved more harmonious labor relations by introducing a uniform wage system which did not discriminate between hourly paid factory workers and other staff. QC circles were introduced from the US and workers themselves began to strive for better quality. Workers became aware that if the company became profitable they would share in the profit through bonuses and so both parties began to cooperate.

Kyoto is very resilient. The people are very independent, which means that they are not so adept at working in groups but that they are very successful in R&D and collaboration with universities.

Science and technology changes over time but deep down people do not change because they seek not only material fulfillment but mental fulfillment. University laboratories will develop because when researchers go home they are consumers and therefore will reflect that experience in their research. This is positive for the community. University research produces technology for companies to apply. This takes time but each of the players affects each other and this leads to valuable by–products.

Kyoto is conducive to this virtuous cycle. We are an ancient city. We have a favorable natural environment. We are also endowed with excellent schools, arts as well as high tech fora. We respect tradition but have always created new things over the centuries. Kyoto has endured for over 1200 years. That's real sustainability.