

**NATIONAL INNOVATION COMPETENCIES AND  
INTERESTS IN A GLOBALIZED WORLD**

**(IST 04/2004)**

**Denver, Colorado, U.S.A**

**25–27 May 2004**



**Asia-Pacific  
Economic Cooperation**

**Industrial Science and Technology Working Group  
September 2004**

## **Conference Summary**

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*Conference Sponsors:*

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*Publication Prepared for*

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APEC#204-IT-04.1

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## **Introduction**

The U.S. Department of Commerce, the Asia Pacific Economic Cooperation (APEC), in collaboration with the Office of Naval Research International Field Office, and the CIBERs at the University of Colorado at Denver and the University of Memphis organized a conference entitled, "National Innovation Competencies and Interests in a Globalized World." The conference was held from May 25-27, 2004 and was hosted by the Colorado Institute of Technology in Broomfield, Colorado.

The objective of the conference was to bring together scholars, practitioners, and policymakers who are interested in the topic of globalization and its impact on national innovation systems. The conference examined the globalization forces on an economy's national innovation systems, its effect on the research enterprise, and the action taken by economies in addressing its impact. Topics covered during the conference include globalization and national innovation systems, workforce development, entrepreneurship, and the location of production and services.

The conference brought together participants from about a dozen countries including Argentina, Australia, Canada, China, France, India, Mexico, New Zealand, Philippines, Korea, Sweden, Chinese Taipei, and the United States. In addition to their attendance in the conference, participants also took part in technology briefing sessions hosted by two Colorado-based companies: Storage Technology and Level 3 Communications.

This conference summary highlights the presentations made during the conference. It is organized into five sessions:

- (A) Globalization Forces, The MNC, and National Innovation Systems
- (B) Responses of the National Innovation Systems
- (C) Globalization, Innovation, and Entrepreneurship
- (D) National Workforce Development and Globalization
- (E) The Global Location of Production and Services

A brief summary/abstract is provided in each module and for selected papers. In addition, we have provided links to the actual presentations and papers.

Inquiries and suggestions regarding the conference should be directed to the conference coordinators: Dr. Sujata Millick and Dr. Manuel Serapio. Please direct questions and comments on the papers/presentations to the authors.

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## **Paper Summaries and Links**

### ***A. GLOBALIZATION FORCES, THE MNC, AND NATIONAL INNOVATION SYSTEMS***

Led by three renowned scholars in the field of international business and economic geography—John Cantwell, Ivo Zander, and Martin Kenney—the keynote session addressed key forces of globalization and their impact on national innovation systems. Discussion revolved around the role of the multinational corporation, international entrepreneurs, and the home/host countries in the development of national innovation systems.

#### ***A.1 John Cantwell, “Globalization of Corporate Innovation Systems and NISs”***

Summary: John Cantwell explored the relationships and interactions between the multinational company’s corporate innovation systems (CIS) and the home/host countries’ national innovation systems (NIS). According to Cantwell, the globalization of innovation in MNCs implies internationally integrated CISs that draw on and contribute to a few geographically dispersed nodes of locally specialized developments. In addition, Cantwell maintained that NISs have become more important in a globalized environment and that science-technology linkages are more critical than ever within NISs that seek to enhance their global positions.

#### ***A.2 Ivo Zander, “MNC Structures in Globalized Markets-Reflections of Exploitation or Exploration” [\(Link to Presentation\)](#) and “Entrepreneurship in a Global Space-Conceptual Foundations and Implications for New Cluster Formation (Links to: [Paper](#), [Presentation](#)).***

Summary: Ivo Zander addressed the exploitation vs. exploration motives in international business expansion. Providing a contending perspective to Cantwell, Zander demonstrated that a significant proportion of international business expansion is driven primarily by motives of exploitation instead of exploration. He provides examples of such motives using a number of case examples (e.g., Electrolux).

Zander also offers an entrepreneurial perspective to globalization and its impact on national innovation systems. This perspective maintains that cluster formation at the national level is enhanced by the international mobility of individuals and prospective entrepreneurs, primarily their abilities to assimilate new ideas in foreign locations and build social networks that transcend geographical distances.

### ***A.3 Martin Kenney, “Global Location of Production and Services”***

Summary: The first part of Martin Kenney’s presentation examined the key forces driving globalization and how these are impacting the global location decision of US MNCs in the service sector. These globalization forces include: (1) cheaper, faster, and better transportation and communications, (2) the growing importance of time and speed, (3) knowledge, capabilities, and clusters, (4) proximity to the customer, and (5) pricing pressure and overcapacity.

## ***B. RESPONSES OF THE NATIONAL INNOVATION SYSTEMS (NIS)***

The session on National Innovation Systems (NIS) examined the globalizing forces on an economy’s NIS, its effects on the research enterprise, and the actions taken by countries in addressing its impact. Effects on R&D investments in the public, private, and non-profit sectors, foreign direct investment flows, intellectual property issues, and other policy initiatives specific to an economy were presented.

Topics that were addressed by the various presenters include globalization forces impacting their economy’s NIS; composition changes in the research enterprise; drivers of technology investments; and development of cooperation mechanisms.

### ***B.1. Rick Christie, “Lessons from New Zealand’s Evolving Innovation Systems” (Links to: [Paper](#), [Presentation](#))***

Summary: Rick Christie, Chair of New Zealand’s Growth and Innovation Advisory Board, described how New Zealand works to

create advantages from a global approach in science and technology. New Zealand is a small country with a population of 4 million. The country is a natural resource-based economy and is geographically remote from its major markets, both of which present challenges and opportunities in today's global economy.

Christie remarked that with a global model in mind, the New Zealand system had changed structurally, policy-wise, and in funding modes. Their NIS is focused towards facilitating export of technology and global connectivity. Research consortia and centers of excellence were being established to attract foreign collaboration in research. The government has also established key research areas for investment and development in animal husbandry and agriculture technologies.

Challenges that New Zealand face include: how a small, specialized, and geographically remote economy can attract the investment in innovation necessary to transform and diversify their industries to participate in global markets; how commercialization of technology could be accomplished in the absence of a strong venture capital industry; how small entrepreneurial companies could attract international collaborations, investors, and/or trade partners given the costs of establishing and maintaining a presence in larger economies; and finally, how New Zealand in particular and other small economies in APEC could attract worldwide investment funds for research and development.

***B.2. William Padolina, “National Innovation System in the Philippines: Opportunities and Challenges” (Links to: [Paper](#), [Presentation](#)).***

Summary: Dr. William Padolina, the Deputy Director General for Partnerships for the International Rice Research Institute spoke about the NIS in the Philippines and the efforts to strengthen their S&T base. The Philippines has a population of about 83 million and a GDP of about 1.3 billion Philippine pesos.. Key activities within the country are focused within the services, agriculture, and industry sectors. S&T efforts within the government are geared towards enhancing the survival rate of small enterprises, technology commercialization, and e-governance. The government is also

actively attempting to develop a skilled workforce to both attract multinationals to the country and to retain talent for domestic enterprises. Finally, the country is also attempting to develop a modern S&T infrastructure.

Dr. Padolina also introduced the concept of an “International Public Good” whereby developing economies such as the Philippines can leverage developments in human resources, facilities, scientific information, and funding with other economies – rather than the costly route of “going alone.”

### ***B.3. Deok Soon Yim, “New Science and Technology Policy for Korea in the Global Innovation System”***

Summary: Dr. Deok Soon Yim from the Science and Technology Policy Institute provided an overview of the drivers of globalization in Korea and the extent of globalization in their R&D enterprise. Drivers of globalization include the increasing complexity and interdisciplinary nature of R&D activities, the decentralization of knowledge and information, the increase of market-oriented R&D activities, and increasing cooperation among countries. Dr. Yim emphasized that there was a great need in Korea to transfer market knowledge to the market and that universities, government, and industry were key stakeholders in this transfer process.

He added that another feature of Korea’s innovation system was the shift to an open-door national innovation system, where international collaboration and regional clusters were critical to innovation. Many MNC’s have established R&D centers in Korea, primarily because Korea is regarded as the entry country for the Asian market. Finally, all this is geared towards making Korea a hub for R&D in Asia.

### ***B.4. Young Ja Bae, “Internationalization of R&D Investment in Korea”***

Summary: Dr. Young Ja Bae of Konkuk University addressed the process by which Korea is moving from the old model of industrialization that is based on imitation (i.e., introducing new technologies to Korea from foreign sources for purposes of assimilation and improvement) to a new model of internal



technological development (i.e., innovation). Dr. Bae outlined the roles of foreign R&D investments and development of national innovation systems under this new model.

***B.5. Yee-Yeen Chu, “National Innovation Competencies in Chinese Taipei: Assessing the Impact of Globalization” (Links to: [Paper](#), [Presentation](#)).***

Summary: Dr. Yee-Yeen Chu from the National Tsing-Hua University provided his economy’s perspective on globalization of R&D. He stated that as a small and open economy within the APEC region, Chinese Taipei has been able to achieve sustainable growth with high-skilled human capital, a focus on hi-tech industries, and government support of regional and private sector technology infrastructure. Increased globalization has resulted in increased interdependence between firms, more competition, and more complementary resources. Chinese Taipei has capitalized on this by moving parts of its production structure to mainland China, increasing collaborations between industry, universities, and research institutes, and by focusing on innovation and entrepreneurship to transform Chinese Taipei’s economic development.

***B.6. Andre Manseau, “Canada’s Innovation System or Sytems-Developing Strategic Industry Clusters”***

Summary: André Manseau from the Université du Québec en Outaouais described the challenges of adapting an S&T structure to a globalized world. He stated that while the Canadian government had already started adapting to globalization in their R&D system, some additional changes were on the way. Increased emphasis on national strategy planning that was more responsive to the forces of globalization had resulted in emphasis on commercialization, R&D tax credits, strengthening innovation-related skills, workforce training, and cluster development. Areas that Canada needed to focus on more were specific industry initiatives in technology and increased international collaboration in standards development and S&T.

### ***B.7. Jorge Miguel Carrillo Rivera, "Surviving Innovation/Innovation to Survive"***

Summary: Dr. Jorge Miguel Carrillo Rivera from the Tecnológico de Monterrey described the challenges Mexico faces in embracing and reacting to globalization. He stated that some of the challenges included scarcity of research funding and infrastructure, technology transfer as a main means of research, and a regionally-based independent approach to innovation rather than a nationally-driven innovation system. He stated that, with the limited S&T resources available in Mexico, changes were incremental and more process-based, generally directed towards minor product changes and diversification of a product line. Carrillo suggested that Mexico should focus on organizing the government and industry efforts for complementary innovation and develop more flexible skills in their scientists and engineers. He emphasized that if Mexico is to prosper in today's global and knowledge-based economy, they need to focus on creating an environment, infrastructure, and human capital that will allow them to use a "Created in Mexico" label rather than a "Made in Mexico" label.

## ***C. GLOBALIZATION, INNOVATION, AND ENTREPRENEURSHIP***

This session explored the role of entrepreneurship in the development and promotion of national innovation competencies. It looked at whether entrepreneurial firms have emerged to play a more prominent role in international business.

### ***C.1. Rafiq Dossani, "India's Growth in Software: Its Relationship to Innovation and Entrepreneurship"***

Summary: Dr. Rafiq Dossani from Stanford University's Asia Pacific Research Center spoke regarding growth of the Indian software capabilities and its relationship to entrepreneurship and innovation. He remarked that his research had shown that India, Israel, and Ireland were primarily the key destinations for software offshoring – each with a specific niche. India, in comparison to Ireland and Israel, tends to provide business processing and software services for U.S. markets. Indian providers such as Tata had developed relationships with U.S. companies starting in the 1970's; overtime, this grew from

work being done on-site in the U.S. to offsite in India. By the end of 2003, Indian software exports grew to almost \$9 billion. Thus the outsourcing of the last 2-4 years was not new, but simply an expansion of existing capabilities and relationships. However, Dossani remarked that there are limits to this expansion. Indian providers still provide lower-end work to the U.S. markets and have not shifted to higher-end work such as system design, integration, and consulting. However, some of this has started in 2003-2004, as the leading Indian software companies have opened offices specifically to perform work in more complex software activities.

### ***C.2. Jayshree Pandya, “Impact of Globalization on National Innovation Systems”***

Summary: Dr. Jayashree Pandya described the importance of risk management and risk mitigation in a global economy, and ways in which countries could tap into the gains of a global economy while remaining realistic about its potential and risks. Pandya stated that, with globalization, demanding customers, price fluctuations, and product demand fluctuations are everyday issues for companies. Countries need to understand the risks and mitigate them in order to handle these challenges. In order to create ongoing innovation, businesses and governments should establish teams to manage the innovation process. Innovative nations have certain traits including; strong values, open cultures, a unified approach between the public and private sectors and government and non-government business, and involvement in proactive risk management. Understanding risk allows for the best decision to be made in a dynamic, competitive, and demanding global economy.

### ***C.3. Ivo Zander, “The Micro-Foundations of Cluster Stickiness-Walking in the Shoes of the Entrepreneur”***

Summary: Dr. Ivo Zander introduced the concept of “cluster stickiness.” He stated that despite globalization, there are certain aspects of innovation that continue to “stick”, i.e. they do not globalize. According to Zander, there are many economies where government actors are key in helping develop the entrepreneurial sector. Macro-opportunities are needed to push entrepreneurship – opportunities such as national goals, business needs, resource

scarcity, and individual drive/initiative. Therefore, the way that entrepreneurs recognize opportunities and their intentions to start a new business should pay particular attention to physical movement and social networks.

#### ***C.4. Jorge Miguel Carrillo Rivera, “Innovation and Entrepreneurship in Mexico”***

Summary: Dr. Jorge Miguel Carrillo Rivera from the Technologico de Monterrey described how Mexico, despite being the most entrepreneurial country in Ibero-America region, still sustains almost a 70 percent mortality rate of small firms after 36 months of operation. Mexico’s expenditure of less than \$2 billion in public and private R&D in 2003 comes to less than 0.5% of their GDP. Much of the innovation in the private sector occurs in the product or process level in manufacturing enterprises and over 80 percent of this innovation occurs within an organization, rather than outside the organization. Thus, with historically low investments and a high mortality rate for entrepreneurial enterprises, Carrillo suggests that the government needs to provide incentives for the small and medium enterprises through establishing S&T priorities and cost-sharing of R&D efforts.

#### ***C.5. J.H. Derick Sohn, “Knowledge Management as a Means of Innovation: The Case of Samsung Advanced Institute of Technology”***

Summary: Dr. Derick Sohn of the University of Seoul described how Samsung was able to transform the company from a follower to a market leader using knowledge management as a means of innovation. Focusing on the case of Samsung Advanced Institute of Technology, Dr. Sohn highlighted Samsung’s new strategic direction of “fusion and synergy.” This new strategic direction enabled Samsung to address the dynamic challenges of convergence, speed (e.g., time to market), and demand fluctuation. In turn, the company’s new system of knowledge management resulted into significant benefits for the company as evidenced by the key metrics of research capability, technology transfer and adaptation, number of patents, and speed of innovation.

## **D. NATIONAL WORKFORCE DEVELOPMENT AND GLOBALIZATION**

This session addressed the challenges and opportunities faced by nations in developing a skilled workforce through education and training, and in making the workforce available to a global market. It looked at the implications of “brain-gain/brain-drain” phenomena within different economies, and the actions taken by governments, businesses, and universities in recruiting S&T workers and students.

### ***D.1. Yugui Guo, “China’s Competitive S&T Workforce: Unprecedented Expansion of Higher Education at the Turn of the Centuries”***

Summary: Dr. Yugio Guo, a China scholar with the Community of Science, Inc., presented his research on China’s S&T workforce and the push by the Chinese government to expand the size and quality of higher education systems in China. According to Guo, a key goal within the country is to quadruple year 2000 GDP by 2020 and national strength and international competitiveness. Other nationally-directed strategic policies include a rejuvenation of China’s science and education system and a development of national talent. This focus on talent expansion will lead to a universally-based education system in China. Guo stated that graduate enrollment is generally influenced by the growth rate of both the national economy and the size of the relevant age cohort. But, in China, it is largely affected by public policy – by whether enrollment quotas are set to restrict growth, or whether enrollment is driven by demand.

### ***D.2. Mario Cervantes, “International Mobility of S&T Students and Personnel: Trends and Policy Implications.”***

Summary: Mario Cervantes with the Organization for Economic Cooperation and Development’s (OECD) Science and Technology Policy Division spoke on the global development of human resources in S&T and on international mobility trends and policies. Cervantes states that overall educational attainment had increased among the OECD economies. Among other strong S&T worker-producing nations, China, India, Russia, Brazil, and Thailand produce almost 60 percent of the number of doctorates produced among OECD member

economies. Much of the demand for S&T researchers is coming from the business sectors rather than the private sector. In terms of international mobility, there has been an increase in cross-border flows among the OECD economies – a result of policy actions in education, immigration, and labor demand.

### ***D.3. Margaret Cozzens, “Technology Workforce Development in Colorado: The Role of CIT”***

Summary: Dr. Margaret Cozzens, President and Chief Executive Officer of the Colorado Institute of Technology, described the requirements for technical workforces in 2010. She stated that employers are looking for a new breed of employee, a hybrid that synthesizes technical expertise with a command of business operations and integration. Cozzens remarked that education systems need to change to meet this new need. Learning needs to be individual-driven and not teacher-driven, and it needs to teach integration skills, analytical skills, communication skills, and management skills.

### ***D.4. Sujata Millick, “Technical Workers in the G-7 Nations”***

Summary: Dr. Sujata Millick presented the findings of a comparative study on technology workers in the G7 nations. The analysis looked at the education, labor, immigration and emigration policies, and approaches of the nations as they related to developing, sustaining, and retaining their S&T workforce. The G7 countries accounted for 67% of the world’s GDP; they are leading nations in terms of R&D expenditures, and have taken concrete measures to ensure that their S&T workforce is prepared to meet the challenges of the 21<sup>st</sup> century. Common education challenges that the countries faced included declining size of entrant groups and declines in S&T enrollments. On the labor/employment side, challenges included a shift from vocational/skill-based employment to knowledge-based employment requiring flexibility in worker learning and worker skills. In handling migration challenges, countries tended to adopt a mix of approaches – short-term stay (temporary visas) and longer-term stay (permanent resident status).

## ***E. GLOBAL LOCATION OF PRODUCTION AND SERVICES***

This session addressed the growing global dispersion of production, services, and innovatory capabilities. One such development contributing to this dispersion is the growth of international outsourcing in business processes and information technology. This session highlights current research that is being conducted in this area.

### ***E.1. Martin Kenney, “Global Location of Production and Services”***

Summary: Martin Kenney described key trends and developments in international outsourcing in the service sector. Drawing on lessons learned from his research on India, Kenney addressed the following topics on offshoring: (1) types of outsourcing firms, (2) types of organizations doing offshored work, (3) offshoring destinations, (4) technical enabling conditions and business drivers influencing offshoring, (5) costs and benefits of offshoring, and (6) issues and future directions.

### ***E.2 Ben Kedia, et.al., “Relocating Value Chain for Competitive Advantage”***

Ben Kedia addressed the development of offshoring (offshore outsourcing) using the framework proposed by Porter in analyzing a firm’s value chain. He offered three key propositions underlying a firm’s decision to offsource; these were based on two factors: (1) contribution of activity to the firm’s competitive advantage, and (2) contribution of activity to the firm’s core competence. Kedia maintained that offshoring enables a combining of the benefits of a firm’s generic strategies, thus leading to competitive advantage.

### ***E.3. Manuel Serapio, “Global Location of Operations in the High Tech Industry: The Case of Colorado”***

Manuel Serapio described his ongoing research on the global location decisions in Colorado's high technology industries. Serapio's interview-based research will address the following key research questions: (1) What factors drive a company's decision to (or not to) engage in international outsourcing?; (2) How do companies select offshoring locations, mode of entry, and mode of partnerships?; (3) How are these companies international outsourcing operations performing?; and (4) What are the implications of the outsourcing development for Colorado's high technology sectors?

***E.4. Honorio Todino, "Business Process Redesign: Embracing the New Globalization" [\(Link to Paper and Presentation\)](#).***

Honorio Todino addressed business process offshoring as a key aspect of the new globalization. According to Todino, the new globalization is characterized by an emphasis on intellectual capital, trade in services, the expanded role of the internet, and contractual forms of engagement across borders. Todino's presentation centered on the key decision and action steps in business process redesign that lead to offshoring.